



Great Plains Center for Agricultural Health 2020-21 Annual Report

Sept 30, 2021

Report Period: October 1, 2020 – September 29, 2021

CDC/NIOSH Grant U54 OH007548

www.gpcah.org

[Facebook.com/GPCAH](https://www.facebook.com/GPCAH), [Twitter @GPCAH](https://twitter.com/GPCAH)

The Great Plains Center for Agricultural Health is located within the Department of Occupational and Environmental Health at the University of Iowa, College of Public Health, at 145 N Riverside Drive in Iowa City, IA, 52246

SECTION I: CENTER SUMMARY

The Great Plains Center for Agricultural Health and Safety (GPCAH) is a nationally recognized public health resource that develops and implements programs of research, intervention, translation, education, and outreach with the long-term goal of preventing occupational injury and illness among agricultural workers and their families. The Center serves a nine-state region: Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. We have also begun collaborations in Ohio and Indiana, currently unserved by any other NIOSH-funded Ag center. The Center addresses the health and safety needs of agricultural workers in America's most agriculturally intensive region, which has a significant burden of severe agricultural injuries and illnesses compared to other regions and industries. A full list of GPCAH program outputs from 2020-21 is provided in the Output Summary (pp 18-27).

OVERALL GOALS

The overall goals of the GPCAH are to:

- 1) Serve as a regional and national resource for agricultural health and safety.
- 2) Conduct relevant and translatable research that provides evidence-based strategies to improve the health and safety of agricultural workers.
- 3) Develop and evaluate educational, outreach, and intervention programs to prevent disease, injury, and hazardous exposure among agricultural workers and their families.
- 4) Provide relevant and evidence-based assistance (*e.g.*, methods, training, and interventions) to health and safety professionals and community-based agricultural health organizations to enhance regional expertise to prevent agricultural injuries and illnesses.
- 5) Maintain and expand networks to promote agricultural health and safety research, training, and prevention programs and to track emerging issues that may put agricultural workers at increased risk of illnesses or injuries.

The Center includes four research projects aimed at reducing the burden of injury and illness throughout our region and has an Outreach Core to build the expertise in health and safety throughout the community, for professionals, community advocates, intermediaries, and farmers.

RELEVANCE

Agricultural workers experience high rates of occupational injury (including fatal injury) and illness when compared to other employed groups. As the region's most well-established agricultural health and safety resource in the nation's most agriculturally intensive region, the Center is highly relevant to agricultural workers, physicians, public health practitioners, and researchers committed to protecting the health and safety of agricultural workers. We describe relevance for each project and activity in Section III.

SECTION II: KEY PERSONNEL

Center Director:	T. Renée Anthony, PhD renee-anthony@uiowa.edu 319-335-4429
Deputy Director:	Nathan Fethke, PhD Nathan-fethke@uiowa.edu 319-467-4563
Center Coordinator:	Jennifer Patterson Jennifer-j-patterson@uiowa.edu 319-335-4026
Evaluation Director:	Kanika Arora, PhD kanika-arora@uiowa.edu
Research Project Leaders:	
<i>Farm Vehicle Roadway Study:</i>	Cara Hamann, PhD cara-hamann@uiowa.edu
<i>Air Quality Improvements:</i>	Matt Nonnenmann, PhD matthew-nonnenmann@uiowa.edu
<i>Surveillance of Injuries and Risk Factors:</i>	Marizen Ramirez, PhD mramirez@umn.edu Carri Casteel, PhD carri-casteel@uiowa.edu
<i>Pilot/Feasibility Projects:</i>	Nathan Fethke, PhD nathan-fethke@uiowa.edu
Outreach Director:	Diane Rohlman, PhD diane-rohlman@uiowa.edu

SECTION III: PROGRAM HIGHLIGHTS AND IMPACT

Planning and Evaluation Core

(T.R. Anthony)

The Planning and Evaluation (P&E) Core comprises ongoing activities that:

- 1) Ensure the efficient and effective management of Center *resources*,
- 2) Identify health and safety *needs* throughout the region,
- 3) Coordinate *communication* between Center personnel and Advisory Committees and stakeholders,
- 4) Develop and implement an *evaluation* program and respond to improvement recommendations to maximize the impact of our programs and projects on agricultural worker protection, and
- 5) Identify and respond to *emerging issues* that threaten the health and safety of agricultural workers throughout the region.

Below are the key GPCAH activities and assessments of their impact towards meeting these objectives in the past year.

Evaluation

GPCAH evaluators collaborated with [CS-CASH](#) and [UMASH](#) to create a cross-center logic model to summarize the many contributions of the NIOSH Ag Centers in the protection of the health and safety of livestock workers. This iterative process included synthesizing the program activities and outputs, determining the outcomes of our collective efforts, and gathering evidence to support our contribution to those outcomes. The logic model (Figure 1) emphasizes the adoption of guidelines generated across all Ag Centers and training activities delivered to farmers, healthcare providers, and industry representatives as well as formal educational programs provided at multiple educational stages. The logic model also highlights innovative contributions made by the GPCAH to improve the air quality in livestock buildings, including *ventilation technology improvements* from our Air Quality study, *gas monitor* training and guidance from Emerging Issues project, and *respiratory research* findings from Pilot Grant projects.

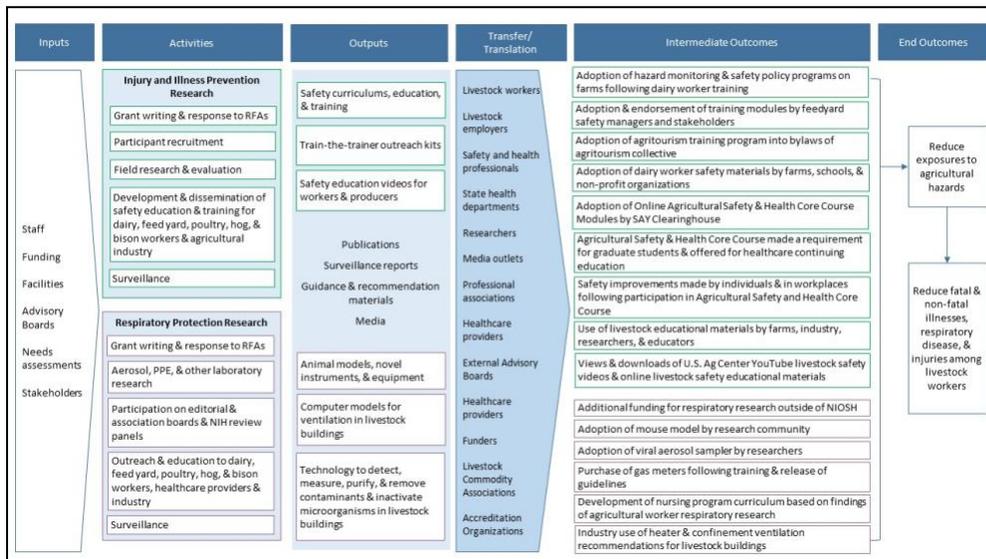


Figure 1: Identification of activities, outputs and outcomes from NIOSH Ag Center activities focused on protecting the health and safety of livestock workers.

Coordinate Communication: Activities and Impact

Advisory Committees: Advisory committees continue to provide valuable communications across the region, leading to improvements in outreach and educational materials and helping staff make connections with experts to provide resources for topics. The Regional Advisory Committee (RAC) meetings shared COVID informational resources (Sept 2020), posters and material cobranding (Sept 2020; Aug 2021), podcast planning (Feb 2021) and structure (May 2021), and dissemination (Aug 21). We discussed the development of new outreach toolkit materials to help others throughout the region lead discussions on Hearing Loss Prevention (Feb 2021) and Falls Prevention (Aug 2021). Also in August 2021, we reviewed the results from the electronic RAC feedback survey and developed a plan for upcoming meetings. Added to our agenda was the coordination of skills development activities at upcoming MRASH conferences, for which we added training for the *Farm Safety Checklist App* (Surveillance Project) in Nov 2021 ([information/registration](#)).

FarmSafe Podcast: At the end of August 2021, the GPCAH launched the *FarmSafe* podcast. The by-weekly podcast creates an additional space to discuss agricultural safety and health hazards and prevention. These podcasts were developed to improve our ability to reach farmers directly. The structure includes farmer voices sharing stories of incidents and close calls related to the episode's hazard, which we hope will shed light on farm risks and will help to normalize discussions about safety on the farm. This long-term outcome of this podcast is to host effective discussions on how to prevent debilitating injuries and illnesses on the farm, drawing on the voices and experiences of farmers combined with guidance from safety and health professionals. During each episode, farmers and health and safety professionals share first-hand stories and real-life tips for making safer and healthier decisions while on the farm. Each episode highlights at least one simple action listeners can take to prevent an on-farm injury. The first episode is an introduction to the GPCAH and highlights some of the Center's research and outreach activities. The next three episodes are part of a series on ATV Safety (ATVs on Roadways, Young ATV Riders, and ATVs on the Farm), which have all aired by the end of September 2021.



Figure 2: FarmSafe Podcast Logo, available at <https://gpcah.public-health.uiowa.edu/farmsafe/>

The podcast is available on the [GPCAH website](#), where currently 50% of our listeners access the podcast. *FarmSafe* can also be found in popular podcast directories (Apple Podcasts, Spotify, and Google Podcasts). As of September 27, 2021, episodes have been downloaded 131 times across 13 states in the US and from viewers in Germany, Canada, Finland, and the United Kingdom.

MRASH: The GPCAH supported the regional Midwest Rural Agricultural Safety and Health ([MRASH](#)) conference, held virtually in November 2020. Staff from both [Minnesota](#) and [Nebraska](#) AgFF Centers participated in the MRASH conference planning and contributed to its content. Center personnel helped coordinate meetings, managed social media, provided introductions at the event, coordinated several roundtables, and developed and analyzed evaluation efforts. This four-morning virtual conference had 132 unique participants who were from fifteen U.S. states, Argentina, Australia, Canada, and Ghana. Figure 3 illustrates the diversity of professions of those who attended the conference.

Cross-cutting panel sessions were incorporated into the program to enhance recognition of relevant topics, including:

- *Emerging Zoonotic Diseases Impacting Agriculture: What Comes After COVID-19?* A keynote provided by Dr. Ali S. Kahn at University of Nebraska Medical Center, followed by panel discussion with Drs. Klumb (MN), Becot (WI), and Nonnenmann (IA) to discuss other zoonotic infections that impact agriculture.
- *Aging on the Farm:* UMASH investigators presented community forums held in 2020 throughout the region to support aging farmers and raise awareness about aging and injury prevention.
- *Farming through the Pandemic:* A roundtable provided perspectives on mental health in farmers.
- *Science of Communicating Effectively for Behavior Change:* A capstone presentation from Dr. Afifi (IA) to build understanding of public health tools and approaches, followed by a panel discussion.

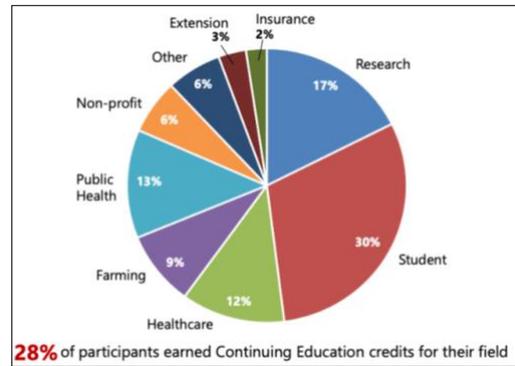


Figure 3: 2021 MRASH attendees bring diverse expertise to the conference.

Social Media: The P&E Core implemented the Center’s social media communications strategy, which reaches audiences on Facebook, Twitter, and YouTube. These networks are used to disseminate safety messages and study findings to new individuals across a broad audience. In this project period, 107 Twitter posts and 392 Facebook posts were generated.

Our Twitter followers tend to be more engaged in scientific studies and reports, and in the past year we made over 29,192 impressions and gained 48 new followers. Figure 4 shows the most popular tweet of the past year, focusing on mental health awareness.

YouTube activities this past year have mostly been used to disseminate information on COVID-19 and the Farm Safety Checklist App training (*Surveillance* project).

Our Facebook followers increased from 487 to 602. In this project period, 16,785 unique individuals viewed our Facebook posts as least once over the year, and the number of engaged readers exceeded 575 this year. Our most popular Facebook post this year was a promotion of the first *FarmSafe* episode (426 reached, 10 engaged). We only paid for one Facebook ad campaign (\$13 “boost” to promote a small pilot grant program for students), which reached 2,091 targeted individuals and resulted in 22 engagements. However, it was minimally effective in increasing applications to this pilot grant opportunity. Table 1 presents the most effective (unpaid) post topics for our Twitter and Facebook accounts.

Top Tweet earned 1,189 impressions

Mental health is a huge part of overall health and should be a priority for everyone, whether you have a mental health condition or not. [#MentalIllnessAwarenessWeek](#) [#MIAW](#) pic.twitter.com/wJ2z1wbaHX



🔗 9 ❤️ 10

Figure 4: GPCAH tweets reaches health and safety organizations across the globe as well as across our region. Mental Health Awareness Week tweets had the most impressions this year.

Table 1: GPCAH Social Media Top Five Posts

Twitter	Facebook
Mental Illness Awareness week https://bit.ly/3kfSgK	FarmSafe Podcast Promo ATVs https://bit.ly/3DIZ3nZ
Register for MRASH 2020 https://bit.ly/3lvzq1k	Save the Date: Child Ag Safety and Health Workshop https://bit.ly/2YnqvY8
Iowa Health Assessment Survey Promotion https://bit.ly/3AdVKD1	Reminder to update first aid kits during harvest season https://bit.ly/2XmPkmh
FarmSafe Episode #1 https://bit.ly/3hAlnVY	FarmSafe Episode 1 https://bit.ly/3tH0K0x
Register for MRASH 2020 https://bit.ly/3CbV0yT	SafetyWatch article: vaccines https://bit.ly/3BG9NlB

In conjunction with the *Emerging Issue activities*, a COVID-19 social media campaign continues to translate and share messages generated to reach rural communities and its farmers. The campaign has included promoting informational videos, video cards, regular social media cards, webinars, *SafetyWatch* articles, vaccination information, and updated web content to our social media followers and to those following hashtags we include in posts. Once vaccines became available to the public, we began posting weekly vaccination information/promotions to highlight vaccination rates in each of our region’s states, along with encouragement to get vaccinated (Figure 5). Combined, *our 51 COVID-related Facebook posts have reached over 3,825 individuals.*

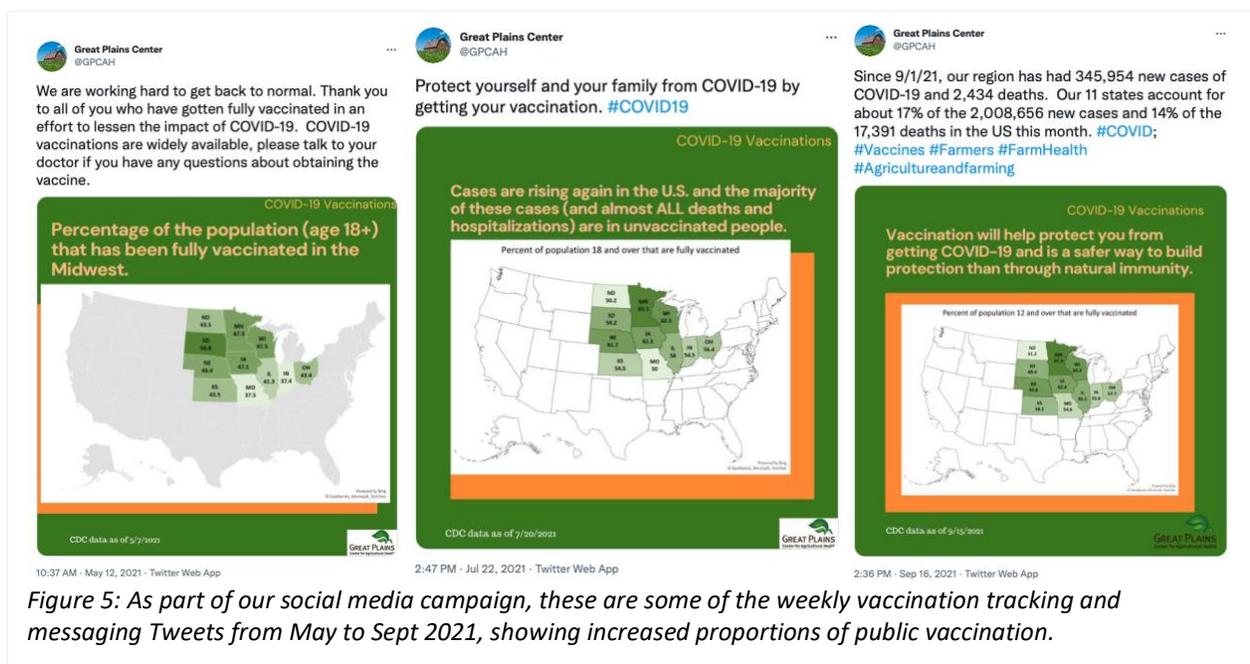


Figure 5: As part of our social media campaign, these are some of the weekly vaccination tracking and messaging Tweets from May to Sept 2021, showing increased proportions of public vaccination.

Press Releases: In 2020-21, press releases were generated to inform communities about the virtual MRASH 2020 conference and the 2021 pilot grant proposal solicitation. We also generated COVID press releases to share and promote research studies by our investigators. A highly impactful press release focused on Dr. Arora’s [findings](#) of increased rates of dementia in ag workers. This press release was picked up by [local news](#) (KCRG and Siouxland News, CBS/Fox affiliates), [Radio Iowa](#), [Ag Update](#), [Farm Week Now](#), [Iowa Farmer Today](#), and on [RFDTV](#). It is also included in an [index](#) for the health and retirement studies (HRS) web site. In addition

to outside media, the press release informed additional newsletters including [NIOSH eNews](#), [Alive and Well](#), [University of Iowa College of Public Health News Digest](#) and the [UI CPH News](#). The press also contacted the Center and [reported on](#) this and other work the GPCAH is undertaking on farmer mental health challenges, citing an emerging issues project (Afifi), the dementia study (Arora), and COVID-19.

A new press release (Sept 17, 2021) promotes a new pilot grant funded paper (Berman et al., [in press 2021](#)) on the relationship between drought and mental health, which we anticipate to be extremely impactful in both the media and the scientific literature. Evaluation is underway. All GPCAH press releases are available on [gpcah.com](#).

Emerging Issues

The GPCAH has funds available to respond to timely hazards throughout the project period. At the start of this center’s funding cycle (2016), manure gas fatalities were a regional concern, then, in 2017, members of rural communities called with questions and concerns about pesticides drifting onto neighboring lands and into homes. In 2018, concerns regarding mental health – particularly as related to the national opioid addiction and later to farmer suicide – became a regional priority. In the current project year, we focused on continuing mental health activities and developed new COVID-19 activities, with both regional and national impact. From early 2020 to the present, we were actively engaged in tracking, educating, and dissemination information on various aspects of COVID-19.

Starting in early April 2020, the GPCAH compiled information on [COVID-19](#), including an [FAQ for COVID](#) that answered questions coming in from farmers, rural communities, and the media. This document has been revised eight times since its original posting (six updates between October 2020 and September 2021) to update relevant statistics and to reflect our improved understanding of COVID-19 risk and prevention strategies. In March of 2021, we created an additional [FAQ page for COVID-19 vaccines](#). This document has been updated twice since its original posting to reflect updated information on vaccine availability and current recommendations.

We worked with other AgFF centers to identify topics for YouTube videos to help communicate prevention methods to agriculture workers, and we focused on [mask use](#) and [medical concerns](#) (Table 2). In addition to conversation and demonstration videos, we generated animated videos focusing on explaining the COVID-19 Timeline (Figure 6) and the Hierarchy of Controls, which have been viewed globally.

Table 2: COVID-19 Videos and Views

Video	Views
Cloth Face Covering Q&A	222 / 157 / 121
Demonstrations (by strap type)	19/21/15/104
Symptom Screening	107
COVID-19 Timeline	7452
Hierarchy of Controls	413

New outcomes from this project period include:

- Resources are on the GPCAH COVID-19 [webpage](#).
- All videos are on the GPCAH [webpage](#) and the GPCAH [YouTube channel](#).
- Provided training on COVID-19 Mitigation Strategies for Community Health Navigators, offered through the [Iowa Chronic Care Consortium](#), which has enrolled many participants who need English-Spanish translation services in healthcare settings.
- Presented collaborative poster with NORA AFF Sector Council Vaccine Working Group: Ramos, A.K., Greer, A. Salzwedel, M., Crawford, K., Corwin, C., Grzywacz, J.G. *Recommendations for efficient rollout of COVID-19 vaccines in the agricultural sector*. ASHCA Safety Summit (Virtual Conference), March 22-24, 2021.

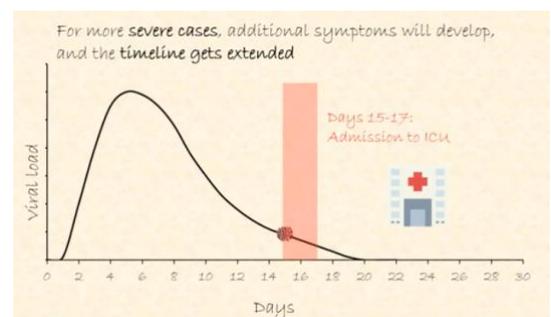


Figure 6: A screenshot from the animated [COVID-19 Timeline](#) video.

Instrumented Farm Vehicle Roadway Study (C. Hamann)

This research study investigates vehicle interactions with farm equipment on public roads that contribute to crashes involving rear-end collisions and dangerous passing maneuvers. Phase 1 of the study aims to develop and refine a device mounted on the rear of farm equipment that (a) measures farm equipment exposure to the roadway and the frequency with which cars approach the farm equipment and (b) measures the behavior of vehicle drivers as they approach the equipment. During Phase 2 of the study, the team developed and are currently deploying and evaluating a farm equipment roadway safety program at the community level.

Naturalistic Driving Data: One final season of data collection was conducted in both the intervention and control communities this year. During the Fall 2020 harvest season, farm vehicles were equipped with *SaferTrek* data collection devices for more than 800 deployment days and recorded almost 2,500 videos. Across all four data collection periods in this study, there were more than 3,100 data collection days.

The refinement of methodologies for processing video and GPS data continued. A set of validation data were used to calibrate and determine the accuracy of the data being extracted from the video processing, (i.e., estimated distance and relative velocity between the farm equipment and a following vehicle). A manuscript on the vehicle distance estimation procedure was drafted and submitted to the Transportation Research Board Annual Meeting. In addition, procedures for identifying roadway trips in the GPS data, excluding data points off the roadway (e.g., driving done in a field), and tabulating trip metrics were finalized. Data from Fall 2018 and Fall 2019 were processed using the developed methodology and produced a dataset containing 4,151 roadway trips.

Community Campaign: A manuscript on the process evaluation of the campaign development, dissemination, and community advisory board was submitted and is under review. Figure 7 illustrates the community campaign kickoff events that occurred in summer 2019, which is part of the process evaluation. Analyses of the survey data are underway, and roadway data analyses will also be conducted once the video and GPS data are fully processed.

Key Achievements: During this reporting period *SaferTrek* devices recorded approximately 800 data collection days resulting in more than 2,500 roadway videos. Data from two data collection periods were processed to extract GPS data for more than 4,000 roadway trips (Phase 1). The process evaluation of the community advisory board was completed, and a manuscript was submitted and remains under review (Phase 2). A manuscript on the video image processing vehicle estimation procedure was drafted and submitted to a research conference. Two other manuscripts are in preparation—one using our roadway data on the driver behavior of vehicles following farm equipment and another on self-reported and perceptions of community member passing behavior using the baseline intercept survey data from Phase 2 of the study.



Figure 7: Kickoff event for the “We’re on This Road Together” community campaign, 2019. Three tips on the banner are: Leave More Space. Avoid Passing. Slow Down.

Air Quality Improvements in Livestock Production Buildings (M. Nonnenmann)

Swine workers experience an elevated rate of lung disease, pulmonary symptoms, and decreased lung function compared to workers in other industries. Aerosols containing microorganisms in swine production contribute to exposure burden and disease transmission among both animals and workers. GPCAH data have demonstrated that two technologies can improve the air quality in small-scale swine farrowing rooms: a recirculating ventilation system with air filtration technology and a gas-fired heating system that vents to the outside. Modifications using proven disinfection technologies (e.g., ultraviolet light or UVC) within the ductwork of this system is being investigated as a technology that could be effective to reduce the burden of disease in both pigs and workers. Our long-term goal is to develop engineering guidelines for the swine industry that will be adopted by builders and swine producers to reduce occupational exposures, thereby reducing lung disease and infection in this working population.

In Aim 1, we are *evaluating* the effectiveness of our technology to improve air quality in swine production. In Aim 2, we are *optimizing* our technology to control microorganisms in the air using filtration and UVC light during commercial swine production. In Aim 3, we are evaluating a bioaerosol treatment system on reducing airborne concentrations of microorganisms *in swine production building*. Technology to reduce airborne dust and microorganisms will be evaluated across multiple field and laboratory experiments and tested in commercial swine farrowing. We expect that this work will result in novel engineering solutions to decrease dust and microorganism concentrations and subsequently to reduce agricultural worker exposure in swine production. This contribution is significant because successful demonstration and adoption of engineering technology would demonstrate a paradigm shift from the current approach to control inhalation hazards.

Over this project year, we have completed laboratory work on Aim 2 and Aim 3.

Aim 2: We completed experimental trials in the lab using aerosolized *E. coli* and bacteriophage MS2 to assess the performance of the prototype filtration/ultraviolet (UVC) system. To evaluate system performance, we compared bioaerosol concentration “upstream” of the treatment system to concentrations measured “downstream” of the treatment system. We challenged the system by varying UVC intensity relative to the estimated maximum particle UVC dose. In the lab, we have demonstrated that a system operating at 1600 cfm, using MERV16, and at 2% of our maximum UVC was effective at inactivating *E. coli* bioaerosol. We also achieved 100% reduction in “active” virus at 76% UVC system intensity, higher than what was needed for *E. coli* inactivation. In addition, when we treated virus aerosol with both filtration and UVC (i.e., 2% intensity), the virus aerosol concentration was below the limit of detection.

Aim 3: We encountered several challenges to complete Aim 3. In 2019, the fear of African Swine Fever virus spreading to the US has prompted many producers to limit access to farms. By late summer of that year, our producer partner from Years 1 and 2 requested that we discontinue our field experiments at their production operations. Furthermore, with the onset of the COVID-19 pandemic in 2020, access to field sites and complicated logistics of field and lab work has slowed our progress. However, we were able to install the prototype system at the Mansfield Swine Education Center at Kirkwood Community College in Cedar Rapids, Iowa (“Kirkwood”). This transition allowed us to continue field experiments over the winters of 2019-2020 and 2020-2021.

We installed our prototype system in October 2020 and started field experimentation in November 2020. We collected concentration data to evaluate the ability of our prototype system to reduce dust and bioaerosol concentrations in swine *finishing*.

We compare dust and bioaerosol concentrations across a “treated” swine finishing room to these concentrations in a similar untreated / “control” swine finishing room that was adjacent to our treatment room. We have collected over 1000 short-term bioaerosol samples to allow evaluation of the unit performance, comparing the concentrations upstream and downstream of the prototype system and to compare concentrations between treatment and control rooms. To date, we have collected approximately 290 integrated 24-hour inhalable and respirable dust measurements comparing the treatment and control rooms (combined over 2019 – 2021). About half of these samples were collected across 25 field site visits this past project year (Nov 2020 - Mar 2021).

Figure 8 highlights our preliminary analyses, which suggest a reduction in airborne concentrations “downstream” of our system concentrations for (a) total viable bacteria, (b) *staphylococcus sp.*, and (c) gram-negative fecal coliform. There were significant differences ($p < 0.001$) between the airborne bacteria concentrations in the four sampling locations with the three mediums used. Dust concentration data analyses continue as we are combining data across multiple project years (i.e., 2019-2020; 2020-2021) to increase the sample size.

COVID Interruption Impacts: Our field and lab project activities were shut down from March 2020 to May 2020, although we were able to perform data analyses while working remotely. In June 2020, we resumed laboratory activities that includes continuing virus aerosol challenges to our UVC air treatment system and field deployment experiments following protocols to reduce transmission of SARS-CoV-2 among project staff. These protocols resulted in some increase in travel and staffing costs.

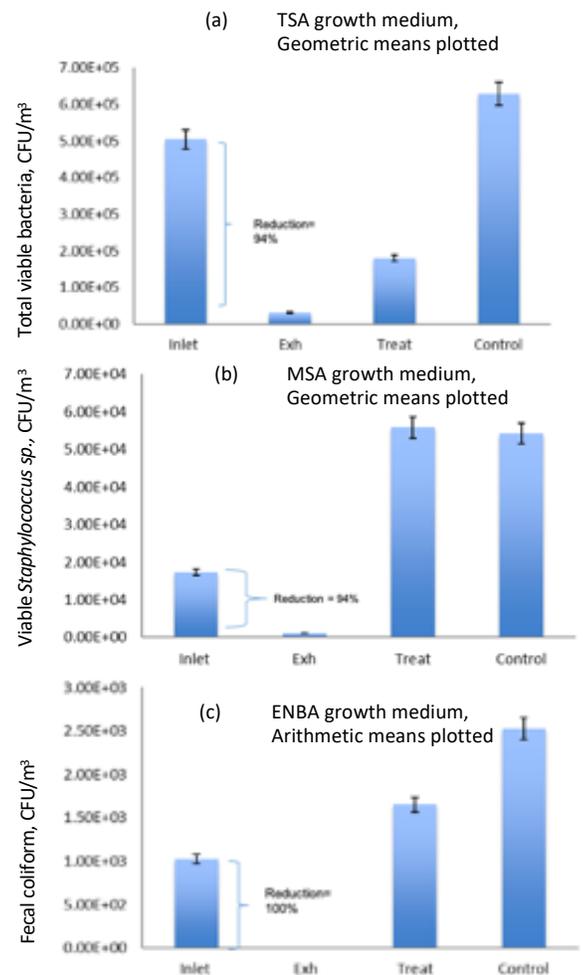


Figure 8: Bacterial concentrations as measured at inlet to the treatment device (Inlet), the exhaust from the device (Exh), and in the swine building treatment room (Treat) and control room (Control). Reductions observed between the inlet and exhaust are indicated between inlet and exhaust. Error bars represent one standard deviation -- geometric for (a)&(b) and arithmetic for (c).

Surveillance of Injuries and Risk Factors in Using Workers' Compensation Data (M. Ramirez, C. Casteel)

The goal of this project is to improve the science of agricultural injury surveillance through two studies, one focused on surveillance of agricultural injuries captured through Workers' Compensation (WC) and State Trauma Registry and a second study focused on surveillance of agricultural hazards. For the first study, we are analyzing agricultural injury cases captured in two datasets: Iowa's Trauma Registry (Iowa Department of Public Health) and Iowa's Workers' Compensation system. The aims of this study are to (a) estimate the incidence of agricultural injury in Iowa reported through the two datasets and (b) compare agricultural injuries by severity, type, mechanism, and demographics reported by farmers and agricultural workers. For the second study, we are evaluating a new agricultural hazard surveillance tool developed by the study team and experts from the GPCAH, including Regional Advisors. The aim of the second study is to evaluate the effectiveness of the Agricultural Hazard Surveillance tool in identifying hazards associated with injuries on the farm.

Study 1: For Study 1, we accessed *three* administrative data sources to characterize injuries, costs and trends: insurance data, state trauma data, and state workers' compensation data.

Insurance data provided unique information about *costs* of claims. Workers compensation from 2010 to 2016 were collected from an insurance company covering small to medium-sized farm operations from 14 U.S. states. Costs of agricultural *injury claims* exceeded \$21 million (\$3 million/yr). Two-thirds of claims were medical only, while about one-third were death/disability claims. The most common body part injured was the distal upper extremity. Falling or flying objects and collisions were the most expensive and common causes of injury. We published these findings in the *International Journal of Environmental Research and Public Health* (Baidwan et al., [2021](#), open access).

Using data from two state-level databases — the Iowa Trauma Registry database [ITR] and the Iowa Division of Workers' Compensation records [IWC] — from 2005-2014, we characterized injuries found separately in each database and identified those cases that linked across both databases. A total of 2,508 agricultural injuries were reported in the ITR, which collects data from injury cases that led to trauma activities in all Level I, II, III and IV hospitals across the state. Of these, 26% were caused by machinery, 18% were from falls and 12% were from being struck by or against objects. More than 90% of trauma cases were male, and 32% were fractures, 16% were open wounds, and 8% were head injuries. Only 17% of trauma causes were paid by workers' compensation. The average age of trauma cases was 49 years, and the mean injury severity score was 6.7 (max, fatal ISS =75). Data from IWC contains records submitted by agricultural operations across the state. In the IWC, we identified a lower percentage of males injured (83.2%), and the top causes of injury in this system were overexertion (23%), falls (23.5%), and natural environments (including animal-related incidents, at 8.9%). Sprains and strains were most prevalent (36%) followed by fractures at 17%. The IWC cases were just slightly younger (mean age= 41) than trauma cases (mean age=49). On average, the IWC cases led to 130 lost workdays.

After employing both deterministic and probabilistic linking procedures, 110 cases linked across both the trauma registry (2508 cases) and workers' compensation (3548 cases) databases. This represents a very small fraction of cases, only about 4.4% of the trauma registry and 3.1% of the workers' compensation cases. From this study, we concluded that the trauma data and workers' compensation data *represent two unique surveillance systems for agricultural injuries*. Two logistic regression models for each database were constructed to identify predictors of linkage. For the trauma database, race, age, and whether their injury was related to farm work were the predictors of linkage with the IWC dataset. For the IWC database, sex and age were the only predictors for linking with the ITR. In the ITR database, age was the strongest

predictor with a Wald $p < 0.0001$, while the most potent covariate in the IWC dataset was a person's sex ($p < 0.0001$).

Study 2: For Study 2, this project period focused on data analysis and enhancing the survey tool.

Data for this study were generated by researchers performing field assessments and completing a hazard assessment checklist with owners / operators of 108 row crop farms in Iowa. For a subset of 45 farms, a second research team member conducted a replicate assessment to allow quantification of inter-rater reliability. Weighted *kappas* demonstrated high inter-rater reliability for all sections of the HAC, ranging between 0.86 (indicating a strong level of agreement) and 0.94 (indicating almost perfect agreement) (Table 3). Data from the HAC is currently being scored to assess the association between a hazard score and the prevalence of injury.

Table 3: Inter-rater reliability by section of the Hazard Assessment Checklist

HAC Section	Total Items in Section	Weighted Average Kappa	Range of Weighted Average Kappa
A. Self-Propelled Vehicles	6	0.94	0.84-0.98
B. Powered-Portable Implements	7	0.93	0.87-1.0
C. Fixed Machinery / Equipment	3	0.91	0.87-0.94
D. Inside Buildings / Structures	7	0.92	0.81-0.97
E. Fall Areas	3	0.89	0.81-0.94
F. Ladders	1	0.86	0.86

During the past year, we have adapted the Hazard Assessment Checklist and into a web-based application (Farm Safety Checklist App) suitable for smartphone/mobile device use in the field. The new web-based data collection application is designed for users to identify on farm injury-related safety hazards and document injuries. We are currently testing the app, training individuals on how to use the app, and evaluating the related training materials. We are also collecting feedback from users about their opinions on app usage and training experience. Training content and delivery have been piloted with nine individuals of various occupations (e.g., farmer/rancher, agribusiness professional, researcher, and safety and health professional). After this initial training, most participants indicated feeling very confident or extremely confident manipulating the features of the app (e.g., logging in, navigating to the field manual, submitting the data) and scoring compliance to safety features using recommended guidelines and professional standards. All participants indicated that the training was well-organized and sufficiently covered how to complete each section of the app.

[Training](#) is currently available, and registered participants must complete an asynchronous session (1-hr video online) and live Zoom training (1.5-hr) to receive a certificate that can be used for 2.5 hours of continuing education. Training will be piloted again with attendees of the Midwest Rural Agricultural Safety and Health Conference in November 2021.

Pilot/Feasibility Projects Program (N. Fethke)

The Pilot/Feasibility Projects Program is a vibrant and vital component of the GPCAH, as it strengthens the Center’s impact on agricultural safety and health by funding new academic research and community-based projects. Throughout this 2017-21 project cycle, the Program has received 61 pilot grant applications from persons affiliated with institutions or organizations in 14 states. Historically, the greatest proportion of applications has come from persons affiliated with institutions or organizations in Iowa (29.5%), including the University of Iowa (11.5%) and Iowa State University (8.2%). This project year, however, less than one-quarter of the applications received were from Iowa-based applicants (none from the University of Iowa), demonstrating our commitment to and success in reaching beyond our home institution to maximize the Center’s regional impact.

Mental health among agricultural workers has been recently emphasized as a priority topic for pilot project applications, based on both regional and national need. Of the three projects awarded in 2019-2020 and

Table 4: Description of Pilot Projects with funding over the previous project period

PI (Affiliation)	Type	Projects awarded and ending	Title	Outputs/Outcomes
Berman [‡] (Univ. of Minnesota)	Academic	October 2019 – March 2021	The impact of drought conditions on occupational psychosocial stress among a Midwest farmers cohort	3 presentations 1 publication 1 funded grant
Brown (ISU Extension)	Community	October 2019 – March 2021	Stress on the farm: strategies to help each other	7 presentations >4,300 persons trained 1 funded grant
Zabel (MN Dept of Health)	Academic	October 2019 – March 2021	Public health agriculture related mental health research	4 presentations 7 surveillance indicators
Liang* (Univ. of Iowa)	Academic	Ongoing awarded Oct 2020	Examining the role of agricultural cooperatives in protecting farmers’ mental health (PhD student)	None reported to date
Rudolphi [‡] (Univ. of Illinois)	Academic	Ongoing awarded Oct 2020	Preventing workplace injury in pig production systems: applying behavior change interventions for safe animal handling	None reported to date
Sheridan (ASHA)	Community	Ongoing awarded Oct 2020	Respiratory protection following COVID-19: developing and testing educational resources in the ag health and safety classroom	1 presentation 1 interactive infographic
Kapur* (Purdue Univ.)	Academic	Ongoing (student summer project) awarded May 2020	Understanding how to collaborate with cooperative extension to disseminate agricultural safety and health programs and information: a mixed-methods study (Honors Undergraduate Student)	None reported to date
Kline* (Ohio State Univ.)	Academic	New projects to be awarded October 2021	Uncounted and invisible: the lives and health of H-2A workers in Ohio (PhD student)	N/A

*Student researcher; [‡]Assistant Professor

ending in 2020-2021, the four ongoing projects awarded in 2020-2021, and the one project identified for 2021-2022 funding (to date), four focus explicitly on aspects of mental health and a fifth includes consideration of mental health in its approach. Outputs reported by directors of the three projects ending in 2020-2021 suggest strong dissemination of results, with 14 conference presentations one peer-reviewed publication. In addition, two awardees reported successfully leveraging their GPACH pilot awards to secure additional grant funding.

Outreach Core (D. Rohlman)

The goals of the Outreach Core are to educate, translate, and communicate agricultural safety and health information and prevention strategies to rural and agricultural communities in the nine-state region. The high impact outputs and activities are presented for each of these outreach goals.

Educate

The Great Plains Center has several educational activities. In addition to the *Core Course*, which is offered annually in June in Iowa, the Outreach Core provides support to other sites offering agricultural safety and health training, such as the Southwest Center for Agricultural Health, Injury Prevention and Education, Central States Center for Agricultural Safety and Health, and the University of Missouri-Kansas City School of Pharmacy. We provide lectures, share homework and class activities, and facilitate the adoption of our online modules. This year, we supported respirator fit testing training for Core Course students attending the University of Missouri and the University of Iowa programs. Our outreach materials are also disseminated to college students nationally and internationally through the *Gear Up for Safety* program offered by the Ag Health and Safety Alliance (AgHSA).

The 2021 summer *Core Course* was again held entirely online due to COVID-19 restrictions. Twenty-five people participated, and 60% were from outside of Iowa, including four international participants. Those enrolled in the weeklong course included students in public health and pharmacy graduate programs and included continuing education students who currently work as safety professionals, nurses, farm managers, and educators. A highlight of the course was a live virtual tour of a swine facility, which allowed students to ask questions of the farmer while experiencing the sights and sounds (but not the smells) of the facility.

Student feedback was overwhelmingly positive:

- *I enjoyed the different perspectives of different professions. New ideas, resources, thought processes to continue to build our safety program.*
- *The presentations by farmers themselves added a real human perspective to the material we were learning.*
- *Crucial as a future pharmacist to learn your community/population and how to serve your community and improve their overall health.*
- *I thought I would be overwhelmed after a week-long course on safety, but I am actually feeling reenergized about ag safety.*

This year's *Core Course* has led to new partnerships with Dordt University (Sioux Center, IA) and Dalhousie University (Nova Scotia, Canada). Both institutions had faculty members enrolled in the course, and this fall they have introduced new classes into their curriculum to focus on agricultural safety and health. They have also incorporated several of our new online modules into their curricula.

During this past project year, we have expanded the materials for online delivery to include audio recordings, pre-recorded lectures, and additional interactive online modules. The *Core Course* materials (PowerPoint) are publicly available at GPCAH.org and have been provided to other AgFF centers, community colleges, and agricultural education programs. Online education modules are being developed based on the *Core Course* materials at the [Ag Safety and Health training portal](#). Nine topics are available for use (*Overview of Agriculture, Forestry, and Fishing; Biological Risk Management; Livestock Handling; Occupational Diseases of the Lung in Agricultural Settings;*

Physical Agents; Occupational Skin Disorders; Transportation Hazards; Personal Protective Equipment, and Protecting Young Workers in Agriculture (Spanish and English). The Young Workers module was developed with funding from the National Children’s Center for Rural and Agricultural Health and Safety but has been incorporated into classes and is disseminated with the other online modules.

Translate

The Outreach Core regularly translates findings from Center research projects into outreach materials. These materials are used during events we attend and are also shared with various organizations (e.g., state extension offices, healthcare providers, educators) across the region and nationally. The AgHSA presented our manure gas monitoring display at the Pesticide Applicator Certification and Training conference in July 2021 (Denver, CO). They have also incorporated several additional outreach brochures (e.g., respiratory protection, hearing conservation, roadway safety, manure gas safety, sun safety, and cold weather hazards) and first-hand accounts of farm exposures from our [Telling the Story](#) project into their *Gear Up for Ag Health and Safety* curriculum. As part of their training, the AgHSA surveys the students to learn more about their current tasks on the farm, safety, or health concerns they might have and their safety behaviors. These data are critical to understand current work practices and to identify potential interventions. GPCAH and AgHSA collaborated to develop a manuscript, recently published in the journal [Safety](#).

Recognizing the need for “off the shelf” materials to help regional outreach providers conduct new and innovative activities at events with the public, the GPCAH developed new Outreach Toolkits. These kits include train-the-trainer information to allow safety and health advocates develop expertise in new areas and then use training ideas in the kit to promote new topics at farm shows and events they attend. The Toolkits include pamphlets and handouts, visual displays, and mini curriculum to help partners talk about safety and health topics and appropriately respond to questions. Two [Outreach Toolkits](#), Rural Roadway Safety and Gas Monitor Use, are currently available. A new Toolkit addressing Hearing Loss Prevention will be released in October 2021.

Communicate

The GPCAH communicates to farmers and their advocates using multiple formats to reach the diverse farming population across our nine-state region. This includes traditional newsprint, in-person interactions, and online. Although COVID has restricted our travel in this project period, we did attend the Minnesota Farm Fest, where we were asked to provide education on the use of gas monitors. We also partnered with Illinois Extension to share materials to the Farm Progress Show. The Chamber of Commerce Agricultural Committee in Le Mars, IA asked for materials to display at their county fair and other events. Over 30,000 people visited the display at the county fair. We also presented at the virtual Agricultural Safety and Health Council of America and the Midwest Rural Agricultural Safety and Health Conferences. These included “Tools of the Trade”



Figure 9: *Gear Up for Safety Training at Kirkwood Community College.*

activities, conference presentations, and hosted a student networking reception.

In the fall, the GPCAH Outreach Core partnered with AgHSA to deliver prevention materials to students at Kirkwood Community College attending a *Gear Up for Safety Training*. Students participated in an online activity designed to address workers' rights, hazard identification, and risks unique to younger workers in agriculture. As described previously, the AgHSA included GPCAH resources when training on hearing loss prevention, whole body vibration, sun exposure, respiratory protection, gas monitor use, and rural roadway safety to college students at several universities including Iowa State University (Ames, IA), Morningside Community College (Sioux City, IA), Iowa Lakes Community College (Spencer, IA), and South Central Community College (N. Mankato MN).

Electronic Newsletter: In this reporting period, we have distributed our electronic [Farm Families Alive and Well Newsletter](#). The newsletter was distributed four times to over 2000 farm families and other agricultural safety and health stakeholders. Over the past year, the GPCAH shared the following information via this newsletter: introduced the new *FarmSafe* podcast; a study that showed working in agriculture poses higher risk of developing dementia; preventing the spread of COVID-19 during the holidays; educating rural health mental health care providers about stress; and numerous calls to use tools and resources on [gpcah.org](#). Our Output Summary details additional stories.



Figure 10: Alive and Well Newsletter cover page.

Output Summary: September 2020 through September 2021

The table below summarizes the number of outputs over the one-year project period. Details on current project year outputs follow.

Table 4: Number of Output Types by Project Period

OUTPUT TYPE	Year 1 (2016-17)	Year 2 (2017-18)	Year 3 (2018-19)	Year 4 (2019-20)	Year 5 (2020-21)
Publications	5	17	7	10	11
Abstracts & Presentations	14	28	31	11	17
Lectures, Seminars, & Workshops	14	33	48	27	39
Consultations	9	14	10	5	13
Information to Policy Makers	2	2	3	1	3
Student Dissertations or Thesis	3	4	3	2	0
Press Releases, Media Stories	27	50	79	49	17
Total Output Count	74	148	181	105	100

Published Manuscripts

1. Baidwan NK, **Ramirez M, Gerr F**, Boonstra D, Cavanaugh JE, **Casteel C**: [2021] Cost, Severity and Prevalence of Agricultural-related injury workers' compensation claims in farming operations from 14 U.S. states. *International Journal of Environmental Research and Public Health*. Jan. 18(8): 4309. PMID: PMC8072536. DOI: [10.3390/ijerph18084309](https://doi.org/10.3390/ijerph18084309)
2. **Berman JD, Ramirez MR**, Bell JE, Bilotta R, **Gerr F, Fethke, NB**: [2021] The Association Between Drought Conditions and Increased Occupational Psychosocial Stress Among U.S. Farmers: An Occupational Cohort Study. *The Science of the Total Environment*. 798: 149245–149245. In Press. DOI: [10.1016/j.scitotenv.2021.149245](https://doi.org/10.1016/j.scitotenv.2021.149245). (Pilot Grant)
3. Eadeh HM, Ismail AA, Abdel Rasoul GM, Hendy OM, Olson JR, Wang K, Bonner MR, **Rohlman DS**: [2021] Evaluation of occupational pesticide exposure on Egyptian male adolescent cognitive and motor functioning. *Environmental Research*, 197:111137. PMID: 8187303. DOI: [10.1016/j.envres.2021.111137](https://doi.org/10.1016/j.envres.2021.111137). (Secondary)
4. **Faust K, Casteel C**, McGehee DV, **Rohlman DS, Ramirez M, Peek-Asa C**: [2020] Examination of realism in a high-fidelity tractor driving simulator. *Journal of Agricultural Safety and Health*. 26(4):123-137. PMID: [PMC8112449](https://pubmed.ncbi.nlm.nih.gov/348112449/). DOI: [10.13031/jash.14043](https://doi.org/10.13031/jash.14043). (Secondary)
5. **Faust K, Casteel C**, McGehee D, **Peek-Asa C, Rohlman D, Ramirez ML**: [2021] Examining the association between age and tractor driving performance measures using a high-fidelity tractor driving simulator. *Journal of Agricultural Safety and Health*. 27(3): 159-175. DOI: [10.13031/jash.14403](https://doi.org/10.13031/jash.14403). (Secondary)
6. Gibbs JL, Walls K, Sheridan C, Sullivan D, **Cheyney M, Janssen B, Rohlman DS**: [2021] Evaluation of Self-Reported Agricultural Tasks, Safety Concerns, and Health and Safety Behaviors of Young Adults in U.S. Collegiate Agricultural Programs. *Safety*, 7(2):44. June. DOI: [10.3390/safety7020044](https://doi.org/10.3390/safety7020044) (open access).
7. Ismail AA, Hendy O, Rasoul GA, Olson JR, Bonner MR, **Rohlman DS**: [2021]. Acute and Cumulative Effects of Repeated Exposure to Chlorpyrifos on the Liver and Kidney Function among Egyptian Adolescents. *Toxics*. 9(6):137. June. PMID: PMC8230541. DOI: [10.3390/toxics9060137](https://doi.org/10.3390/toxics9060137). (Secondary)

8. **Liang Y, Wang K, Janssen B, Casteel C, Nonnenmann M, Rohlman DS:** [2021] Examination of Symptoms of Depression among Cooperative Dairy Farmers. *International Journal of Environmental Research and Public Health*, 18(7). PMID: PMC8037613. DOI: [10.3390/ijerph18073657](https://doi.org/10.3390/ijerph18073657). **(Pilot Grant)**
9. **Rohlman DS, Campo S & TePoel M:** [2021] Protecting Young Agricultural Workers: The Development of an Online Supervisor Training. *Journal of Agromedicine*, In press. DOI: [10.1080/1059924X.2021.1979155](https://doi.org/10.1080/1059924X.2021.1979155). *(Secondary)*
10. Wickman A, Duysen E, **Cheyney M**, Pennington W, Mazur J, Yoder A: [2021] Development of an educational YouTube channel: A collaboration between U.S. Agricultural Safety and Health Centers. *Journal of Agromedicine*. 26(1):75-84 PMID: PMC8117175. DOI: [10.1080/1059924x.2020.1845269](https://doi.org/10.1080/1059924x.2020.1845269)

Other Publications

1. **Janssen B:** [2021] Food Systems. L. Pedersen & L. Cliggett (Eds.), SAGE Handbook for Cultural Anthropology, Newbury Park: CA: *SAGE Publishing* 502-519. [Book chapter]

Abstracts/Presentations at Scientific Meetings

1. Barnette A, **Rohlman DS**, Davis JA: [2020] Sources of Pesticide Exposure among Egyptian Adolescents. Midwest Rural Agricultural Safety and Health Conference, Virtual. Nov 17-20. Poster. **(Outreach Core)**
2. **Berman JD:** [2020] *The Existing Challenges and Opportunities in Drought and Health Research*. Society for Epidemiological Research. Poster/Oral Presentation. Dec. 2020. **(Pilot Grant)**
3. **Berman JD:** [2020] *Exploring the association between drought and health: psychosocial stress in farmers*. International Society of Environmental Epidemiology (ISEE). Poster/Oral Presentation. Aug. 2020. **(Pilot Grant)**
4. **Berman JD:** [2021] *The association between drought conditions and occupational psychosocial stress among Midwestern U.S. farmers: an occupational cohort study*. International Society of Environmental Epidemiology (ISEE). Poster/Oral Presentation. Aug. 2021. **(Pilot Grant)**
5. **Brown DN & Santiago AD:** [2019] *Responding to behavioral and mental needs among rural lowans and farming communities*. National Association for Rural Mental Health Annual Conference. Santa Fe, New Mexico. **(Pilot Grant)**
6. **Brown DN, Dunnegan D & Day D:** [2020]. *Suicide prevention and the agricultural community*. Midwest Rural Agricultural Safety and Health Conference. Virtual. **(Pilot Grant)**
7. Estes RK, **Casteel C, Faust K, Gerr F, Ramirez MR:** [2020] Compliance with recommended safety standards among high-risk farm equipment. Abstract accepted to *Agricultural Safety and Health Council of America (ASHCA), 2020 Safety Summit*. DOI: [10.1080/1059924X.2020.1763733](https://doi.org/10.1080/1059924X.2020.1763733).
8. Duysen E, **Cheyney M**, Schossow M: [2020] *Striving to Conduct Effective Agricultural Safety and Health Outreach during a Pandemic: From John Deere Masks to Plexiglass*. Midwest Rural Agricultural Safety and Health Conference. Virtual. Nov 17-20. **(Outreach Core)**
9. **Faust K, Casteel C, Estes RK, Gerr F, Ramirez MR:** [2020] *Compliance with recommended safety standards among row crop farmers in Iowa*. Abstract accepted to the *American Society of Agricultural and Biological Engineers, 2020 Conference*. **(Surveillance)**
10. Liang Y, Rohlman DS: [2020] *Using Mixed Methods to Examine Symptoms of Depression among Cooperative Dairy Farmers*. Midwest Rural Agricultural Safety and Health Conference, Virtual. Nov 17-20. Poster. **(Outreach Core)**

11. McFalls M, **Peek-Asa C**, Harland K, Zhu M, Morris NL, **Ramirez MR** [2020] Farm equipment crashes on public roads. Society for the Advancement for Injury and Violence Research. **(Roadway)**
12. **Nonnenmann MW, Anthony TR**, Sousan S, Ubeda E, Altmaier R, JL Gibbs, A Ramirez [2021] *Evaluation of a Prototype Aerosol Control Technology to Reduce Dust and Bioaerosol Concentrations in Two Phases of Swine Production*. ASABE 2021 Annual International Meeting (Virtual). July 12. **(Air Quality)**
13. Ploeckelman M, Duysen E, Heiberger S, Yoder A & **Leonard S**: [2020] Telling the Story – Using Storytelling to Disseminate Agricultural Safety and Health Messaging, *Journal of Agromedicine*, 25:3, 249-250, JA:2021-24. DOI: [habs/10.1080/1059924X.2020.1765576](https://doi.org/10.1080/1059924X.2020.1765576). **(Outreach Core)**
14. **Rohlman DS**, Campo S, TePoel M: [2020] Protecting and Promoting the Health of Young Agricultural Workers through Supervisor Training. *Journal of Agromedicine* 25(3):251-252. JA:2021-26.[habs/10.1080/1059924X.2020.1765576](https://doi.org/10.1080/1059924X.2020.1765576). **(Outreach Core)**
15. Sheridan C, Gibbs JL, Sullivan, D: [2020] *Rapid Development of Respiratory Protection Guidance Resources for the Agricultural Community During COVID-19*. Poster Presentation and 3 Minute Recorded Prezi-Video, MRASH Conference, Nov. 2020. **(Pilot Grant)**
16. Soupene V, Cheyney ML, Arora K, Rohlman DS, Anthony TR: [2020] Perspectives and Concerns on Agricultural Safety among Community College Students. *Journal of Agromedicine* 25(3):260-261. JA:2021-37. **(Outreach Core)**
17. Soupene V, Rohlman DS: [2020] Assessing Pesticide Education Interventions using Kirkpatrick's Evaluation Model: A Narrative Literature Review. Midwest Rural Agricultural Safety and Health Conference. Virtual. Nov. 17-20, 2020. **(Outreach Core)**

Lectures, Seminars, or Workshops Delivered in Academic Settings

1. **Hamman CJ**: [2021] Community-level intervention and naturalistic study of farm equipment and vehicle interaction on Iowa's roadways. *Rural Health and Ag Medicine* (OEH 6110), University of Iowa, College of Public Health. Delivered Feb. 9. **(Roadway)**
2. **Hamman CJ**: [2021] Community-level intervention and naturalistic study of farm equipment and vehicle interaction on Iowa's roadways. *Agricultural Safety and Health: The Core Course*. Delivered virtually on June 14. **(Roadway)**
3. **Hamann CJ**, Daly E, Askelson N, **Schwab-Reese L**, & **Peek-Asa C**: [2021] Community engagement and the development of a rural road safety campaign. *Society for the Advancement of Violence and Injury Research*, Virtual Conference. Delivered on April 9. **(Roadway)**
4. Duysen E, Heiberger S, **Leonard S**, Ploeckelman M, Yoder A. Telling the Story – Using Storytelling to Disseminate Agricultural Safety and Health Messaging. *ASHCA Summit 2020*, (virtual) Lightning Talk presented Sept. 17. [LINK](#). **(Outreach Core)**

Courses Taught in Agricultural Safety and Health

1. Agricultural Safety and Health Core Course: [2021] The 40-hour course completed by 34 attendees. Instruction provided by multiple GPCAH faculty and staff along with regional advisors (Sheridan, Neenan) and veterinary expertise from Iowa State (Bickett-Weddle, Iowa City, IA), 25 graduate students and working professionals. June 14-18. **(Outreach Core)**
2. **Janssen B:** [2020] OEH: 6120 Topics in Agriculture and Rural Health – Agriculture Communication. (11 graduate students) Fall 2020. **(Outreach Core)**
3. **Janssen B:** [2021] CPH:4200 Agriculture, Food Systems & Sustainability. 23 undergraduate students. Fall 2021. **(Outreach Core)**
4. **Janssen B:** [2021] OEH:6120 Topics in Agriculture and Rural Health – The Culture of Agriculture. 10 graduate students. Fall 2021. **(Outreach Core)**
5. **Nonnenmann M:** [2021] The Industrial Hygiene Paradigm Case Study: Broiler Chicken Production. OEH:6110 Rural Health and Agricultural Medicine. **(Air Quality)**
6. **Nonnenmann M:** [2021] Ergonomics in Agriculture. OEH:6110 Rural Health and Agricultural Medicine. **(Air Quality)**
7. **Nonnenmann M:** [2021] The Industrial Hygiene Paradigm Case Study: Broiler Chicken Production. Dalhousie University Ag Safety and Health Course. **(Air Quality)**
8. **Nonnenmann M:** [2021] Indoor Air Quality Improvements in Ag Production & Biosecurity. Dalhousie University Ag Safety and Health Course. **(Air Quality)**
9. **Nonnenmann M:** [2021] Ergonomics in Agriculture. Dalhousie University Ag Safety and Health Course. **(Air Quality)**
10. **Rohlman DS:** [2021] OEH:6110 Rural Health and Agricultural Medicine. 13 graduate students. Spring 2021. **(Outreach Core)**
11. **Rohlman DS:** [2021] OEH:6120 Topics in Agriculture and Rural Health – Spies, Dr. Seuss, Tobacco, and Genetics. 14 graduate students. Spring 2021. **(Outreach Core)**
12. **Rohlman DS:** [2021] Agricultural Safety and Health Course - Dalhousie University. 19 undergraduate students. Fall 2021. **(Outreach Core)**

Lectures, Seminars, or Workshops Delivered to the Agricultural Community

1. **Brown DN:** [2020] *Stress on the farm: Strategies to help each other.* Iowa Farm Bureau Federation. Statewide webcast. **(Pilot Grant)**
2. **Brown DN:** [2020] *Responding to behavioral health needs among rural Iowans and farming communities.* Iowa Institute for Cooperatives Winter Meeting. Storm Lake, Iowa. **(Pilot Grant)**
3. **Brown DN:** [2020] *Responding to behavioral health needs among rural Iowans and farming communities.* Iowa Institute for Cooperatives Winter Meeting. Cedar Falls, Iowa. **(Pilot Grant)**
4. **Faust K, Anthony TR:** [2021] Farm Safety App Testing Workshop professionals (2 contact hours; July 14). **(Surveillance/P&E Core)**
5. **Cheyney M:** [2021] – Farmfest training **(Outreach Core)**
6. **Rohlman, DS:** [2021] Mental Health of Agricultural Workers in Rural and Public Psychiatry Lecture. **(Outreach Core)**
7. **Rohlman, DS:** [Oct 2020] Farmer Mental Health at Iowa Psychiatric Society. **(Outreach Core)**
8. **Rohlman DS:** [2021] Introduction to Rural Health & Agrimedecine Agricultural Regulations in Occupational Safety and Health in Agriculture Introduction to Hierarchy of Controls in UMKC 7223 Rural Health & Agrimedecine course. University of Missouri – Kansas City. Guest Lecturer. Attended by graduate students. **(Outreach Core)**

9. **Rohlman DS:** [2021] Pesticide Exposures; Transportation Hazards in Agriculture in UMKC 7223 Rural Health & Agrimedecine course. University of Missouri – Kansas City. Guest Lecturer. Attended by graduate students. **(Outreach Core)**
10. **Rohlman DS:** [2021] Mental Health and Total Worker Health in Agricultural Populations in UMKC 7223 Rural Health & Agrimedecine course. University of Missouri – Kansas City. Guest Lecturer. Attended by graduate students. **(Outreach Core)**
11. **Rohlman DS:** [2020] OEH:6720 Advanced Toxicology course. University of Iowa. Guest Lecturer Attended by graduate students. **(Outreach Core)**
12. **Rohlman DS:** [2021] OEH:6110 Rural Health and Agricultural Medicine. University of Iowa. Primary Instructor. Attended by graduate students. **(Outreach Core)**
13. **Rohlman DS:** [2021] OEH:6120 Topics in Agriculture and Rural Health: Rural Mental Health. University of Iowa. Primary Instructor. Attended by graduate students. **(Outreach Core)**
14. **Rohlman DS:** [2021] OEH:6510 Environmental and Occupational Epidemiology: Neurobehavioral Assessment. University of Iowa. Guest Lecturer. Attended by graduate students. **(Outreach Core)**
15. **Rohlman DS:** [2020] OEH:4240 Global Environmental Health. University of Iowa. Guest Lecturer. Attended by graduate students. **(Outreach Core)**

Core Course Modules

1. **Anthony TR, Nonnenmann M, Nonnenmann M, Morrison L, Rohlman DS, Mohling K:** [2021] *Transportation Hazards in Agriculture* [online module]. Training Source. [LINK](#).
2. Bickett-Weddle D, **Nonnenmann M, Morrison L, Rohlman DS, Mohling K:** [2020] *Biological Risk Management* [online module]. Training Source. [LINK](#).
3. **Gerr F, Morrison L, Rohlman DS, Nonnenmann M, Mohling K:** [2020] *Occupational Diseases of the Lungs in Agricultural Settings* [online module]. Training Source. [LINK](#).
4. **Gerr F, Morrison L, Rohlman DS, Nonnenmann M, Morrison L, Mohling K:** [2020] *Occupational Skin Disorders in Agriculture* [online module]. Training Source. [LINK](#).
5. Gibbs JL, **Nonnenmann M, Gerr F, Morrison L, Rohlman DS, Mohling K:** [2020] *PPE for Agricultural Health* [online module]. Training Source. [LINK](#).
6. Gibbs JL, **Nonnenmann M, Gerr F, Morrison L, Rohlman DS, Mohling K:** [2020] *Physical Agents for Agricultural Health* [online module]. Training Source. [LINK](#).
7. **Janssen B, Bickett-Weddle D, Rood K, Rohlman DS, Nonnenmann M, Morrison L, Mohling K:** [2020] *Livestock Handling* [online module]. Training Source. [LINK](#).
8. **Rohlman DS, Nonnenmann M, Gerr F, Morrison L, Mohling K:** [2020] *Overview: Agriculture, Forestry, Fishing* [online module]. Training Source. [LINK](#).
9. **Rohlman DS, Campo S, TePoel N:** [2020] *Protecting Young Agricultural Workers: A Training for Supervisors, Parents, and Teachers* [online module]. Training source [LINK](#). **(Available in English and Spanish)** *This training was developed with funding from the National Children’s Center for Rural and Agricultural Health and Safety. U54 OH009568

Consultation or Information Exchange

1. **Anthony TR:** [2021] Request for educational materials and resources on manure gas safety and gas monitors for personal use on farms by Smart Barn Services. Sept. 3. 2021
2. **Anthony TR:** [2021] Request for information about which gas monitors to use during silo filling and general silo entry, and how to acquire calibration gas for these monitors from Minnesota Extension. Sept. 21, 2021
3. **Anthony TR:** [2021] Met with Deere to discuss abrasive blasting sampling methods. May 6 2021

4. **Anthony TR:** [2021] Participated in Injury and Violence Prevention Advisory Committee to represent agricultural risk factors for Iowa, participated in fall prevention working group. May 2021-present.
5. **Cheyney M:** [2021] Request for educational materials on tractor safety, road collisions with farm equipment, gas hazards in agriculture, and lighting and marking best practices by LeMars [Iowa] Chamber of Commerce Ag Committee, to be presented at the Plymouth County Fair (30,000 people visited their exhibit). June 30, 2021
6. **Cheyney M:** [2021] Request for educational materials (rural roadway safety, whole body vibration, winter fall prevention, hearing loss among farmers, and how to choose hearing protection devices) by Illinois Extension for display at Farm Progress Show in Decatur, IL. Aug.
7. Nationwide reviewed and was provided the final version of **Baidwan N, Gerr F, Casteel C, Ramirez M:** [2021] Farm-related injuries: Cost and risk estimations by the type of injury claims. *American Journal of Industrial Medicine*. (in press)
8. **Nonnenmann M:** [2021] Discussion with Ag Health and Safety Alliance about dissemination of project information as an example of “engineering controls” to reduce exposure to dust among swine workers. This information could be used for training of community college students in animal science programs. Jan. 2021
9. **Rohlman DS:** [2021] Dr. Shala Mhlanga from the Swiss Tropical and Public Health Institute in Basel, Switzerland, in collaboration with the University of Cape Town, requested Diane Rohlman participate in an key informant interview for, “A mixed method qualitative study to explore the experiences of African agricultural stakeholders on interventions to reduce pesticide exposure in farming”.
10. **Rohlman DS:** [2021] Peer Review of grant sub-topic for Northeast Center for Occupation Health and Safety (Julie Sorensen, Director).
11. **Rohlman DS:** [2021] Reviewer for a Research Proposal for a Fellowship for National University of Ireland (NUI) Post-Doctoral Fellowship in the Sciences & Engineering 2021.
12. **Rohlman DS:** [2021] Request for educational materials on grain bin rescue to hand out to group of farmers who requested a community learning session by former Core Course student. Sept. 13.
13. University of Iowa ITS- Enterprise Services. Contact: Steve Bowers. A group from the **GPCAH Safety App project** have been working with Steve Bowers and his team in the development of an app to collect data from the Hazard Assessment Checklist. (Casteel and Anthony, June 2020-present)

Information Provided to Policy Makers

1. **Anthony TR, Rohlman D.** Washington DC Hill Visits for Ag Centers, Total Worker Health Centers, and Educational Research Centers. Mar. 2021.
2. **Casteel C.** Washington DC Hill Visit for Injury Control Research Centers. Mar. 2021.
3. **Ramirez M.** Washington DC Hill Visits for Educational Research Centers. Feb. 2021.

Student Thesis/Dissertation (Accessible at [Iowa's Institutional Repository](#))

None this project period

Press Releases and Media Stories

Media Stories

1. **Rohlman DS:** [2021] *Share Public Health, Rural Health: You've Gotta Care about People*. Virtual Podcast. The Midwestern Public Health Training Center, Feb. 23. [LINK](#). **(Outreach Core)**
2. **Rohlman DS:** [2021] *Protect the smallest working parts, Sobering statistics of injuries and fatalities of youth on farms for Dakota Farmer/Nebraska Farmer*. Farm Progress. Kevin Schulz senior staff writer. **(Outreach Core)**
3. **Rohlman DS:** [2021] *Keep youth safe on the farm*. Farm Progress. March 16. [LINK](#). **(Outreach Core)**
4. **Rohlman DS** and **Salzwedal M:** [2021] *Machinery Link: Farms Have Several Positives but Also Hazards for Youth*, Progressive Farmer. March 22. [LINK](#). **(Outreach Core)**

Safety Watch News Column in Lee Agrimedia Publications

1. **Janssen B:** [2021] Develop plans to save livestock and livelihood. *Iowa Farmer Today*. Feb. 12. [LINK](#).
2. **Janssen B:** [2021] Flowers are blooming, ticks are crawling. *Iowa Farmer Today*. Apr. 16. [LINK](#).
3. **Janssen B:** [2021] Be aware of equipment blind spots to keep bystanders safe. *Iowa Farmer Today*. Jun 9. [LINK](#).
4. **Janssen B:** [2021] Keep safety in mind when mowing ditches. *Iowa Farmer Today*. Aug. 11. [LINK](#).
5. **Leonard S:** [2020] Case count: Iowa leads as COVID rates rise in Midwest. *Iowa Farmer Today*, 37(7) Sept. 15. [LINK](#).
6. **Leonard S:** [2020] Keep your guard – and mask – up. *Iowa Farmer Today*. 37(17) Nov. 19. [LINK](#).
7. **Leonard S:** [2021] Shot in the arm: Vaccine rollout doesn't end need for care. *Iowa Farmer Today*. 37(24) Jan. 11. [LINK](#)
8. **Leonard S:** [2021] Hope and Caution – With vaccines come new ways to stay safe. *Iowa Farmer Today*. 37(33) March 12. [LINK](#).
9. **Leonard S:** [2021] Vaccine vignette – Farm leaders share COVID vaccination experiences. *Iowa Farmer Today*, 37(41) May 8. [LINK](#).
10. **Leonard S:** [2021] Family matters: 'Protecting others' tops motivations to get vaccine. *Iowa Farmer Today*. July 10. [LINK](#).
11. **Leonard S:** [2021] Rural doctor's goal: 'Prevent people from getting sick'. *Iowa Farmer Today*. 37(50) Sept. 10. [LINK](#).

Telling the Story Project – New Stories 2020-21

No new stories in this project period.

Additional Media Stories with GPCAH Collaboration

1. **Rohlman DS:** [2020] *One Health: Bringing Health to Humans, Animals, and the Environment*. Story by Kay Miller Temple, MD. RHIhub, The Rural Monitor. Oct. 14. [LINK](#).
2. **Rohlman DS:** [2020] *Free training for supervisors aims to keep young agricultural workers safe*. Story by Scott Heiberger. Marshfield Clinic Research Institute. Sept. 30. [LINK](#).
3. **Rohlman DS:** [2020] *Free training for supervisors aims to keep young agricultural workers safe*. Louisiana Farm Bureau News. Sept 30. [LINK](#).
4. **Rohlman DS:** [2020] *Free training for supervisors aims to keep young agricultural workers safe*. ONFOCUS. Sept. 30. [LINK](#).
5. **Rohlman DS:** [2020] *Free training for supervisors aims to keep young agricultural workers safe*. AGDAILY. [LINK](#).
6. **Rohlman DS:** [2020] *Free training for supervisors aims to keep young agricultural workers safe*.

- Progressive Farmer powered by DTN. [LINK](#).
7. **Rohlman DS:** [2020] Radio interview on supervisor training with Brian Winnekin, WRDN, Durand, WI. Oct. 6.
 8. **Rohlman DS:** [2020] *One Health: Bringing Health to Humans, Animals, and the Environment*. Story by Kay Miller Temple, MD. RHIhub The Rural Monitor. Oct 14. [LINK](#).

Farm Families Alive and Well Newsletter Articles [LINK](#).

1. **Anthony TR:** [2020] Director's Message. *Farm Families Alive and Well Newsletter*. 26(4): Sept. 2020. [LINK](#).
2. **Anthony TR, Crawford K and Patterson J:** [2020] Holidays 2020: Recommendations to Prevent COVID-19 Spread. *Farm Families Alive and Well Newsletter*. 27(1): Dec. [LINK](#).
3. **Anthony TR:** Director's Message. *Farm Families Alive and Well Newsletter*. 27(2): March 2021. [LINK](#).
4. **Anthony TR:** [2021] Director's Message: New Communication Avenues. *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).
5. **Arora K and Patterson J:** Study shows working in agriculture poses higher risk of developing dementia. *Farm Families Alive and Well Newsletter*. 27(2): Mar. [LINK](#).
6. **Crawford K:** [2020] COVID-19 prevention on the farm: Q&A video series about cloth face coverings. *Farm Families Alive and Well Newsletter*. 26(4): Sept. [LINK](#).
7. **Crawford K:** [2021] What do you want to know about making your workday on the farm safer and healthier? *Farm Families Alive and Well Newsletter*. 27(2): Mar. [LINK](#).
8. **Crawford K:** [2021] "There's an App for That!" Help us test the new Farm Safety Checklist App. *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).
9. **Foushee R:** [2020] Agricultural Safety and Health: The Core Course 2020. *Farm Families Alive and Well Newsletter*. 26(4): Sept. [LINK](#).
10. Gibbs J: [2021] New interactive informational resources: Guidance for farmers when using respirators in agriculture. *Farm Families Alive and Well Newsletter*. 27(4): Sept. 2021. [LINK](#).
11. Olson G and **Patterson J:** [2021] Register now and join MRASH's effort to "Raise the Cloak of Invisibility." *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).
12. Olson G: [2021]. Midwest Rural Agricultural Safety and Health (MRASH) Conference. 27(3): June. [LINK](#).
13. Olson G: [2020] "Rising to New Challenges" at the MRASH Conference. *Farm Families Alive and Well Newsletter*. 26(4): Sept. [LINK](#).
14. **Patterson J:** Questions about COVID-19 and vaccines? UI Health Care's COVID-19 Toolkit provides answers. *Farm Families Alive and Well Newsletter*. 27(2): Mar. [LINK](#).
15. **Patterson J:** [2021] Don't be shy! Start the conversation about preventing farm injuries. *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).
16. **Patterson J:** [2021] Access Core Course materials, audio, and online modules *at no cost*. *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).
17. **Patterson J:** [2021] Drought can lead to more than the summertime blues in farmers. *Farm Families Alive and Well Newsletter*. 27(4): Sept. [LINK](#).

Podcasts

FarmSafe

1. Crawford, K. 2021. *FarmSafe Podcast: Introducing FarmSafe and the Great Plains Center for Agricultural Health* (No. 1, Guest: GPCAH Faculty) [Audio podcast episode]. In *FarmSafe*. GPCAH. Aug. 20. [LINK](#).
2. Crawford, K. 2021. *FarmSafe Podcast: ATVs on Roadways* (No. 2, Guest: Chuck Jennissen) [Audio podcast episode]. In *FarmSafe*. GPCAH. Sep. 1. [LINK](#).
3. Crawford, K. 2021. *FarmSafe Podcast: Young ATV Riders* (No. 3, Guest: Chuck Jennissen) [Audio podcast episode]. In *FarmSafe*. GPCAH. Sep. 15. [LINK](#).
4. Crawford, K. 2021. *FarmSafe Podcast: ATVs on the Farm* (No. 4, Guest: Chuck Jennissen) [Audio podcast episode]. In *FarmSafe*. GPCAH. Sep. 29. [LINK](#).

From the Field

1. Rohlman, D. 2021. *From the Field: Conversation with Rural EMS, Emergency Response on the Farm* (No. 1, Guest: Brad Kruse) [Audio podcast episode]. In *From the Field*. GPCAH. [LINK](#).
2. Rohlman D. 2021. *From the Field: Conversations with Ag Producers, A Typical Day on the Dairy Farm - Challenges and Successes* (No. 2, Guest: Rick Naerebout) [Audio podcast episode]. In *From the Field*. GPCAH. [LINK](#).
3. Rohlman D. 2021. *From the Field: Conversations with Ag Producers, Global Agriculture, Challenges and Successes Faced by Ag Employers, Immigrant Workers and Safety* (No. 3, Guest: Olga Brouwer) [Audio podcast episode]. In *From the Field*. GPCAH. [LINK](#).
4. Rohlman D. 2021. *From the Field: Conversations with Ag Producers, Rural Mental Health: Farmer's Perspective* (No. 4, Guest: Ted Matthews) [Audio podcast episode]. In *From the Field*. GPCAH. [LINK](#).

Press Releases

Press Release promoting K. Arora's Dementia Paper (Arora, Jan 19, 2021)

Arora K and Patterson J: [2021] Study shows working in agriculture poses higher risk of developing dementia. [LINK](#). This promoted Arora et al. paper, <https://doi.org/10.1093/geronb/gbab005>

It was covered by 9 media outlets, NIOSH eNews, 3 University of Iowa-based newsletters, and 2 estate planning websites. As of Sept 17, this had an Altmetric score of 2 (3 tweets, no news identified)

1. **Arora K and Patterson J.** Study Shows Work in Agriculture Poses Higher Risk of Developing Dementia. *Alive and Well Newsletter*. 27(2): March 2021. [LINK](#).
2. Brooks G. CBS2Iowa.com. Jan 31, 2021. Re-entry study shows agriculture workers have a greater chance of having dementia. [LINK](#).
3. DeYoung J.: 2021. Study connects farmers, risk of dementia. *Iowa Farmer Today*. May 22, 2021. [LINK](#).
4. KLEM, Le Mars Radio. KLEM1420.com. Feb 2, 2021. UI Study Finds Farmers Have 46% Greater Chance of Dementia. [LINK](#).
5. KMEG, Sioux City News. Siouxlandnews.com. Jan 31, 2021. Recent study shows agriculture workers have a greater chance of having dementia. [LINK](#).
6. Radio Iowa. Radiolowa.com: 2021. Study shows agriculture workers more likely to have dementia. Feb 3, 2021. Radio Iowa. [LINK](#).
7. Solash-Reed L.: 2021 Do Farmers Have a Higher Chance of Getting Dementia? Lslawyer.com [estate planning website]. Jan 31, 2021. [LINK](#).

8. Murray W. College of Public Health examines mental health challenges for farmers. *Daily Iowan*. Feb 10, 2021. [LINK](#).
9. Staff Writer: 2021. Study shows farmers face greater dementia odds. FarmWeekNow.com. Jan 20, 2021. [LINK](#).
10. Staff Writer: 2021. Do Farmers have a higher chance of getting dementia? Alabama Estate Planning Attorneys. Feb 24, 2021. [LINK](#).
11. Taylor J. WHO Radio. WHORadio.iheart.com. Feb 1, 2021. UI Study Shows Agriculture Workers More Likely to Have Dementia. [LINK](#).
12. UI College of Public Health: 2021. Study shows working in agriculture poses higher risk of developing dementia. *UI College of Public Health News Digest*. Jan 22, 2021. [LINK](#).
13. UI College of Public Health News. Study shows working in agriculture poses higher risk of developing dementia. Jan 20, 2021. [LINK](#).
14. Williams D. 2021: Study Links Agricultural Work to Higher Dementia Risk. *NIOSH eNews* .18(10) Feb 2021. [LINK](#).

Press Release promoting the virtual MRASH Conference (Patterson, Oct. 14, 2020)

Virtual conference is taking Midwest farm safety to the world (MRASH). [LINK](#).

This announced the virtual conference one month before the event, during the pandemic.

It was not picked up by any media outlets. We did include it in *Alive and Well*: Olson G: [2020] "Rising to New Challenges" at the MRASH Conference. *Farm Families Alive and Well Newsletter*. 26(4): Sept. 2020. [LINK](#).

Press Release promoting the 2021 Pilot Grants Announcement (Patterson, March 25, 2021) Apply for \$30,000 GPCAH and let your research soar. LINK.

This announcement was not picked up by any media outlets; however, this was one of our most popular social media campaigns -- with 11 posts on Facebook that reached 749 individuals and 2,119 individuals via Twitter -- prior to the application deadline on July 1, 2021.

Press Release promoting Jesse Berman's Publication (Pilot grant) (Patterson Sept. 17, 2021) Drought can lead to more than the summertime blues in farmers. LINK.

This promotes the Berman et al. paper (Pilot grant), <https://doi.org/10.1016/j.scitotenv.2021.149245>

It had an Altmetric score of 5 the day of our press release on (which captured Tweets from its online publication at the end of July 2021). It is too early to track the impact of this press releases.

We also included it in *Alive and Well Newsletter* (see *Alive and Well* publications above).