



# Great Plains Center for Agricultural Health 2021-22 Annual Report

**Sept 30, 2022**

*Report Period: September 30, 2021 – September 29, 2022*

***CDC/NIOSH Grant U54 OH007548***

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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 expanded our network in preparation to support Ohio and Indiana in the upcoming 2022-27 funding cycle. This 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 2021-22 is provided in the Output Summary (pp 19-28).

### **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

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## SECTION III: PROGRAM HIGHLIGHTS AND IMPACT

### Planning and Evaluation Core

*(T.R. Anthony)*

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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

The GPCAH Evaluation team has been examining the impact of our research projects across multiple grant periods, using the lens of translational research. The objective of this work is to demonstrate how our research programs has moved across the many stages of research to practice. Early work focused on quantifying the hazard (Stage 0), and subsequent activities moved research to the development stage (1) and then to testing (2). Finally, once our studies have demonstrated successful interventions with respect to reduction of agricultural injuries and illnesses, we move to the institutionalization stage (3).

We have completed an assessment of the GPCAH Air Quality portfolio of projects, which were aimed to reduce the risk of respiratory illnesses for swine production workers in the Midwest by improving the air quality inside buildings, particularly in the cold, Midwest winters. (See p. 10 for updates on current project activities.) The following highlights the progression in hazards assessed, control technologies investigated, and population of demonstration as we progress through these stages of research for this portfolio.

- Over time, the Center has expanded the hazards assessed in swine barn air quality studies, beginning with a focus on dust-related exposures (pre- 2011) to include assessments of other gases (CO, NH<sub>3</sub>, H<sub>2</sub>S, endotoxin, in 2011-16), then adding a bioaerosol hazards in the current project period.
- At the same time, this portfolio expanded its prevention focus from reliance on respiratory protection adoption (pre-2011) to examining commercially available dust control technology effectiveness (2011-16), and we are wrapping up work that combines both filtration and UVC disinfection technologies to remove both dust and biological hazards (2016-22). Future work will focus on miniaturizing these technologies to improve adoptability and institutionalization of this engineering control.
- As we developed interventions, we also moved from non-production locations (e.g., community college), where we necessarily had to show our interventions did not adversely affect producer productivity (harm to the piglets in farrowing barns), to installing and testing control systems in production operations, where farmer operations and production impacts could both be assessed with improvements of air quality.

To improve the likelihood of institutionalized adoption, our studies have incorporated the One Health model and now examine factors that will improve the health of both workers and hogs. In addition,

installation and operational costs of engineering solutions have been considered and reported. Future work is designed to directly solicit input on practical and operational concerns from farmers as we refine miniaturized units to maximize likelihood of adoption in hog production buildings.

The evaluation team has identified the next step of this project (2022-7) has been designed to maximize the adoption of an evidence-based technology to improve worker health at commercial swine operations. This was accomplished (1) by addressing a multitude of producer concerns (e.g., worker health, pig health, and cost), (2) through increasing outreach efforts to critical stakeholders (e.g., national, state, and local pork boards and ASABE), and (3) by translating research findings in educational curriculum on ag safety and health and communicating findings directly to farming populations as well as to researchers.

The Evaluation Team has conducted similar evaluations of Roadway Safety research and the Core Course Outreach programs to evaluate the similar progression across translational research continuum. A center-wide Evaluation Report will be available online in early 2023.

### **Coordinate Communication: Activities and Impact**

**Advisory Committees:** Our advisory committees continued to provide valuable feedback and ideas from across our region, leading to improvements in outreach and educational materials and helping staff make connections with experts to provide resources for topics. Our *Regional Advisory Committee (RAC)* brought together outreach and research experts from the region to share ideas about products developed by the GPCAH and our partners (*FarmSafe* podcast, Avian Influenza, and Fall Prevention Toolkit) as well as participating in a shared stakeholder mapping exercise and sharing updates and response needs to emerging issues across the region. We welcomed Shawn Ehlers from Indiana's Purdue University in 2021 and said goodbye to Susan Harris-Bloomfield from University of Nebraska Extension who has joined the ranks of the retired. Encouraged by our RAC, we began providing skills training as pre-conference session for MRASH, holding asynchronous and virtual training sessions on the *Farm Safety Checklist App* (Surveillance Project) in Nov 2021. We are preparing for a respirator fit-testing workshop to hold before the Nov. 2022 MRASH meeting ([registration](#)).

In June 2022, we convened a meeting with our national *External Advisory Committee* and center investigators, welcoming three new members to the team. Kaci Buhl (Oregon State University), Jay Harman (Iowa State University), and Michael Pate (Utah State University) have joined this advisory group, serving alongside our longtime advocates and advisors, Paul Gunderson and Risto Rautiainen. We highlighted project updates across the Center and introduced new research projects that were included in the January competitive renewal to the team. We updated them in September about our new funded projects.

**FarmSafe Podcast:** The first season of the FarmSafe podcast wrapped at the end of July 2022. Since its launch in August 2021, the GPCAH has produced 25 episodes of the bi-weekly podcast and 2 bonus episodes promoting time-sensitive events. We kicked off Season 2 in conjunction with the 2022 Farm Progress Show in August with new hosts. In each episode, we aim to share stories of incidents and close calls related to the episode's hazard, to highlight on farm risks and help normalize discussions about safety on the farm. Season one topics included roadway safety, cold weather hazards, grain bin safety, anhydrous ammonia safety, and gas manure hazards. We also prepared a four-episode series highlighting GPCAH pilot projects in which we interviewed pilot grant recipients to discuss their projects as well as their impact on the investigators' careers. The podcast is available on the GPCAH website, where currently 40% of our listeners access the



Figure 1: FarmSafe Podcast Logo, available at <https://gpcah.public-health.uiowa.edu/farmsafe/>

podcast. Listeners also access the podcast through popular podcast directories including Apple Podcasts (21%), Spotify (9%), and Google Podcasts (1%). As of September 21, 2022, episodes have been downloaded 1000 times in 214 cities across 42 states in the US and 19 countries. Other Ag Radio and Ag podcasts have begun incorporating clips from our podcast into their audio programming, and we look forward to tracking the impact of this new dissemination tool as it is incorporated into the Outreach Core portfolio.

Information on the podcast was shared at MRASH and NORA Sector Council to share insights on the process undertaken to design and manage the podcast to assess impact.

**MRASH:** The GPCAH helped coordinate and sponsor the regional 2021 Midwest Rural Agricultural Safety and Health ([MRASH](#)) conference. While we hoped to hold the conference live in November 2021, we pivoted to the virtual space due to regional COVID rates in the fall. Our typical two-day agenda was again stretched to cover topics over four mornings to minimize participant fatigue on virtual platforms. The 2021 MRASH theme was “Spotlighting Safety and Health for Agriculture’s Essential workers: Raising the Cloak of Invisibility.”

Partners at both [Minnesota](#) and [Nebraska](#) AgFF Centers participated in MRASH conference planning. Regional Advisory Committee members in Illinois, Missouri, and Ag Health & Safety Alliance, along with personnel from all three AgFF centers in our region, contributed expertise to the session presentations. GPCAH Center personnel helped coordinate meetings, managed social media, provided introductions at the event, coordinated several roundtables, and developed surveys and analyzed evaluation feedback. This four-morning virtual conference had 129 unique participants from 20 U.S. states, and we also welcomed attendees from Argentina and Nigeria. Figure 2 illustrates the diversity of professions associated with conference attendees.

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

- **Vulnerable Populations:** A keynote panel including experts in immigrant (Holmes), indigenous (Bear), youth (Bendixen) and women (Rose-Davison) workers discussed needs of these communities.
- **Frontlines Panel: Ag S&H Risks and Remedies – Veterans:** A panel discussed relevant topics with farmers/veterans (Foulk, Stockahm), AgrAbility’s Veteran Outreach Coordinator (Chastain), and a VA Clinical Director (Tuvey).
- **Recovery in Rural Iowa: How to Support Your Neighbor:** A panel of care providers (Haglund at CADC, Day and Johnson from Iowa State Extension and Outreach) provided updates on available mental health support tools
- **Additional Roundtables:** These provided presentation and evaluation of virtual events held during COVID, strategies to engage with audiences using email, and updates on meeting farmers to promote and provide COVID testing and vaccination.

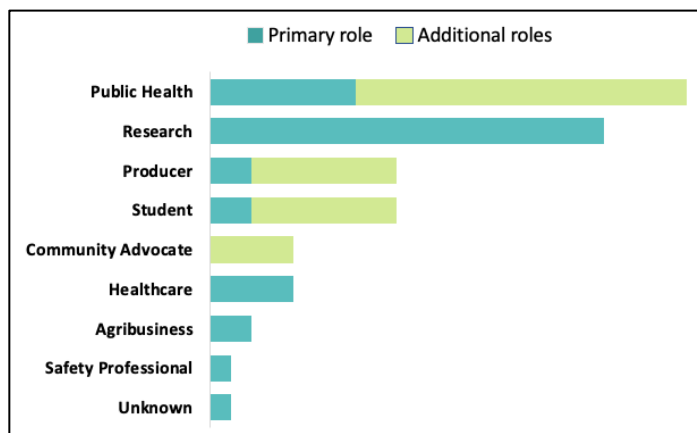


Figure 2: Rolls served by 2021 MRASH attendees.

**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, 40 Twitter posts and 155 Facebook posts were generated and shared.

Our **Twitter** followers tend to be more engaged in scientific studies and reports, and in the past year we made over 16,464 impressions and gained 39 new followers. Figure 3 shows the most popular tweet of the past year, which was a promotion for a new tractor safety podcast airing in early December. The total Twitter engagement percentage for the year is calculated by dividing the *total engagement* (likes and retweets = 439) by the *number of tweets* published in the past year (40) to get the average engagement/post (10.97). Then divide 10.97 by the *number of followers* (367) and multiply by 100 to compute the 2.9% engagement rate. We have exceeded the target of 1%, typically considered to be “very high” for an organization (0.02% is “very low”).

Our **Facebook** followers increased from 602 to 651 this year, and 563 individuals “like” our page, nearly a 6% increase since September 2021. Facebook has recently suggested a new metric for gauging Facebook performance: divide your *total post engagements* (likes, comments, shares = 433) by the *total reach* of your page (10,738) and multiplying by 100 (= 4.0%) to compute an engagement rate. A Facebook engagement rate of 5% indicates “exceptionally well.” In the next project period, we will develop and test new strategies to increase this percentage, as an increased engagement rate indicates how successfully you connect with your audience, leading to higher impressions and increased traffic. Our most popular Facebook post this year was a promotion National Rural Health Day on November 17, 2021 (1,357 reached, 83 engaged). Table 1 presents the most effective (unpaid) post topics for our Twitter and Facebook accounts.



Figure 3: GPCAH tweets reach health and safety organizations across the globe as well as across our region. The FarmSafe Podcast: Lighting and Marking on Ag Vehicles tweet had the largest audience this year with 1,208 impressions.

Table 1: GPCAH Social Media Top Five Posts

Twitter	Facebook
FarmSafe Podcast: Lighting and Marking on Ag Vehicles <a href="https://bit.ly/3R4h45w">https://bit.ly/3R4h45w</a>	National Rural Health Day Promo <a href="https://bit.ly/3eZMhJE">https://bit.ly/3eZMhJE</a>
Register for MRASH 2021 <a href="https://bit.ly/3dxzrCf">https://bit.ly/3dxzrCf</a>	Dementia Study Recruitment <a href="https://bit.ly/3R2Mo4z">https://bit.ly/3R2Mo4z</a>
FarmSafe Podcast: ATVs on Roadways <a href="https://bit.ly/3hAlnVY">https://bit.ly/3hAlnVY</a>	Core Course Promo <a href="https://bit.ly/3dxZN77">https://bit.ly/3dxZN77</a>
Community Pilot Grant Announcement <a href="https://bit.ly/3LAXsVw">https://bit.ly/3LAXsVw</a>	Free Virtual Workshop to Safeguard Youth Workers on Farms <a href="https://bit.ly/3Bz8hmp">https://bit.ly/3Bz8hmp</a>
Diane and Marsha at ASHCA Conference <a href="https://bit.ly/3f7311M">https://bit.ly/3f7311M</a>	Pilot Grant Announcement <a href="https://bitly/3S09e9dg">https://bitly/3S09e9dg</a>

Although we have not posted a new COVID-19 video on **YouTube** since February 2021, the “[COVID-19 Timeline](#)” video continues to be our most popular video, reaching 13,061 views (up from 7452 last year).

**Press Releases:** In the past year, press releases were generated to inform communities about the virtual 2021 MRASH conference and the 2022 pilot grant call for proposals. A Sept. 17, 2021, press release promoted a pilot grant-funded research paper (Berman *et al.*) on the relationship between drought and mental health. It was picked up by the November issue of [NIOSH eNews](#) and [ExtensionConnection.com](#), and the article was featured on Drought.gov at <https://www.drought.gov/news/links-between-drought-and-increased-psychosocial-stress-among-us-farmers>. It was also featured in our newsletter, *Alive and Well*, and UMASH also included the story in their [Spotlight publication](#). Other press releases included promotion of a free virtual workshop (Enhancing the Safety and Health of Youth Working in Ag), the MRASH conference, and the National Farm Safety and Health Week. All GPCAH press releases are available at <https://gpcah.public-health.uiowa.edu/news-archive/>.

## Emerging Issues

The GPCAH uses available funds to respond to timely hazards throughout the project period. At the start of this Center's funding cycle (2016), we responded to manure gas fatalities and provided prevention solutions. 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 disseminating information on various aspects of COVID-19. In this project period, we maintained [updates to our COVID web site](#), including linking state-specific resources to track local infection rates and identify vaccination and testing resources. We have [archived](#) many resources developed during the height of the pandemic so they remain available but do not detract from current best practices.

In April 2022, we worked with regional partners to provide updates to guide poultry farmers on protective guidelines for Avian Influenza. We provided experts to be guests on our *FarmSafe* podcast platform (April 7, 2021) to share updated resources early in the spring outbreak. Owing to the lack of regional resources to provide respiratory fit testing, we supported the development of fit-testing training program and infographic for pesticide applicators (Ag Health and Safety Alliance) and are supporting a survey and program to identify partners to provide this needed service to our region's farmers. The aim is to understand how to best build capabilities to quickly respond to respiratory concerns from future emergencies related to respiratory hazard as well as providing needed expertise to comply with worker protection standards for pesticide applications.

New Emerging Issues outcomes from this project period include:

- Avian Influenza Web Page, <https://gpcah.public-health.uiowa.edu/avian-influenza-information/>.
- Avian Influenza [FarmSafe Podcast](#) (April 9, 2022)
- Avian Flu: PPE Guidelines, including an interim (April) GPCAH update (retired) and a [final multi-organization update](#)
- Streamlined [COVID FAQ page](#) (April 2022) with archived resources (Dec. 2021)



# Instrumented Farm Vehicle Roadway Study (C. Hamann)

This research project studies the how vehicles interact with farm equipment on public roads. These interactions are analyzed to extract information about factors related to rear-end collisions and dangerous passing maneuvers.

During Phase 1, our team designed and constructed the *SaferTrek* devices that were mounted on the rear of several types of farm equipment to collect GPS and video data of nearby vehicles when driving on roadways. During Phase 2, our team developed and deployed a community safety campaign titled *We're on this Road Together*, while continuing to collect roadway data with *SaferTrek* devices. During the last year of the study, we have focused on processing and analyzing the large quantity of data collected across more than 3,100 sampling day events.

**Video Image Processing:** The most challenging aspect of image processing has been estimating the distance between the farm equipment and the following vehicle from a single camera view. Three different methods of estimation were applied to a validation dataset, and the most accurate method, artificial neural network, was applied to the roadway data. All three candidate methods required as an input the height of the vehicle captured in the recording so additional manual review was completed to identify make, model, and height of each vehicle. We have published a manuscript describing this process, after presenting information at the Transportation Research Board Annual Meeting in January (poster).

**GPS Data Processing:** Our team explored approaches for processing the GPS data collected by the *SaferTrek* devices. New procedures were developed for cleaning and merging two types of raw GPS data and extracting candidate trips. The candidate trips were then analyzed to determine whether the farm equipment traveled on a known road and for what portion of the trip. A methodology for extracting videos related to the candidate trips was developed, and a dashboard that integrated the video, mapped GPS data, and trip summary data was designed. Various approaches for map matching (i.e., snapping the individual GPS coordinates in a candidate trip to known road segments) and assessing the GPS error, changes in speed and heading, trip length, and data quality were considered to determine the optimal threshold for classifying candidate trips as “on-road.”

### Graphical User Interface (GUI) and Coding Protocol for Video Image Annotation:

Videos of the vehicle interactions were manually annotated to determine when a following vehicle began to enter the oncoming lane to overtake the farm equipment (where the *SaferTrek* was mounted) and how long it occupied the passing lane. Other observations that were annotated included the presence of passing zones, oncoming traffic, environmental conditions, intersections, and other conflict points. In addition, a methodology was devised to annotate the time offset between the GPS and video data. A Graphical User Interface (GUI)

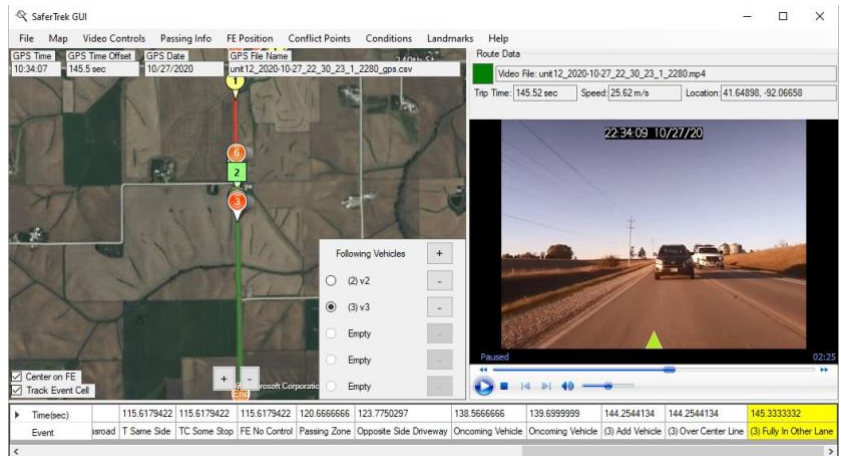


Figure 4. Graphical User Interface (GUI) developed for annotating videos of vehicle interactions with farm equipment.

previously developed for another project was adapted and significantly modified to integrate the annotation scheme for this study and to add features for visualizing and saving the annotated data.

**Safety Campaign CAB evaluation:** A process evaluation was conducted with the community advisory board who were involved with the development and dissemination of the campaign. Results demonstrated the vital role community engagement played in informing the campaign messaging and coordination of logistics of campaign implementation. We published our evaluation of this process in the *Journal of Transport and Health*.

**Intercept Survey Analysis:** An analysis of baseline pre-intervention intercept survey data was completed during this reporting period and a manuscript, *Predictors of rural driver self-reported passing behaviors when interacting with farm vehicles on the roadway*, has been drafted.

**Key Achievements:** Four data collections (nearly 400 deployments for 3,167 total days) resulted in over 7,000 videos containing more than 2000 on-road vehicle interactions. We shared results with various stakeholders through both presentations and peer-reviewed publications:

Arabi, S: [2022] Farm Vehicle Following Distance Estimation by Using Deep Learning and Monocular Camera Images. 2022 Transportation Research Board Annual Meeting, Washington, DC, January 9-13. (Poster)

Arabi S, Sharma A, Reyes M, Hamann C, Peek-Asa C: [2022] Farm Vehicle Following Distance Estimation Using Deep Learning and Monocular Camera Images, *Sensors*, April 2022, 22(7), 2736. PMID: PMC9003299. <https://doi.org/10.3390/s22072736>

Hamman CJ, Daly E, Schwab-Reese L, Askelson N, Peek-Asa C: [2021] Community engagement in the development and implementation of a rural road safety campaign: Steps and lessons learned, *Journal of Transport & Health*, December 2021, 23. PMID: PMC9348780. <https://doi.org/10.1016/j.jth.2021.101282>

## 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 the exposure burden and disease transmission among both animals and workers. GPCAH investigators have demonstrated that a recirculating ventilation system (RVS) with air filtration can improve the air quality in swine farrowing rooms. Modifications using proven disinfection technologies (e.g., ultraviolet light or UVC) within the RVS 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 prototype trailer based RVS (tRVS, Figure 5) to improve air quality in swine production. In Aim 2, we are *optimizing* the tRVS to control microorganisms in the air using filtration and UVC. In Aim 3, we are *evaluating* a bioaerosol treatment system on reducing airborne concentrations of microorganisms in swine production. Technology to reduce airborne dust and microorganisms were evaluated across multiple field and laboratory experiments and tested in commercial swine farrowing. We expected that this work would 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 as successful demonstration and adoption of engineering technology is a paradigm shift from the current approach to control inhalation hazards.

**Aims 1 and 3** of the project are completed. Over the past project year (2021-22), we continued to our work in Aim 2 to optimize the tRVS to demonstrate effectiveness at controlling an additional bacteriophage aerosol (*i.e.*, Phi X174) compared to what was originally proposed.

**Aim 2:** To evaluate tRVS performance, we compared Phi X174 aerosol concentration “upstream” (*i.e.*, inlet) of the tRVS to concentrations measured “downstream” (*i.e.*, outlet) of the tRVS (top of Figure 5). After successfully detecting virus aerosol upstream and downstream in the tRVS, our plan was to use stages of control technology [*i.e.*, filtration and UVC treatment, shown in Figure 6] and observe the impact on virus aerosol. We have completed 11 experimental trials where we have successfully detected Phi X174 concentrations both upstream and downstream of the tRVS. The geometric mean concentration of Phi X174 upstream of the tRVS was  $1.3 \times 10^4$  plaque forming units per cubic meter (PFU/m<sup>3</sup>) (GSD =  $1.2 \times 10^6$ ) and  $3.5 \times 10^4$  PFU/m<sup>3</sup> (GSD =  $1.4 \times 10^5$ ). The concentration of viral

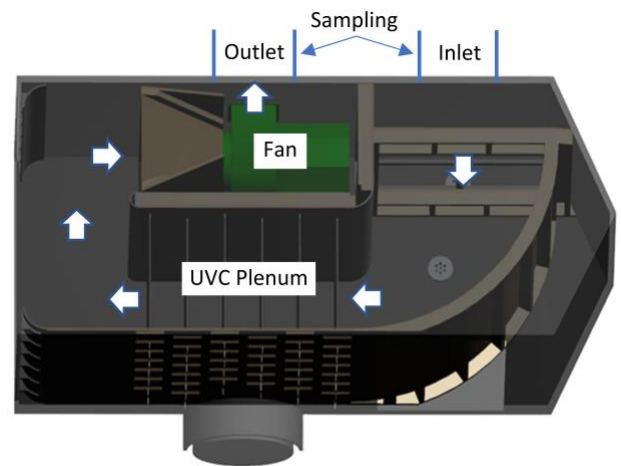


Figure 5. Prototype tRVS showing air entering through the inlet, following the path of the white arrows, and leaving through the outlet. Sampling occurred at the inlet and outlet of the unit



Figure 6. Illustration of the UVC plenum operating in the tRVS, as graphically shown in Figure 5.

stock that were aerosolized have ranged from  $10^5$  –  $10^6$  PFU per milliliter (PFU/ml). Before the project period ends, we plan to use a UVC treatment at 2% of our maximum UVC dose in the tRVS to observe inactivation of Phi X174 aerosol downstream of the tRVS.

**Key Achievements in the Past Year:**

- Overcome the technical challenges of propagating and aerosolizing Phi X174 in the laboratory
- Develop a plaque assay for Phi X174 using a bacterial host
- Quantified virus aerosol concentrations upstream and downstream of the tRVS (n=11)

**Challenges:** We have struggled to create a virus stock solution to aerosolize into the tRVS above  $10^6$  PFU/ml. In our previous work in Aim 2, we created a viral stock solution of MS2 near  $10^9$  PFU/ml. Given the tRVS operates at 1600 cubic feet per min, we need to create a higher concentration of viral stock solution to aerosolize into the tRVS to consistently detect virus concentrations both upstream and downstream. We have completed many trials where virus concentrations were below the limit of detection either upstream or downstream of the tRVS. We have also experienced supply chain challenges as the bacterial host for Phi X174 was not available for several months, related to global supply chain issues.

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

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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 a 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 identified 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. Two-thirds of claims were medical only, while about 1/3 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).

Using two Iowa state databases (workers' compensation records and the state trauma database) from 2005-2014, we characterized injuries found separately in each database and then identified those cases that linked across both databases. A total of 2,398 unique injuries from the Iowa Trauma Registry (ITR) and 3,419 unique injuries from Iowa workers' compensation (WC) were found. There was very little overlap between the two sources. Specifically, only 110 cases were identified in both data sources, representing 4.4% of the ITR and 3.1% of the WC cases.

We developed logistic regression models to compare injuries associated with inclusion in each data source, and to probabilistically predict which data source captured an agricultural injury, given the injury characteristics and worker demographics. When an agricultural worker is younger, their farm-related injury is more likely to be found in WC (maximum probability of 78% at the age of 16) than in the ITR (Figure 7). Once they are at least 55 years of age, there is a higher probability their injury would be found in the trauma registry (minimum probability of 51% at the age of 55).

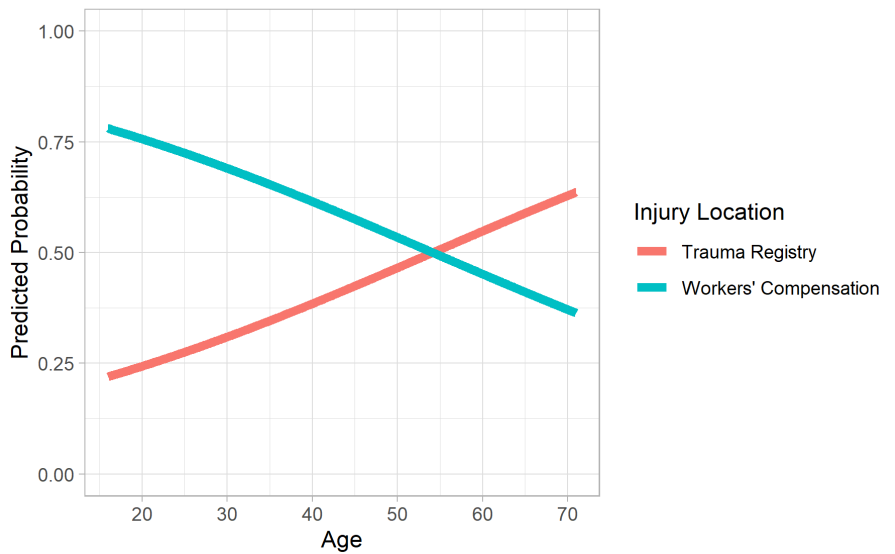


Figure 7. Logistic regression models to compare injuries associated with inclusion in each data source

Across all ages, machinery injuries have a minimum probability of 63% of being located in the ITR (Figure 8). Among agricultural workers 25+ years of age, motor vehicle traffic (MVT) crashes are also more likely to be found in the ITR than WC. Young (16-25 years of age) agricultural workers injured in a MVT crash are more likely to be found in WC. For causes related to cut/pierce or struck by/against objects, agricultural workers are more likely found in WC than ITR, but the probabilities flip around age 45. It is not until the age of 62 that these fall injuries have a greater chance of being in the trauma registry.

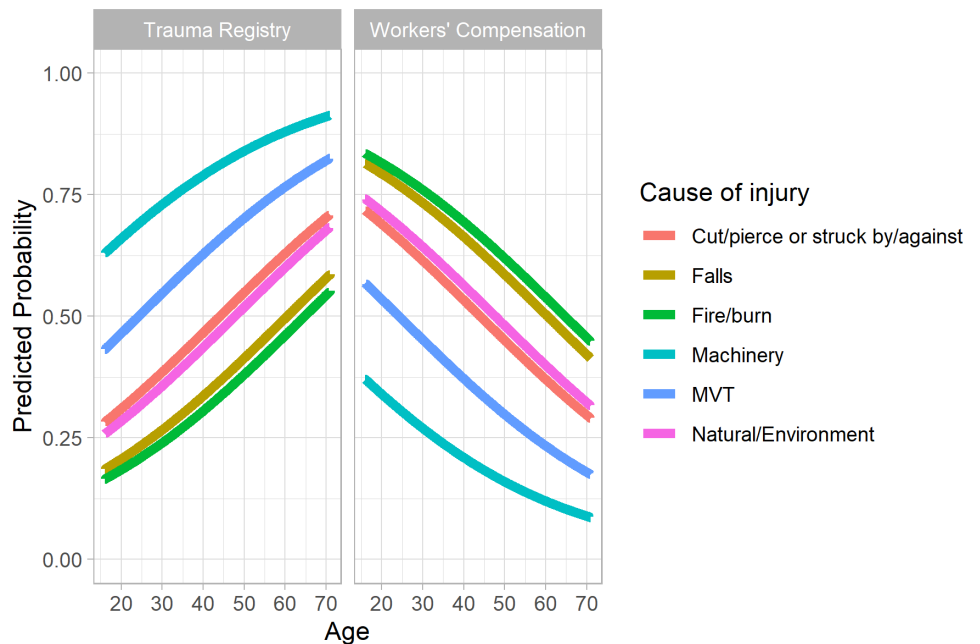


Figure 8. Logistic model: Machinery injuries across all ages

**Study 2:** For Study 2, researchers completed a hazard assessment checklist (HAC) with the owners/operators of 103 row crop farms in Iowa. For a subset of 52 farms, a second research team member conducted a replicate assessment so inter-rater reliability could be quantified. 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) (see table below). A manuscript describing the development of the HAC and the results of the inter-rater reliability has just been accepted by the *Journal of Agricultural Safety and Health*. Data from the HAC is currently being scored to assess the association between a hazard score and the prevalence of injury.

Given recruitment efforts undertaken to obtain farmers willing to participate in our team's site visits using this checklist, we have analyzed the recruitment strategy to explore factors associated with farmer recruitment success. We hypothesized that farmers were more likely to participate if they were contacted and screened during the growing or offseason and during evening hours. Our results partially align with this hypothesis. Specifically, farmers were more likely to be screened for study participation if they were contacted during the growing season but during daytime hours. This finding carried over to farmers who completed the farm visit, where probabilities of completion were highest among farmers contacted during the day. Contacting farmers during the offseason did not improve the likelihood of participation. This information may help improve recruitment efforts in future studies of Midwest row crop farmers.

We shared results with various stakeholders this period through presentations and peer-reviewed publications:

1. Ramirez MR, Casteel C, Boonstra DE, Gerr F, Cavanaugh J, Rosebush C. Surveillance of Agricultural Injuries: Comparison of State Trauma and Workers' Compensation Data Sources. National Occupational Injury Research Symposium, May 12, 2022.
2. Faust K, Casteel K, Gerr F, Cavanaugh J, Boonstra DE, Anthony TR, Soupene VA, Ramirez M. Development of a checklist to identify injury hazards on row crop farms in the midwestern United States. *Journal of Agricultural Safety and Health* (in press Sept. 27, 2022).

## Pilot/Feasibility Projects Program (N. Fethke)

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The Pilot/Feasibility Projects Program is a vibrant and vital component of the GPCAH. The Program strengthens the Center’s impact on agricultural safety and health by operating a competitive funding opportunity using two “tracks,” one designed to support new academic research and the other to support community-based education/outreach/translation projects. Since September 1, 2021, we have implemented several changes to our requests for proposals (RFPs), our infrastructure (e.g., website), and our processes for promoting the RFPs.

*Academic-Track Awardee Characteristics.* A key goal of the Program is to support investigators new to the field of agricultural safety and health.

*Community-Track Awardee Characteristics.* A key goal of the Program is to support regional organizations in their efforts to develop, implement, evaluate, and deliver evidence-based ASH services (e.g., educational programming for agricultural workers).

The Program administered *six pilot projects* during the 2021-2022 project year; four of these projects were funded during and carried over from the previous project period. Two academic-track projects (both with trainees as principal investigator) were focused on understanding the role of agricultural cooperatives in protecting the safety and health (including mental health) of agricultural workers. Other topics included safe animal handling in swine operations (academic), occupational factors associated with suicide among agricultural workers (academic), the safety and health experience of vulnerable H-2A agricultural workers (academic), and respiratory protection in the context of COVID-19 (community).

In anticipation of the Center’s continued funding by NIOSH, the Program issued in April 2022 its RFPs for academic- and community-track pilot projects to be awarded during the 2022-2023 project year (with an application deadline of July 1, 2022). We received six applications (five academic and one community) from institutions/organizations in Iowa, Nebraska, and Indiana, but none met the threshold for funding following our established merit review process. Therefore, in September 2022 we issued a second RFP for 2022-2023 pilot projects; the application deadline is December 1, 2022, and promotion is ongoing.

When planning to solicit applications for 2022-2023 pilot projects, we (i) simplified the language in both the academic- and community-track RFPs and (ii) aligned the RFPs with the approach proposed with our application to continue the Program during the next Center funding cycle (i.e., 2022-2027). The Program website (<https://gpcah.public-health.uiowa.edu/gpcah-pilot-grant-program/>) was also redesigned to better distinguish the two project tracks for potential applications. In addition, we have revised the application process for community-track applicants to enhance responsiveness and quality of applications received. Specifically, community-track applicants are now required to submit a brief “Project Concept” about six weeks in advance of the deadline for full applications. The concept submission requires potential applicants to succinctly describe the agricultural safety and health problem to be addressed, the project objectives, and how project activities will be evaluated. Applicants receive feedback from the Center and an invitation to discuss their concepts with Center personnel. In this way, the Center can assist in refining objectives, methods, and the evaluation process as the full application is developed.

We have also expanded our contact list to include more community colleges, government, and state-sponsored programs, and have shared the announcements on regional and national web resources such as the Childhood Agricultural Safety Network and the Extension Foundation’s Connect Extension website and newsletters. We continue to reach out to our internal, regional, and external advisors so that they can also share RFPs with their professional networks.



Following the Program’s evaluation processes, pilot grant awardees continue to provide outputs and outcomes. See the table below for recent updates.

Table 2. Recent updates for Pilot Grant Program

PI (Affiliation)	Track	Title	Outputs/Outcomes
<b>Pilot projects awarded May 2020 and carried into the 2021-2022 Program project period</b>			
Kapur <sup>2</sup> (Purdue Univ.)	Academic	Understanding how to collaborate with cooperative extension to disseminate agricultural safety and health programs and information: a mixed-methods study	<ul style="list-style-type: none"> <li>• None reported to date</li> </ul>
<b>Pilot projects awarded October 2020 and carried into the 2021-2022 Program project period</b>			
Liang <sup>1</sup> (Univ. of Iowa)	Academic	Examining the role of agricultural cooperatives in protecting farmers’ mental health	<ul style="list-style-type: none"> <li>• PhD dissertation</li> <li>• Conference poster</li> <li>• Conference presentation</li> </ul>
Rudolphi <sup>3</sup> (Univ. of Illinois)	Academic	Preventing workplace injury in pig production systems: applying behavior change interventions for safe animal handling	<ul style="list-style-type: none"> <li>• 3 conference presentations</li> <li>• 1 future grant submission</li> </ul>
Sheridan (ASHA)	Community	Respiratory protection following COVID-19: developing and testing educational resources in the ag health and safety classroom	<ul style="list-style-type: none"> <li>• 9 presentations to 424 individuals</li> <li>• 4 conference presentations</li> <li>• 1 interactive infographic</li> <li>• 1 video motion graphic</li> <li>• Received additional funds to extend promotion of outreach materials</li> </ul>
<b>Ongoing pilot projects awarded October 2021</b>			
Kline <sup>1</sup> (Ohio State Univ.)	Academic	Uncounted and invisible: the lives and health of H-2A workers in Ohio	<ul style="list-style-type: none"> <li>• 131 interviews at 63 farms in 24 counties</li> </ul>
<b>Ongoing pilot projects awarded December 2021</b>			
Davis <sup>3</sup> (Univ of Iowa)	Academic	Identifying circumstances leading to suicide for farming, fishing, and forestry workers	<ul style="list-style-type: none"> <li>• 1 accepted conference presentation</li> <li>• 1 manuscript in-process</li> </ul>

<sup>1</sup> PhD student; <sup>2</sup> Other student (e.g., undergraduate or MS); <sup>3</sup> Junior faculty

## Outreach Core

### (D. Rohlman)

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The Outreach Core has three goals: **educate** health providers, safety professionals, and farmers on the prevention of agricultural related injury and illness, **translate** research findings into culturally appropriate messages to prevent injury and illness, and **communicate** this information through our education and outreach activities.

#### Educate

The GPCAH has continued to expand national and international delivery of agricultural safety and health education. Since 2006, the *Agricultural Safety and Health Core Course* has been delivered 72 times in 10 US states, and Australia, Turkey, and Canada to over 2,000 trainees. It has been adopted into graduate and professional training (public health, pharmacy, medicine) and provided continuing education credits for physicians, nurses, emergency medical services, and veterinarians. In the summer of 2022, 34 attendees completed the course, provided virtually again. We partnered with the Ag Health and Safety Alliance (AgHSA) to provide respirator fit test training to course participants. Last fall, the *Core Course* was delivered in partnership with Farm Safety Nova Scotia to first-year college students in the Agricultural Farm Management program at Dalhousie University. Respondents to a 2022 Core Course alumni survey, participants reported implementing a health or safety program (30%), incorporating changes into practice (35%), sharing materials, or using them in classroom settings (70%), and increasing discussions with stakeholders (43%) following completion of the course.

We also expanded the reach and impact of the *Core Course* through the development of a series of online training modules. Since 2017, over 1,000 participants have enrolled in the online modules. Courses are included in the SAY National Clearinghouse, aligned with the Agricultural, Food & Natural Resources (AFNR) Career Content Standards used by agricultural educators. 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.

#### 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.

Evidence-based findings and experiential narratives (storytelling) were translated into communication tools (e.g., media stories, *Telling the Story [TTS]*, interactive activities, outreach kits, posters/handouts, social media campaigns). We collaborated with NIOSH, Agricultural Centers of Excellence, and other intermediary organizations (e.g., Agricultural Health and Safety Alliance, AgriSafe, Lee Agri-Media, Iowa's Center for Agricultural Safety and Health) to deliver these regionally, nationally, and internationally.

#### 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. We attended the 2021 *National FFA Conference* and 2022 *Minnesota FarmFest*, where we piloted newly developed falls prevention and ladder safety materials.

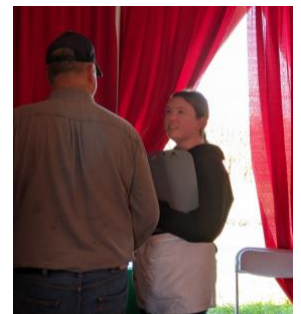


Figure 9. Student interviewing a farmer at the 2022 Farm Progress show in Boone, IA

The GPCAH led the coordination of the Health & Safety tent at the *Farm Progress Show* in 2022, when Kathy Leinenkugel, collaborator from the Iowa Department of Public Health, retired. We brought in local, regional, and national experts to present information, share resources, and provide health screenings and hands-on demonstrations on a variety of agricultural health and safety topics (Table 3). We also presented at the 2021 Midwest Rural Agricultural Safety and Health Conference (MRASH), the 2022 Agricultural Safety and Health Council of America, and the 2022 International Society for Agricultural Health and Safety (ISASH). We developed and pilot-tested an interactive needs-assessment tool ([#ShoppingForSafety](#)) to guide educators and outreach providers through a structured system to identify resources and formats. This tool will be used at the upcoming National FFA Conference, and results will be shared to guide the development of priority resources for FFA instructors.

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*. Our outreach team presented interactive displays on rural roadway safety, hearing loss prevention, and whole-body vibration. 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: Electronic Newsletter:** In this reporting period, we have distributed our electronic *Farm Families Alive and Well Newsletter*. Over the past year, the GPCAH shared the following information via this newsletter to over 1500 farm families and other agricultural safety and health stakeholders: identified expanded educational opportunities at the Center; announced new FarmSafe podcast topics; introduced the development of a new agricultural hazard assessment checklist app; provided information on dementia and farm safety; shared research on vehicle interactions with farm equipment on public roads; highlighted a new system to improve air quality in swine barns; shared resources on falls protection, and signs of stress on the farm; introduced the development of the *#ShoppingForSafety* hands-on tool; and reflections from graduate health and safety student on their perspectives of farm shows.

*Table 3: List of 2022 [Farm Progress Show Safety & Health Tent Topics](#), coordinated by GPCAH*

- AgrAbility
- ATV safety\*
- Falls prevention on the farm\*
- Farmer well-being resources
- Foster care information
- Gasoline safety education
- Grain-handling safety\*
- Hazard mapping\*
- Infectious and zoonotic disease prevention\*
- Mental health and stress
- Opioid overdose prevention
- Personal Protective Equipment
- Pesticide safety / worker protection standards
- Respirator fit-testing\*\*
- Roadway safety\*\*
- Stop the Bleed program
- Suicide prevention
- Swine and livestock safety\*
- Whole-body vibration\*\*

*\*Presented by NIOSH AFF Centers, including GPCAH\*\**

## Output Summary: October 2021 through September 2022

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	Year 6 2021-22	All 2016-22
Publications	5	17	7	10	11	6	56
Abstracts & Presentations	14	28	31	11	17	15	116
Lectures, Seminars, & Workshops	14	33	48	27	39	42	203
Consultations	9	14	10	5	13	13	64
Information to Policy Makers	2	2	3	1	3	2	13
Student Dissertations or Thesis	3	4	3	2	0	5	17
Press Releases, Media Stories	27	50	79	49	17	43	265
FarmSafe Podcasts	-	-	-	-	4	21	25
<b>Total Output Count</b>	<b>74</b>	<b>148</b>	<b>181</b>	<b>105</b>	<b>104</b>	<b>139</b>	<b>759</b>

### Published Manuscripts

1. Aribi S, Sharma A, Reyes M, Hamann, C Peek-Asa C. Farm Vehicle Following Distance Estimation Using Deep Learning and Monocular Camera Images, *Sensors*. 22(7): 2736. PMC9003299, <https://doi.org/10.3390/s22072736> (Roadway)
2. Bhat SM, Shrestha D, Massey N, et al.: [2022] Organic dust exposure induces stress response and mitochondrial dysfunction in monocytic cells. *Histochem Cell Biol*. 155(6):699-718. PMC8195852. <https://link.springer.com/article/10.1007/s00418-021-01978-x> (Pilot)
3. Faust K, Casteel K, Gerr F, Cavanaugh J, Boonstra DE, Anthony TR, Soupene VA, Ramirez M. Development of a checklist to identify injury hazards on row crop farms in the midwestern United States. *Journal of Agricultural Safety and Health* (in press Sept. 27, 2022). (Surveillance)
4. Hamann C, Daly E, Schwab-Reese L, Askelson N, Peek-Asa C: [2021] Community engagement in the development and implementation of a rural road safety campaign: Steps and lessons learned, *Journal of Transport & Health*, 23: 101282. PMC9348780 <https://doi.org/10.1016/j.jth.2021.101282> (Roadway)
5. Rohlman DS, Campo S, TePoel M: [2022] Protecting Young Agricultural Workers: The Development of an Online Supervisor Training. *J Agromedicine* 27(4):359-396. PMC8936061 (Outreach)
6. Shrestha D, Bhat SM, Massey N, et al. [2021] Pre-exposure to hydrogen sulfide modulates the innate inflammatory response to organic dust. *Cell Tissue Res*. 384:129-148. PMC8453448 <https://link.springer.com/article/10.1007/s00441-020-03333-3> (Pilot)

### Other Publications

None reported this period

### Abstracts/Presentations at Scientific Meetings

1. Liang Y, Janssen B, Casteel C, Nonnenmann M, Rohlman DS: [2021] Agricultural Cooperatives in Mental Health: Farmers' Perspectives on Potential Influence. *J Agromedicine*. 2022 Apr;27(2):143-

153. doi: 10.1080/1059924X.2021.2004962. Epub 2021 Nov 26. PubMed Central PMCID: PMC8957597. (Pilot)
2. Crawford K: [2021] FarmSafe: From a seed to a podcast. Midwest Rural Agricultural Safety and Health (MRASH) Conference. November 8-12, 2021. (P&E Core)
  3. Crawford K: [2021] The US Agricultural Safety and Health Centers' YouTube Channel: Examining viewership of agricultural health and safety videos. Midwest Rural Agricultural Safety and Health (MRASH) Conference. November 8-12, 2021. (P&E Core)
  4. Crawford K and Anthony TR: [2021] Developing the FarmSafe Podcast. NORA AgFF Sector Council, November 17, 2021. (P&E Core)
  5. Gibbs J, Sheridan C, Sullivan D, Cheyney M, Janssen B, Rohlman DS: [2021] Using Infographics and Motion Graphics to Enhance Agricultural Health and Safety Education Among Young Adults. Midwest Rural Agricultural Safety and Health (MRASH) Conference. November 8-12, 2021. (Outreach Core)
  6. Arabi, S: [2022] Farm Vehicle Following Distance Estimation by Using Deep Learning and Monocular Camera Images. 2022 Transportation Research Board Annual Meeting, Washington, DC, January 9-13. (Roadway)
  7. Rohlman DS, Chronister, Kayser, Suarez-Torres, Checkoway, Friedman, Martinez: [2022] Pesticide Exposure: Understanding Pathways of Exposure and Health Outcomes to Develop Interventions to Reduce Exposure and Improve Safety, International Commission on Occupational Health. February 7-11, 2022.
  8. Smith S, Hamann C, Schwab-Reese LM, Peek-Asa C. [2022] Toward a better understanding of collaboration with cooperative extension in the dissemination of agricultural safety and health programs. A presentation in the Society for Advancement of Violence and Injury Research conference. Washington DC. March 2022. (Pilot)
  9. Crawford K, Morrison L, Nonnenmann M, Kay Mohling K, Rohlman DS: [2022] Evaluation of New Agricultural Safety and Health Asynchronous Online Training Modules. ASHCA Conference, Las Vegas, NV. March 28-30, 2022. (Outreach Core)
  10. Bentley M, Cheyney M, Rohlman DS: [2022] Young workers in agriculture – what do they know about workplace safety? ASHCA Conference, Las Vegas, NV. March 28-30, 2022. (Outreach Core)
  11. Yoder A, Duysen E, Heiberger S, Ploeckelman M: [2022] Telling the Story: How one farmer's story provided impactful worker training and outreach. Poster ASHCA Conference, Las Vegas, NV. March 28-30, 2022. (Outreach Core)
  12. Ramirez MR, Casteel C, Boonstra DE, Gerr F, Cavanaugh J, Rosebush C. Surveillance of Agricultural Injuries: Comparison of State Trauma and Workers' Compensation Data Sources. National Occupational Injury Research Symposium, May 12, 2022. (Surveillance)
  13. Ploeckelman M, Heiberger S, Charlier D, Leonard S, Duysen E, Palm K, Rautiainen, Yoder A: [2022] Telling a Story to Save a Life – Creating an Impactful First-Person Narrative. International Society for Agricultural Safety and Health (ISASH) Conference, Fort Collins, Colorado. June 12-16, 2022. (Outreach Core)
  14. Rohlman DR: [2022] Research to Practice at the University of Iowa College of Public Health. International Association for Worksite Health Promotion conference, 9th Global Healthy Workplace Awards & Summit, November 17, 2022.
  15. Davis J: [2022] Using the National Violent Death Reporting System to determine Occupation Specific Risk Factors for Suicide: An example using Farming, Fishing, and Forestry Workers. 3<sup>rd</sup> International Symposium to Advance Total Worker Health Conference. October 11-14, 2022. Bethesda, MD (accepted). (Pilot)

## Lectures, Seminars, or Workshops Delivered in Academic Settings

1. Rohlman DS: [2021] Grand Rounds: Youth and Agriculture for Rural Prep (Outreach Core)
2. Rohlman DS: [2021] Farm Culture Activity for National Centre for Farmer Health in Australia (Outreach Core)
3. Rohlman DS: [Fall 2021] Rural Health and Agricultural Medicine: The Core Course. Dalhousie University. (Outreach Core)
4. Rohlman DS: [2021] Agricultural Safety and Health in OEH: 4240 Global Environmental Health course. University of Iowa. Guest Lecturer. Attended by graduate students. (Outreach Core)
5. 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)
6. 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)
7. 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)
8. Rohlman DS: [2021] OEH:6110 Rural Health and Agricultural Medicine. University of Iowa. Primary Instructor. Attended by graduate students. (Outreach Core)
9. Rohlman DS: [2021] OEH:6510 Environmental and Occupational Epidemiology: Neurobehavioral Assessment. University of Iowa. Guest Lecturer. Attended by graduate students. (Outreach Core)
10. Hamann C: [2021] Injury Epidemiology and Roadway Safety: Highlighting Child Passenger and Farm Vehicle Research. University of Iowa. Attended by faculty, staff, and students (undergraduate and graduate). (Roadway)
11. Barnwal, A.: [2022] Map-matching in R: Introducing the forthcoming 'mapmatchr' package. ISU Statistics Dept Graphics Group. February 24, 2022. (Roadway)
12. Smith S, Hamann C, Schwab-Reese LM, Peek-Asa C. Toward a better understanding of collaboration with cooperative extension in the dissemination of agricultural safety and health programs. A presentation in the Purdue University Spring HHS Research Event. West Lafayette, IN. March 2022. (Pilot)
13. Rohlman DS: [Spring 2022] CPH:3500 Global Public Health: Adolescent Health, Impact on Young Workers. University of Iowa. Attended by undergraduate students. (Outreach Core)
14. Rohlman DS: [Spring 2022] Course in OEH: 6110 Rural Health and Agricultural Medicine. University of Iowa. Attended by graduate students. (Outreach Core)
15. Rohlman DS: [Summer 2022] Rural Health and Agricultural Medicine OEH:6110/Ag Safety and Health: The Core Course. University of Iowa. Attended by graduate students and professionals. (Outreach Core)

## **Courses Taught in Agricultural Safety and Health**

1. Rohlman D: [Summer 2022] Agricultural Safety and Health Core Course: 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: [Fall 2021] Course in OEH: 6120 Topics in Agriculture and Rural Health: The Culture of Agriculture. University of Iowa. Attended by graduate students.
3. Janssen B: [Fall 2021] Course in CPH: 4200 Agriculture, Food Systems & Sustainability. University of Iowa. Attended by undergraduate students.
4. Rohlman DS: [Spring 2022] Course in OEH: 6110 Rural Health and Agricultural Medicine. University of Iowa. Attended by graduate students.
5. Rohlman DS: [Spring 2022] Course in OEH: 6120 Topics in Agriculture and Rural Health: Mental Health in Rural Communities. University of Iowa. Attended by graduate students.

## **Lectures, Seminars, or Workshops Delivered to the Agricultural Community**

1. Cheyney M: [2021] Rural Roadway Safety, Whole Body Vibration, and Hearing Loss Prevention, Gear Up for Safety (in collaboration with Ag Health and Safety Alliance), Kirkwood Community College, Cedar Rapids, IA. September 20, 2022. (Outreach Core)
2. Rohlman DS: [2021] Working Youth Panel. Child Agricultural Safety and Health Workshop: Protecting the Future of Agriculture Conference. September 28, 2021. (Outreach Core)
3. Rohlman DS: [2021] Conference Session Facilitator. Child Agricultural Safety and Health Workshop: Protecting the Future of Agriculture. September 14, 21, 28, 2021. (Outreach Core)
4. Cheyney M, Bentley M: [2021] Young worker rights and hazard identification games, National FFA Convention & Expo, Indianapolis, IN. October 27-29, 2021. (Outreach Core)
5. Rohlman DS: [2021] Network with the Professionals, Coffee Talk. Midwest Rural Agricultural Safety and Health (MRASH) Conference. November 8-12, 2021. (Outreach Core)
6. Rohlman DS: [2021] Risk perception and behavior in Egyptian adolescent pesticide applicators: an intervention study. Interventions to Reduce Pesticide Exposure from Agriculture Sector in Africa. November 15, 2021. (Outreach Core)
7. Rohlman DS: [2021] Research to Practice at the University of Iowa College of Public Health. Summit Session on Capacity Building, International Association for Workplace Health Professionals. November 17, 2021. (Outreach Core)
8. Rohlman DS: [2022] Early neurobehavioral and cognitive development in Filipino children: BARS, United States National Institutes of Health. January 21, 2022.
9. Rohlman DS: [2022] Making Farming Safer: Resources for Improving Ag Workers' Health and Wellness, Business Leadership Network, Clinton, IA. March 3, 2022. (Outreach Core)
16. Cheyney M: [2022] Using the NIOSH HLSIM (hearing loss simulator) in Outreach and Education efforts, ASHCA Conference, Las Vegas, NV. March 28-30, 2022. (Outreach Core)
17. Cheyney M: [2022] #ShoppingForSafety needs assessment tool, International Society for Agricultural Safety and Health (ISASH) Conference, Fort Collins, CO. June 12-16, 2022. (Outreach Core)
18. Cheyney M, Bentley M, Proctor A, Smaellie E: [2022] Falls Prevention in Agriculture, Minnesota FarmFest, Redwood Falls, MN. August 2-4, 2022. (Outreach Core)
19. Cheyney M, Smaellie E, Bentley M: [2022] Rural Roadway Safety, Hearing Loss Prevention, Whole Body Vibration, Farm Progress Show, Boone, IA. August 30-September 1, 2022. (Outreach Core)

20. Smaellie E: [2022] Respiratory Protection on the Farm, Farm Progress Show, Boon, IA. Aug 30-September 1, 2022 (Emerging Issues)
21. Rohlman D: [2022] Enhancing the Safety and Health of Youth Working in Ag: Protecting the Future of Agriculture, Virtual Workshop, with NCCRAHS. September 28, 2022. (Outreach Core)
22. Rohlman DS: [2022] Reducing Agricultural Injuries and Pesticide Exposure among Rural Farmers in Kuje, Abuja Nigeria. Mandela Washington Fellowship Reciprocal Exchange Award. September 2022.

### Core Course Modules

Online modules are all available for training at: <https://gpcah.public-health.uiowa.edu/core-course-online-modules/> . Two final modules (ATV/UTV Safety and Pesticides) are in final production.

1. Anthony TR, Nonnenmann M, Morrison L, Rohlman DS, Mohling K: [2021] *Transportation Hazards in Agriculture* [online module].
2. Bickett-Weddle D, Nonnenmann M, Morrison L, Rohlman DS, Mohling K: [2020] *Biological Risk Management* [online module].
3. Gerr F, Morrison L, Rohlman DS, Nonnenmann M, Mohling K: [2020] *Occupational Diseases of the Lungs in Agricultural Settings* [online module].
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].
6. Gibbs JL, Nonnenmann M, Gerr F, Morrison L, Rohlman DS, Mohling K: [2020] *Physical Agents for Agricultural Health* [online module].
7. Janssen B, Bickett-Weddle D, Rood K, Rohlman DS, Nonnenmann M, Morrison L, Mohling K: [2020] *Livestock Handling* [online module].
8. Rohlman DS, Nonnenmann M, Gerr F, Morrison L, Mohling K: [2020] *Overview: Agriculture, Forestry, Fishing* [online module].
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] Information provided to caller about respirators and respirator fit testing. Dec 28, 2021.
2. 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.
3. Rohlman DR: [2021] Invited to participate in panel on research to practice at the International Association for Worksite Health Promotion conference. Nov 17, 2021
4. Rohlman DS: [2022] 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 a 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”.
5. Cheyney M: [2022] Resources on choosing hearing protection provided to EHS manager. Feb 7, 2022.



6. Anthony TR: [2022] Request for information/materials on whole body vibration by nurse in Agrinurse program. May 17, 2022.
7. Anthony TR: [2022] Resources and information on agricultural safety courses offered by GPCAH provided to Mandela Scholar. July 6, 2022.
8. Cheyney M: [2022] Resources for agricultural safety and health library in Africa provided to Mandela Scholar. July 6, 2022.
9. Rohlman DR: [2022] Request for pesticide exposure surveys for use in project in Kenya. Aug 8, 2022
10. Anthony TR: [2022] Request for information on machinery safety and injury statistics by reporter from Carlyle Union Banner. Aug 17, 2022
11. Arora, K: [2022] Request to use article information and link from *Dementia and Farm Safety* (Alive & Well Newsletter, June 2022) in UMASH spotlight article. Sept 8, 2022.
12. Patterson J: [2022] Request by Farm to Fork radio show to use FarmSafe podcast excerpts during show (airing on 137 radio station in GPCAH region. Sept 1, 2022. (Rural Roadway Safety episode excerpts used Sept 20, 2022).
13. Patterson J: [2022] Request to use posters from the Iowa State Trauma Registry data analysis on how farmers are most frequently injured. Sept 19, 2022.

### Grant Funding

1. Moynihan M, PI: [2021]. Bend, Don't Break – Managing Stress in Agriculture. U.S. Department of Agriculture (\$599,605). Project [#MINW-2021-09291](#). Minnesota Dept. of Agriculture. Nov 2021. (Pilot grant awardee, 2018-20)
2. Rohlman DS: [2022] GEOHealth Hub for Environmental and Occupational Health Research and Training in the MENA Region ([GEOHealth MENA](#)), 2022-7. Funded by NIEHS and Fogerty Institute. Sept. 2022. This is a new grant (funded for five years) to assist trainees who will take the GPCAH Core Course.

### Information Provided to Policy Makers

1. Anthony TR. Washington DC Hill Visits for Ag Centers, Total Worker Health Centers, and Educational Research Centers. Mar 2022.
2. Aurora K: [2022] Legislative analyst Tania Calle requested dementia in agricultural workers study findings.

### Student Thesis/Dissertation

1. Soupene, V. Pesticide Safety Behaviors and Resources Utilized among Midwest College Students. 2021, MS Thesis, May 2021. (*Not unckuded in 2021 annual report*) [LINK](#)
2. Liang, Y: [2021] Social Connectedness and Mental Health Among Midwest Farmers. PhD Dissertation, December 2021. [LINK](#)
3. Metzcus, L: [2022] Evaluating Private Pesticide Applicator Curriculum using the Hierarchy of Controls, MS Thesis, August 2022. [LINK](#)
4. Arabi, S: [2022] Monitoring of civil infrastructure: A deep-learning-based computer vision approach. PhD Dissertation, May 2022. [LINK](#)
5. Proctor, AR: [2022] The Occupational Health Hazards of Altrenogest, MS Thesis, May 2022. [LINK](#)

## Media Stories and Press Releases

### Media Stories

1. Beware of Tractors, Combines on Area Roads during Harvest Season. The Intelligencer. Oct. 2021. [LINK](#).
2. Froust Prater L: Ag Safety Awareness Program Week: Disaster Preparedness. Successful Farming. March 2022. [LINK](#).
3. Froust Prater L: Back Pain Can Be Attributed to Whole-Body Vibration. Successful Farming. Aug. 2022. [LINK](#).
4. Free Safety workshop to focus on youth working in agriculture. KIWA Radio Aug. 2022. (Outreach)
5. National Farm Safety and Health Week: Overall Farmer Health. KCRG 4 PM News. Interviewed by Jim Martens (livestream). Sept. 2022. (P&E)
6. National Farm Safety and Health Week: Roadway Safety. KWWL News. Interviewed by Katie Wadman (livestream). Sept. 2022. (Roadway)

### Safety Watch News Column in Lee Agrimedia Publications

1. Leonard S: [2021] Rural Doctor's Goal: 'Prevent People from Getting Sick. Iowa Farmer Today. Sept 10. [LINK](#).
2. Leonard S: [2021] H2S Hazard Lethal and Unpredictable. Iowa Farmer Today. Nov 16. [LINK](#).
3. Leonard S: [2022] New COVID-19 Variant Requires All the Tools We Have. Iowa Farmer Today. Jan 6. [LINK](#).
4. Janssen B: [2022] Gloves Protect from More than Cold. Iowa Farmer Today. Jan 6. [LINK](#).
5. Janssen B: [2022] ROPS a Proven Strategy to Keep Old Tractors Safely Running. Iowa Farmer Today. Feb 16. [LINK](#).
6. Leonard S: [2022] National Weather Service Offers Training to Spot Risk. Iowa Farmer Today. Mar 11. [LINK](#).
7. Janssen B: [2022] Consider Safety in Grain Bins of All Ages and Sizes. Iowa Farmer Today. Apr 9. [LINK](#).
8. Leonard S: [2022] Survivor Shares Vivid Memories of '92 Twister that Took her Home. Iowa Farmer Today. May 13. [LINK](#).
9. Janssen B and Olson G: [2022] Retiree Awarded for Career Keeping Iowans Safe. Iowa Farmer Today. Jun 10. [LINK](#).
10. Leonard S: [2022] Safety Watch: Noxious Plants Get under Your Skin. Iowa Farmer Today. Jul 7. [LINK](#).
11. Janssen B: [2022] Even a Small Needle Can Cause Big Problems. Iowa Farmer Today. Aug 12. [LINK](#).
12. Janssen B: [2022] Beware Sharp Needles when Vaccinating. Iowa Farmer Today. Sept. 9. [LINK](#).

### Telling the Story Project – New Stories 2021-22

No new stories in this project period.

### Additional Media Stories with GPCAH Collaboration

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

1. Olson G: [2022]. Midwest Rural Agricultural Safety and Health Conference November 16-17. Alive & Well Newsletter. 28(4):1. Sept. [LINK](#).
2. Anthony TR: [2022]. Director's Message. Alive & Well Newsletter. 28(4):2. Sept. [LINK](#).

3. Aurora K: [2022]. Dementia and Farm Safety. 28(4):3. Sept. [LINK](#).
4. Hamann C: [2022]. Instrumented Farm Vehicle Study. Alive & Well Newsletter. 28(4):4. Sept. [LINK](#).
5. Nonnenmann M: [2022]. Indoor Air Quality Improvements Targeting Dust, Gases, and Pathogens in Pork Production. Alive & Well Newsletter. 28(4):2. Sept. [LINK](#).
6. Anthony TR: [2022]. Farm Safety App. Alive & Well Newsletter. 28(4):5. Sept. [LINK](#).
7. Patterson J: [2022]. Timely Web Resources: Mental Health and Farmers. Alive & Well Newsletter. 28(4):6. Sept. [LINK](#).
8. Patterson J: [2022]. GPCAH Pilot Grants are Available to Develop a New Line of Research Inquiry for Preventing Injury and Illness on the Farm. Alive & Well Newsletter. 28(4):7. Sept. [LINK](#).
9. Mohling K: [2022]. Agricultural Safety and Health Core Course Held June 13-17. Alive & Well Newsletter. 28(4):7. Sept. [LINK](#).
10. Crawford K: [2022]. FarmSafe Podcast. Alive & Well Newsletter. 28(4):8. Sept. [LINK](#).
11. Cheney M: [2022]. #ShoppingForSafety. Alive & Well Newsletter. 28(4):9. Sept. [LINK](#).
12. Mohling K: [2022]. Educational Opportunities Expand at the Great Plains Center. Alive & Well Newsletter. 28(2)1. Mar. [LINK](#).
13. Anthony TR: [2022]. Director's Message. Alive & Well Newsletter. 28(2)1. Mar. [LINK](#).
14. Crawford K and Patterson J: [2022]. Catching Up with the FarmSafe Podcast. Alive & Well Newsletter. 28(2)3. Mar. [LINK](#).
15. Casteel C and Patterson J: [2022]. Do You Know How Safe Your Farm Is? We are Developing an App for That. Alive & Well Newsletter. 28(2)4. Mar. [LINK](#).
16. Crawford K: [2021]. Listen up! The FarmSafe Podcast is Here. Alive & Well Newsletter. 27(4):1. Sept. [LINK](#).
17. Anthony TR: [2021]. Director's Message: New Communication Avenues. Alive & Well Newsletter. 27(4):2. Sept. [LINK](#).
18. Patterson J: [2021]. Don't be Shy! Start the Conversation about Preventing Farm Injuries. Alive & Well Newsletter. 27(4):3. Sept. [LINK](#).
19. Patterson J: [2021]. Access Core Course Materials, Audio, and Online Modules at No Cost. Alive & Well Newsletter. 27(4):3. Sept. [LINK](#).
20. Olson G and Patterson J: [2021]. Register Now and Join MRASH's Effort to "Raise the Cloak of Invisibility". Alive & Well Newsletter. 27(4):4. Sept. [LINK](#).
21. Crawford K: [2021]. "There's an App for That!" Help Us Test the New Farm Safety Checklist App.. Alive & Well Newsletter. 27(4):4. Sept. [LINK](#).
22. Patterson J: [2021]. Drought Can Lead to More than the Summertime Blues in Farmers. Alive & Well Newsletter. 27(4):3. Sept. [LINK](#).
23. Aurora K: [2021]. Do You Take Care of a Family Member with Dementia? Alive & Well Newsletter. 27(4):6. Sept. [LINK](#).
24. Rudolphi J: [2021]. Help Researchers Learn About Stress in the Household by Participating in a Farm Family Survey. Alive & Well Newsletter. 27(4):6. Sept. [LINK](#).
25. Gibbs J: [2021]. New Interactive Informational Resources: Guidance for Farmers when Using Respirators in Agriculture. Alive & Well Newsletter. 27(4):4. Sept. [LINK](#).

### **Podcasts**

#### ***FarmSafe (all available at [LINK](#))***

1. Crawford, K. 2021. *FarmSafe Podcast: ATV Safety Features* (Guest: Carolyn Sheridan and Jenna Gibbs) [Audio podcast episode]. In *FarmSafe*. GPCAH. Oct 13.

2. Crawford, K. 2021. *FarmSafe Podcast: Sleep* (Guest: Amanda Prokasky and Susan Harris) [Audio podcast episode]. In *FarmSafe*. GPCAH. Oct 27.
3. Crawford, K. 2021. *FarmSafe Podcast: Whole Body Vibration* (Guests: Fred Gerr and Nate Fethke) [Audio podcast episode]. In *FarmSafe*. GPCAH. Nov.6.
4. Crawford, K. 2021. *FarmSafe Podcast: Thanksgiving Special*. [Audio podcast episode]. In *FarmSafe*. GPCAH. Nov. 24.
5. Crawford, K. 2021. *FarmSafe Podcast: Lighting and Marking in Agriculture Vehicles* (Guests: Marsha Cheyney, Roadway) [Audio podcast episode]. In *FarmSafe*. GPCAH. Dec. 8.
6. Crawford, K. 2022. *FarmSafe Podcast: Cold Weather Gear* (Guests: GPCAH) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jan.12.
7. Crawford, K. 2022. *FarmSafe Podcast: Falls on Ice* (Guest: Kathy Lee) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jan. 26.
8. Crawford, K. 2022. *FarmSafe Podcast: Cold Weather Training Tips* (Guest: Maristela Rovai) [Audio podcast episode]. In *FarmSafe*. GPCAH. Feb. 9.
9. Crawford, K. 2022. *FarmSafe Podcast: Grain Bin Safety* (Guests: Salah Issa) [Audio podcast episode]. In *FarmSafe*. GPCAH. Feb. 23.
10. Crawford, K. 2022. *FarmSafe Podcast: Anhydrous Ammonia* (Guest: Dan Neenan, Pilot) [Audio podcast episode]. In *FarmSafe*. GPCAH. Mar. 9.
11. Crawford, K. 2022. *FarmSafe Podcast: Research Spotlight: Farm Vehicle Crashed on Public Roads* (Guests: Matt McFalls and Marizen Ramirez, Roadway) [Audio podcast episode]. In *FarmSafe*. GPCAH. Mar. 23.
12. Crawford, K. 2022. *FarmSafe Podcast: Avian Influenza* (Guests: Renee Anthony and Matt Nonnenmann, Emerging Issue) [Audio podcast episode]. In *FarmSafe*. GPCAH. Apr. 7.
13. Crawford, K. 2022. *FarmSafe Podcast: Pilot Spotlight: Stress on the Farm: Strategies to Help Each Other* (Guests: David Brown, Pilot) [Audio podcast episode]. In *FarmSafe*. GPCAH. Apr. 20.
14. Crawford, K. 2022. *FarmSafe Podcast: Airing Out Farm Stress* (Guests: Meg Moynihan, Pilot) [Audio podcast episode]. In *FarmSafe*. GPCAH. May 4.
15. Crawford, K. 2022. *FarmSafe Podcast: Pilot Spotlight – Examining Support Systems for Farmers’ Mental Health* (Guest: Yanni Liang, Pilot) [Audio podcast episode]. In *FarmSafe*. GPCAH. May 18.
16. Crawford, K. 2022. *FarmSafe Podcast: Pilot Spotlight – Job Demands and Health Outcomes for Beginning Farmers* (Guests: Maya Ramaswamy, Pilot) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jun. 1.
17. Crawford, K. 2022. *FarmSafe Podcast: Manure Gas Safety* (Guest: Renee Anthony, Emerging Issue) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jun. 29.
18. Crawford, K. 2022. *FarmSafe Podcast: Gas Monitors* (Guest: Renee Anthony, Emerging Issue) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jul. 13.
19. Crawford, K. 2022. *FarmSafe Podcast: Season One Wrap-Up* (Guest: Matison Bentley) [Audio podcast episode]. In *FarmSafe*. GPCAH. Jul. 27.
20. Bentley, M. 2022. *FarmSafe Podcast: Farm Progress Show 8/30-9/1* (Guest: Marsha Cheyney, Outreach) [Audio podcast episode]. In *FarmSafe*. GPCAH. Aug. 30.
21. Bentley, M. 2022. *FarmSafe Podcast: Women in Agriculture and Safety Issues* (Guests: Shelby Wright and Susan Wright) [Audio podcast episode]. In *FarmSafe*. GPCAH. Sept. 21.

## ***Press Releases***

***Press Release promoting Free Safety Workshop to Focus on Youth Working in Agriculture (Patterson, Aug. 26, 2022). [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 2022 Pilot Grants Announcement (Patterson, April 26, 2022) GPCAH Funds Multiple Pilot Projects per Year Intended to Promote Innovative Outreach and Research Efforts Targeting the Prevention of Injury and Illness Resulting from Agricultural Work Exposures. [LINK](#).***

This announcement was not picked up by any media outlets; however, it did appear in The Loop [LINK](#) and University of Iowa College of Public Health News [LINK](#). It was also in the *Alive and Well Newsletter* (see above) and shared by the Extension Foundation. [LINK](#).

***Press Release written by Scott Heiberger at Marshfield promoting Agricultural Literacy Week (March 21-25) by Sharing Agricultural Safety Stories with a Media Toolkit Provided by Telling the Story Project. [LINK](#).***