Summary Annual Report

2021-2022

NIOSH Center of Excellence in Agricultural Disease and Injury Research, Education, and Prevention
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Section I: Center Overview

Introduction

This past year has been a season of reflecting on the past and looking forward. The Upper Midwest Agricultural Safety and Health Center (UMASH) successfully competed for renewed funding for an additional five years, which began in October 2022. To do this, we looked back on our partners, projects, and successes, including this last year, the 11th year of UMASH. In this last year, we continued serving producers, agricultural workers, and farm families through our research, community engagement, and outreach efforts. Enclosed in this annual report, we reflect on 2021-2022, share our work, and thank the community of support and partners around us that also believe in and support the vision of UMASH: *Healthy and safe people in all agricultural communities.*

About the Center

UMASH is a Center of Excellence in Agricultural Disease and Injury Research, Education, and Prevention funded by the National Institute for Occupational Safety and Health (NIOSH). The Center is a collaboration of the **University of Minnesota School of Public Health** and **College of Veterinary Medicine**, the **National Farm Medicine Center of the Marshfield Clinic** with the **Migrant Clinicians Network**, and the **Minnesota Department of Health**. This collaboration brings together unique and complementary expertise to address existing and emerging occupational health and safety issues in agriculture.

UMASH focuses on the interrelationship between agricultural production practices, farm workplace health and safety conditions, and the interdisciplinary connections needed to address agricultural worker health and safety. Agricultural production practices are primarily driven by social, economic, and animal health and productivity considerations. These agricultural production practices, in turn, strongly influence workplace health and safety conditions. UMASH emphasizes the concept of One Health which engages multiple disciplines and sectors to understand the interdependence between animal health, human health, and the health of the environment. UMASH also emphasizes how the ever-changing nature of agriculture can influence the health and well-being of agricultural workers. The 2016-2022 grant cycle included six funded research projects supporting agricultural worker health and safety:

1. Optimizing Assessment and Control of Virus-Containing Particles in Animal Agriculture Operations
2. Rural Firefighters Delivering Agricultural Safety and Health (RF-DASH)
3. Promoting Safety and Worker Health for Immigrant Dairy Workers
4. Longitudinal Study of Infectious Disease Risks at the Human-Swine Interface
5. Surveillance and Control of Zoonotic Diseases in Agricultural Workers in the Upper Midwest
6. Assessing and Preventing Work Related Injuries in Animal Agriculture

The Center also has an outreach component to disseminate and collect information from stakeholders; an emerging issues program to explore new opportunities and address emerging issues in agricultural safety and health; and an evaluation program to monitor and assess the performance and outcomes of the Center

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Section II: UMASH Research Project Updates

Monitoring Zoonotic Diseases in Minnesota Agricultural Workers, Their Families and Those Who Engage in Agritourism

Background

Agriculture is the foundation of the economy in the Upper Midwest. Minnesota, in particular, ranks 5th in the United States in overall agriculture production and generates over $112 billion annually in total economic impact while supporting more than 430,000 jobs. Minnesota is the largest producer of turkeys in the U.S. and the 3rd largest producer of hogs.

Agriculture is not only integral to Minnesota's economy, but it is also a big part of Minnesota's culture. More than 90 county fairs and the Minnesota State Fair attract more than 2.1 million visitors yearly. Food production animals naturally carry several zoonotic pathogens (germs that can be passed between animals and people) that can cause illness in agricultural workers, their families, and visitors to farms and fairs. Since 2012, this **UMASH project led by the Minnesota Department of Health (MDH) has focused on documenting the scope of zoonotic diseases in agricultural populations and visitors to agricultural venues**. This information will inform prevention measures and guide educational efforts around zoonotic enteric diseases.

Project update

At the beginning of the final year of funding, the MDH team continued to focus on responding to the COVID-19 pandemic. State Public Health Veterinarian Dr. Joni Scheftel supported veterinary staff and agriculture businesses for COVID-19 management. Other MDH UMASH staff were cycling off their full-time COVID response duties and back to their previous roles. On January 1, 2022, the team returned to full UMASH surveillance project activities, including prospective surveillance and intensive interviews of enteric disease cases who report food animal exposures during incubation. During this reporting period, the team investigated six animal contact-associated outbreaks. One outbreak occurred at a county fair, one at a garden center with a petting zoo, three on private farms, and one was a national outbreak associated with backyard poultry contact. These backyard poultry Salmonella outbreaks occur annually in the U.S., and the 2022 outbreak included 1,191 cases (61 in Minnesota), 221 hospitalizations (4 among Minnesota cases), and two deaths. MDH collaborates with the Minnesota Board of Animal Health to trace live poultry sales back to specific hatcheries and to test poultry from Minnesota cases.

The animal contact outbreaks in the past year have been associated with various pathogens, including *Salmonella*, *Cryptosporidium*, and Shiga toxin-producing *E. coli*. The project team investigated and documented every outbreak in detail, identifying contributing factors. All investigations included a personalized consultation, including tailored recommendations to the specific venue regarding preventive measures to reduce the risk of future illnesses. Furthermore, contributing factors and lessons learned from outbreaks help to develop our disease prevention outreach and education.

Over the last six years, this project has compiled and published the most systematic and comprehensive dataset and analysis of zoonotic disease burden from food animal agricultural exposures.

In addition to the project's research activities, the team also engaged in various outreach activities. For example, Carrie Klumb and Joni Scheftel presented at multiple state, national, and international conferences, including the United States Animal Health Association Annual Meeting, International Workshop on Agritourism, and Minnesota Veterinary Medical Association Annual Meeting. The team also hosted the 6th annual Emerging Issues Coffee Break event virtually, with 55 attendees from 34 different organizations. With a slow return to in-person events, the zoonotic disease prevention-themed mobile escape room also traveled to the Northeast Youth Livestock show, where over 200 people participated.

Dr. Scheftel, Carrie Klumb, and other Zoonotic Diseases Unit epidemiologists have also been responding to a highly pathogenic avian influenza (HPAI) H5N1 outbreak in Minnesota poultry that began in March 2022. The role of this project team in the HPAI response is to protect human health, monitor the health of exposed workers and responders, provide guidance on infection control and use of personal protective equipment, and serve as a source of information for industry and the public. Since March 2022, there have been 105 Minnesota poultry flocks that have tested positive for HPAI H5N1. MDH has monitored 578 workers or responders associated with these flocks and has arranged influenza testing for 23 people who experienced an influenza-like illness (no cases of avian influenza H5N1 have been detected). MDH also translated health information materials into Spanish, Karen, and Somali. For this outbreak, Dr. Scheftel serves as Human Disease Surveillance Officer in the Unified Board of Animal Health/USDA Incident Management Team. The inclusion of a state health department at this level is rare.

Over the last six years, this project has compiled and published the most systematic and comprehensive dataset and analysis of zoonotic disease burden from food animal agricultural exposures. The burden of zoonotic enteric infections among agricultural workers and their families is substantial, with an estimated cumulative incidence of zoonotic enteric infections for people who live and/or work on farms with food production animals in Minnesota eight times greater than for other

Minnesotans. While further research and outreach are needed, this project has successfully provided a foundation for understanding and preventing zoonotic diseases among agricultural workers and their families.

Longitudinal Study of Infectious Disease Risks at the Human-Swine Interface

Background

The importance of the human-animal interface, or the ways animals and humans can interact, as a source of emerging infectious diseases is universally recognized. People having regular animal contact are at the front line for exposure to known and emerging pathogens, and veterinarians provide a unique window into occupational risks for emerging zoonotic diseases. A 5-year longitudinal cohort study of U.S. swine veterinarians has been conducted to understand the exposure and health risks attributable to pig exposure for three important emerging zoonotic pathogens that are endemic in the U.S. swine industry: 1) Livestock-associated *Staphylococcus aureus* (including Methicillin-resistant *S. aureus* (MRSA) and multidrug-resistant *S. aureus*); 2) Influenza A viruses; 3) Hepatitis E virus. A control group of companion animal veterinarians without contact with swine was included to compare exposure and health risks and to calculate risks attributable to swine exposure.

Project update

This project completed the final sampling and survey collection for the project in June 2021, so this year, the team focused on completing laboratory testing, analyzing data, and preparing manuscripts. A novel component of this project was to prospectively collect data on relevant health events from both swine vets and a control population of companion animal vets.

There was a higher prevalence of *S. aureus* (approximately two-fold) and MRSA (approximately four-fold) in swine vets (SV) compared to companion animal vets (CAV). Isolates from swine vets were dominated by livestock-associated variants, which were uncommon in CAV. Only three individuals – two

While swine veterinarians have a greater potential for exposure to *S. aureus* of animal origin there is no evidence that they are at higher risk of infection.

swine vets and one companion animal vet – reported clinical *S. aureus* infections that were medically confirmed. None were MRSA, and all were minor localized infections.

Table 1 compares the incidence of self-reported work-related injuries (WRI), WRI receiving medical attention, skin and soft tissue infections, and *S. aureus* infections. Similarly, there was no indication of an elevated risk of influenza-like illnesses or hepatic disease.

Table 1. Incidence of self-reported health events in swine veterinarians and companion animal veterinarians (cases per 100 person-months at risk)

	Swine Veterinarians	Companion Animal Veterinarians
Workplace injuries	2.8	4.0
Medical attention for work injury	0.2	0.4
Skin or soft tissue injuries	5.9	9.8
Medical attention for skin injury	0.50	0.40
Skin or soft tissue infections	0.93	0.40
S. aureus infection	0.06	0.04

While swine veterinarians have a greater potential for exposure to *S. aureus* of animal origin, there is no evidence that they are at higher risk of infection. The risk of injury was similar between companion animal and swine veterinarians. Veterinarians and animal producers should continue to engage in preventative measures, such as wearing protective clothing and handwashing following animal contact, as well training and practices that reduce the risk of injury.

Optimizing Assessment of Virus-Containing Particles in Animal Agriculture

Background

Viruses have the potential to be transmitted through the air among animals and between animals and people, posing risks to swine and poultry workers and veterinary workers. Animals in agricultural facilities generate virus-containing particles from their respiratory tracts or fecal matter. Many of these particles are small enough to be transported at substantial distances. Few measurements have been made of these virus-containing particles' airborne concentrations, sizes, and viability. Understanding particle size is especially important because it helps to determine 1) how far virus-containing particles can travel through the air, 2) where virus-containing particles deposit in the human respiratory tract, and 3) technologies that can remove the particles from the air. This research aimed to identify or develop a high-volume, field-portable, size-differentiating viral aerosol sampler and use it to measure worker exposures to infectious airborne influenza viruses in animal agriculture facilities.

Project update

During this project year, we worked exclusively on designing and building an improved sampler. The research team completed the design of the Bioaerosol Cascade Virtual Impactor (BCVI), a sampler that separates particles into four aerodynamic size intervals (<1 µm, 1-4 µm, 4-10 µm, and >10 µm)

using a series of virtual impactor stages. A virtual impactor consists of an acceleration inlet nozzle and two outlets: a collection probe that draws away a minor portion of the incoming flow – in our case, 4-5% – and a bypass outlet that draws away the remaining major portion of the incoming flow. Airborne particles are accelerated through the inlet nozzle with the incoming air and directed toward the collection probe. Larger particles with sufficient inertia are separated in the probe and carried away with the minor flow, while smaller particles follow the turning air and are carried away with the major flow. The BCVI has three stages placed in series with progressively more and smaller nozzles. These stages will process the same incoming 300 L/min aerosol flow, with the particles separated by size into several samples that can be collected and analyzed individually. An advantage of using a virtual impactor over a conventional inertial impactor is that the virtual impactor keeps the size-separated virus-containing particles airborne so that they can be collected by methods that maintain virus infectivity, as opposed to depositing them on a surface from which they must be removed and upon which the viruses can be inactivated. We will generally collect particles using aerosol impingers, although filters are feasible too.

The project team designed the BCVI using Ansys computational fluid dynamics modeling software. The steps needed to design the size-separating impactor sections were to (1) draw the geometry of each section in three dimensions, (2) lay out a three-dimensional mesh within the geometries, (3) model the airflow throughout the mesh, and (4) superimpose particle motion into the airflow. The team adjusted the design parameters to achieve the planned size separation aerodynamic diameters of 10 µm, 4 µm, and 1 µm. The existing scientific literature supported these selected values. After the design was complete, the team imported computational fluid dynamic drawings into an engineering drawing program, producing drawings that allowed the University of Minnesota College of Science and Engineering Machine Shop to fabricate the BCVI. The BCVI design drawings and fabricated stages are shown in Figures 1-3. As the BCVI was fabricated, the team shifted to set up the laboratory apparatus to verify its performance. These tests measure the separation of non-biological droplets or particles in each stage as a function of diameter.

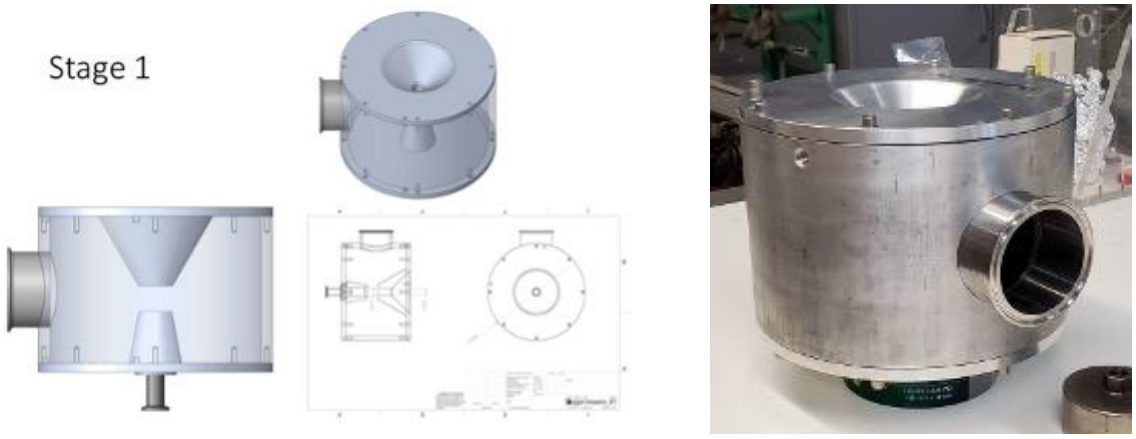


Figure 1. Engineering drawings for the first stage of the prototype Bioaerosol Cascade Virtual Impactor (left). The first stage of Bioaerosol Cascade Virtual Impactor as fabricated (right).

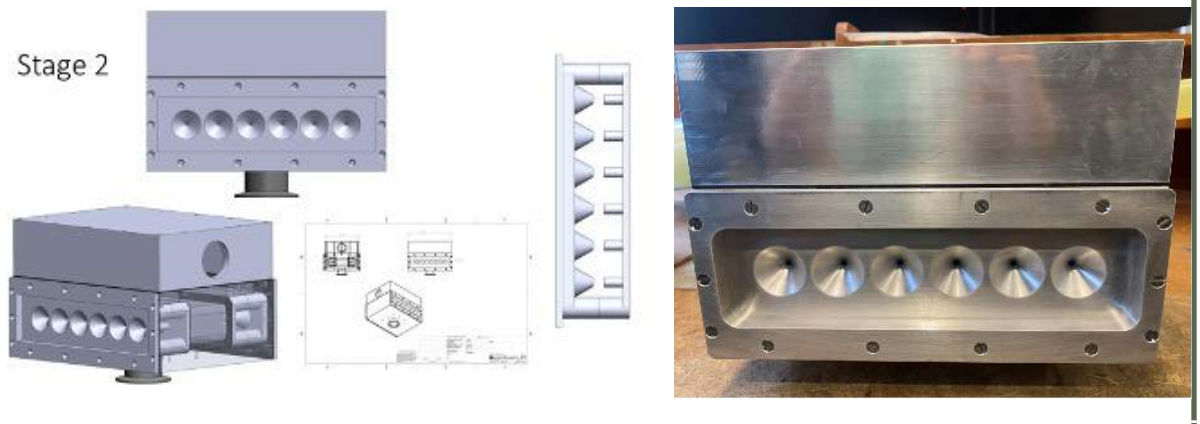


Figure 2. Engineering drawings for the second stage of the prototype Bioaerosol Cascade Virtual Impactor (left). The first stage of Bioaerosol Cascade Virtual Impactor as fabricated (right).

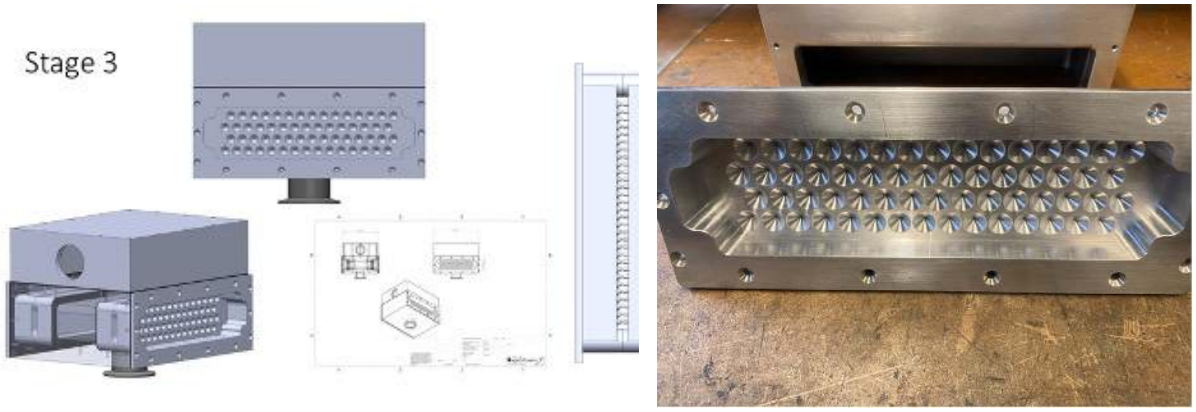


Figure 3. Engineering drawings for the third stage of the prototype Bioaerosol Cascade Virtual Impactor (left). The first stage of Bioaerosol Cascade Virtual Impactor as fabricated (right).

Ultimately, this research is helping to determine the best ways to sample airborne viruses, not only influenza viruses in animal agriculture operations but also other types of viruses in other settings. Additionally, knowing more about the concentrations and sizes of influenza viruses and other pathogens in animal agriculture operations and elsewhere will help researchers and practitioners determine the most appropriate control technologies to reduce exposure to viral aerosols.

Rural Firefighters Delivering Agricultural Safety and Health (RF-DASH)

Background

The Rural Firefighters Delivering Agriculture Safety and Health (RF-DASH) project is a train-the-trainer program designed to increase rural fire and emergency medical services (EMS)

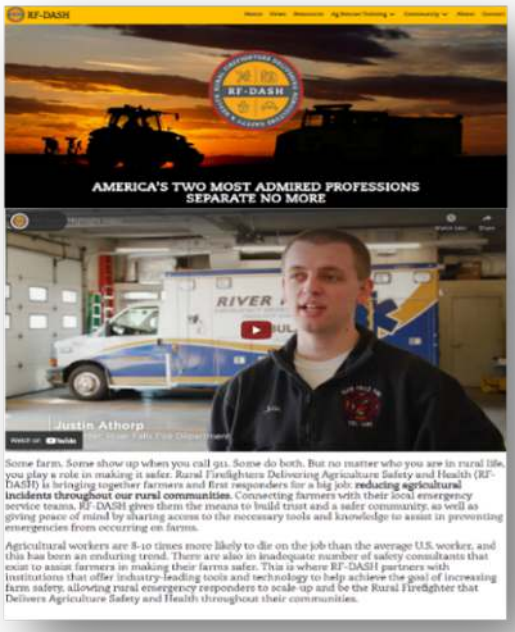
knowledge and promote injury prevention on farms in our local communities. The program expanded beyond the Midwest and has trained over 70 firefighters/EMS in 10 states, and in turn, they have begun to train dozens more.

Project update

This year, the Canadian Agriculture Safety Association (CASA) requested the RF-DASH team come to Winnipeg, Manitoba, Canada, March 7th-9th to train their Master Trainers within the RF-DASH program. A round table discussion was also organized to assist CASA and their newly trained RF-DASH trainers in further developing their RF-DASH Canada program. The group consisted of Fire Chiefs, Training Officers, and Agricultural Safety and Health Specialists from departments in Manitoba, Alberta, Saskatchewan, Quebec, and Ontario. The CASA Master Trainers brought over 180 years of rural firefighting experience to the proceedings. CASA continues to develop its version of RF-DASH Canada and has already had success with its master trainers conducting training in their regions.

Further, existing RF-DASH trainers have increasingly communicated their desire for additional information and materials to assist in their continuing education and further disseminating RF-DASH information. This feedback transitioned the program activities from conducting training to focusing on grant sustainability.

Social Network Analysis and semi-structured interviews with RF-DASH trainers revealed a need to streamline the training materials. The solution was to design a training manual to serve as a guide to help trainers and provide in-depth instruction on the methodology for organizing training. The completed training manual delves into the five modules, information on conducting and organizing training, media guidelines for emergency responders, and resources in agriculture health and safety. As we continue to identify gaps and additional resources needed, we will update the existing material in future editions and for refresher training.



The RF-DASH national training group expressed interest in communications and progress updates from other RF-DASH sites. The demand for a community network culminated in the development of a dedicated RF-DASH website, rfdash.org, allowing individuals to

explore and utilize new and updated resources and materials to assist in adapting RF-DASH. The site also houses a related program that adopted RF-DASH into its curriculum, Agriculture Rescue Training, which shares techniques to rescue individuals involved in an agriculture emergency safely. In addition, the Community tab provides a social venue for all RF-DASH members to share their successes, challenges, and updates with one another. This resource will allow us to maintain strong communication with trainees and assist them in promoting and growing RF-DASH.

The RF-DASH team has received feedback from trainers regarding the continued improvement of Farm MAPPER (displayed below) for pre-planning fire departments' responses to farms in the event of an emergency. The team is refining the existing tool to address limitations and technical bugs while meeting the requests of the program's target audiences and allowing for further adaptability and technical support in the future. The refined tool will improve the usability and current functions of the Farm MAPPER tool through reorganization, pop-outs, increased detail of the maps, new icons, measurement features, and additional information available to first responders.

Since the pandemic's start, the program has begun looking into alternative training methods. Although in-person training has always been preferred, asynchronous or full virtual training has been explored. Further research into 360 video and interactive technology has been ongoing as a potential option to help expand the program in regions where training is requested, but trainer availability is limited.

Additionally, trainers have requested additional resources and materials to increase buy-in for firefighters as they go out and conduct training within their regions. Currently, the RF-DASH team developed an official RF-DASH patch and is developing a challenge coin to be shared among first responders, partnering organizations, and farmers.

Overall, this project has effectively and innovatively built a model to increase the number of local and trusted safety consultants available to assist farmers in improving the safety of their farms and has the momentum to become a national and international network.

Promoting Safety and Worker Health for Immigrant Dairy Workers

Background

Immigrant workers are important to the economic sustainability of dairy production in the United States. Yet, this population often lacks adequate training due to cultural and language barriers. This project aims to improve the occupational health and safety of Minnesota's growing immigrant dairy workforce. This involves incorporating a One Health approach and employing a multidisciplinary team of clinicians, veterinarians, producers, workers, and community health centers. This project builds on previous efforts that successfully implemented a train-the-trainer safety and health curriculum for immigrant workers and applied a community health worker (CHW) model *(See Seguridad en Las Lecherías: Immigrant Dairy Worker Health and Safety)*.

Project update

This year, the project team conducted in-person dairy worker training at nine dairies, training 171 workers. Five sites were new, with 139 newly enrolled dairy workers. Over the course of the last six years, 360 workers from 19 dairies were trained, with 11 farms completing the entire five-lesson training. Four completed three and four lessons, one completed two lessons, and three completed one lesson. The reach of the training program also expanded beyond Minnesota, including the training of 28 workers from a dairy in South Dakota. A printed, user-friendly train-the-trainer manual with all five health and safety lessons was given to each farm that completed the training. Electronic PowerPoint presentations for the training were also provided to three dairies upon request.

Community Health Workers (CHWs) were pre-selected among workers in four dairies that opted to have CHWs. The selected workers were trained to use the train-the-trainer manual and to conduct monthly safety walkthroughs. The CHW aspect of the project was partially implemented. However, follow-up visits to the dairies would be necessary to provide support and additional training to CHWs. In two dairies, the CHWs helped organize the health and safety training for workers, assisted with logistics, and made sure the workers attended.

Additionally, as a part of the project's One Health efforts, the team partnered with industrial hygiene faculty and the College of Veterinary Medicine to develop a safety audit tool for veterinarians to assess safe animal handling practices, infectious disease exposures on dairies, and worker safety. In

the summer of 2022, faculty members, a student, and a resident veterinarian piloted this tool on a farm to review and assess the tool. The team plans to continue testing and refining this safety audit tool, especially with farms that have requested an external safety walkthrough.

Finally, a video called "Caution with Calves: Stopping the Spread of Zoonotic Diseases" was produced in English and Spanish and shared on the UMASH website and YouTube channel in November 2021, receiving almost 400 views as of October 2022. Further, efforts are currently underway to develop outreach materials on safely handling "down cows" to address a need expressed by producers.

Ultimately, this project successfully engaged regional industry leaders and workers and responded to worker and producer needs during the pandemic. Evaluation of the dairy worker training demonstrated an increased worker safety knowledge and awareness after each lesson and resulted in improved communication between workers and producers.

Assessing and Preventing Work Related Injuries in Animal Agriculture

Background

Occupational injury in animal agriculture affects the health and well-being of workers and is a significant burden to the agriculture industry in terms of lost productivity and compensation costs. However, the tools available to identify specific injury prevention activities are limited. People working in the animal agriculture industry may encounter many health and safety risks daily. Contact with animals, working on uneven and slippery surfaces, repetitive motions in ergonomically compromised positions, and using powered machinery, are examples of routine hazards. Characterizing the burden of injury, identifying prevention opportunities, and evaluating progress require systematically collected injury data. However, such a source does not currently exist. We collected data from multiple sources on injuries to workers in animal agriculture to identify priorities for injury prevention.

Project update

With data from larger pork production companies and worker compensation insurance carriers, this project team characterized major injury types and potential opportunities for intervention. An advantage of these data sources is the inclusion of non-reportable injuries, collected by some companies as an incident or near-miss, and the injuries that require medical treatment but do not result in lost work time. A disadvantage of these data is that they represent only a few companies. Combining data sources can be a challenge, as definitions, reporting procedures, and data management practices vary by company. The identified areas of focus in swine operations include

injuries due to interactions with animals, needlestick injuries, lower extremity injuries, and injuries related to power-washing.

The project team also evaluated worker compensation claims data reported to the Minnesota Department of Labor and Industry to explore a broader cross-section of injuries to swine and dairy workers. These represent a wider range of producers but only include injuries that result in more than three days of lost work time. All claims reported from 2012-2019 with a North American Industry Classification System (NAICS) code of 112120: Dairy Cattle and Milk Production N=636) and 112210: Hog and Pig Farming (N=790) were included in the analysis. Like data from the large pork production and workers compensation insurance companies, these data only represent injured workers, so we can't compare them to the overall workforce; however, some notable findings emerged.

Interaction with animals was the most common event leading to an injury, followed by slips, trips, and falls.

Women accounted for 30.3% of hog and pig production claims but only 19.8% in dairy. Injured workers with less than one year of time in that job accounted for 42% of the injuries. The body part injured differed by type of production, where dairy workers were proportionally more likely to have an upper extremity injury, and hog and pig workers were more likely to have lower extremity and back injuries. The nature of injury also varied, with dairy workers more often reporting a fracture, while hog and pig workers were more likely to have sprains, strains, and tears. Interaction with animals, followed by slips, trips, and falls, were the most common events leading to an injury. Most of the claims (57%) incurred some temporary total disability, and 23% required modified or light-duty accommodations to return to work. Permanent partial disability of some level occurred in 18.1% of dairy claims and in 12.2% of pig claims, indicating the potential severity of these injuries. The results of these data analyses from different sources are being compiled to communicate to and review with industry partners to identify opportunities for prevention and future directions.

Section III: Other Program & Activity Highlights

Emerging Issues Program

The challenges faced by the agricultural workforce are dynamic. The UMASH Emerging Issues Program aims to identify and respond to emerging or re-emerging issues that may impact the health and well-being of the agricultural workforce and their families. To support these activities, the UMASH advisory board is key in identifying emerging issues across the region and providing suggestions to address the topic(s). Read on for this year's emerging issues, topics, and activities.

Development, Delivery, And Evaluation Of An Occupational Safety Program For Vet Techs And Vet Assistants In Iowa And Minnesota

The Ag Health and Safety Alliance (AHSA) is a 501(c)3 nonprofit organization that focuses on health and safety for the next generation of agriculture through the delivery of the Gear Up for Ag Health and Safety™ program. This program utilizes the NIOSH Hierarchy of Controls model to deliver evidence-based agricultural safety and health information to young adults enrolled in high school and collegiate agricultural programs across the globe. In the last two years, AHSA staff has experienced a new demand for the delivery of similar programming to future large animal veterinary workers such as vet techs and vet assistants. This project aims to provide curriculum development, delivery, and evaluation support for the delivery of a new Gear Up for Ag™ - Veterinary Program to young adults in large animal veterinary and pre-veterinary science programs at community colleges in the Upper Midwest region. Curriculum development will involve a partnership with a UMASH (Upper Midwest Agricultural Safety and Health Center) Veterinary Resident in the Public Health Program.

The new program will be piloted at three community colleges in the Upper Midwest region (Iowa and Minnesota) with strong foundational agriculture and veterinary sciences programs. It will be evaluated by examining changes in participants' self-reported knowledge and safety behaviors using a pre-and post-test model. AHSA and the veterinary resident will evaluate qualitative participant and instructor feedback to make improvements. At the end of this project, AHSA and UMASH will have an entirely new program reaching a new occupational audience in agricultural health and safety.

Stress And Infectious Agent Shedding In Livestock

Agricultural fairs serve as important cultural events for local communities and farm economies, while developing youth skills. They also present an increase in animal-to-animal contact and human-to-animal contact and an increased opportunity for zoonotic disease transmission. Cattle are natural reservoirs for Shinga toxin-producing *E. coli* (STEC), and higher levels of shedding (the release of bacteria or viruses from a body) occur in the summer. It has also been hypothesized that stress increases shedding, but that relationship has not yet been quantified because measurements of cortisol, a stress hormone, have not been collected. This study explores transportation to fairs, the activities associated with showing cattle at fairs, and whether these activities are associated with increased cattle stress.

Manure Hazards

Animal agriculture is significant in the Upper Midwest: dairy, cattle, poultry, and swine are ubiquitous to the landscape, creating a need for managing manure. The potential hazards from manure have been known for decades. UMASH collaborated with the University of Minnesota (UMN) Extension to survey 162 manure applicators at training workshops throughout Minnesota to understand work practices and characterize potential hazards involved with manure application work. Findings suggested that manure work is hazardous. These have been shared in a manuscript published in the Journal of Agromedicine and a webinar for the Livestock and Poultry Environmental Learning Community. Additional safety and health resources are being developed to support the needs of manure applicators.

Aging on the Farm

As the average age of the farmer in the United States approaches 60, and as many continue to live and work on the farm, support and resources are needed. In 2020, UMASH hosted two *Aging on the Farm* community forums and funded four partner projects, including:

- **University of Minnesota Occupational Therapy (OT)** created six individualized telehealth OT sessions to provide OT services to rural farmers and delivered two webinars about successful aging-in-place on the farm that are now available on demand.
- **Rural Minnesota Memory Loss Connection - Big Stone** created 25 memory loss kits, available at a local library to be checked out by community members, to bring back memories of life on the farm for rural farmers with dementia.
- **Active @ Home**, a collaboration between the American Parkinson Disease Association and University of Wisconsin Occupational Therapy, created and mailed out 30 toolkits containing items like stretchy bands, putty, stretch straps and support blocks to assist participants in

developing an exercise and stretching routine and **offered telehealth OT programming to rural Wisconsin farmers living with Parkinson's disease** to improve their physical and mental wellbeing.

- **Healthy Aging on the Farm**, a collaboration between United Church of Christ- Zumbrota and The Normandale Center for Healing and Wholeness, **learned from farmers about their current support systems, thoughts and concerns about aging on the farm and tangible ways that other community members can help them** with activities of daily living and farm activities that become harder with age.

These partner projects leveraged their professional, academic, and community networks to form transdisciplinary collaborations and create innovative solutions for aging in place on the farm. Each project has plans to build upon its success, and UMASH plans to continue and expand upon this work.

Stress and Mental Health

Many factors in the agricultural system continue to strain agriculturalists. UMASH continues to build on past stress and mental health work partner projects and networks. 2022 brought significant weather and climate events to nearly every region. Much of the Upper Midwest navigated extensive drought conditions, the Highly Pathogenic Avian Influenza (HPAI) outbreak, wildfires that impacted crop growth, animal health, economic stability, air quality, and more.

Outreach and Engagement

Background

The UMASH outreach team is composed of staff at the University of Minnesota (UMN) School of Public Health, the National Farm Medicine Center (NFMC) in Marshfield, WI, and the Minnesota Department of Health (MDH). Our collective purpose is to promote agricultural safety and health in our five-state area, particularly with farmers, farmworkers, and their families. We accomplish our goals by working closely with the other National Institute for Occupational Safety and Health (NIOSH) funded U.S. Agricultural Health and Safety Centers, agriculture partners, researchers, educators, and organizations via farm shows, meetings, conferences, and other stakeholder events. "In the Field" posts and "Spotlight Stories" featured on our website describe many of these events. **Spotlight Stories** share in-depth information on health and safety topics and often highlight a person, project, or program promoting occupational safety and health in agriculture. **In The Field**

posts demonstrate UMASH interactions in the five-state area, bringing attention to in-person events and communicating one-on-one with farmers.

Outreach Update

This past year, UMASH has prioritized a spectrum of outreach and community engagement methods to advance the health and safety of agricultural workers throughout Iowa, Minnesota, North Dakota, South Dakota, and Iowa. UMASH regularly connects with our stakeholders and audiences through online and in-person outreach activities, sharing new resources, research findings, and more. Telling stories and having our boots on the ground increased the salience and reach of UMASH. UMASH resources span many topics, and resources like the Farm Safety Check, our animal handling video series in English and Spanish, and needlestick prevention tools regularly receive positive feedback. We continue to grow our available resources to meet the needs of farmers and highlight them at various outreach venues. This year, over **40 Spotlight Stories and 30 In the Field** posts were shared on our website and social media channels, and over **50 email communications** reached the UMASH subscribers, keeping the agricultural community connected to the latest health and safety information and resources.

We know the agricultural audience gets their information from a plethora of platforms, and paid advertisements in print and online trade and commodity publications are among those used to reach farmers/producers who may rely on those as a primary source of information for their farm operations. UMASH continues to provide expert interviews across the Upper Midwest by working with agricultural associations and media. We continue to build and leverage partnerships to amplify safety reminders and awareness campaigns and promote upcoming events on agricultural and rural podcasts, social media, radio, and in printed publications

UMASH Wellness Pavilion: Farmfest 2022

For Minnesota Farmfest 2022, the UMASH team set out on the road to Redwood County to provide up-to-date safety and health information to nearly 30,000 regional farmers, farmworkers, and their families.

The UMASH team partnered with colleagues from across the country to offer the UMASH Wellness Pavilion, where we offered free health screenings, five live demonstrations took place daily, and subject matter experts exhibited on-site to supplement the demonstrations with

prevention resources. Demonstrations at Farmfest this year included:

- **Tractor rollover** demonstration showcasing the use of a roll bar/seat belt and injury prevention by the Kentucky Department of Agriculture's Dale Dobson and Garrett Peterson thanks to a partnership with Minnesota Department of Agriculture Commissioner Thom Petersen.
- **Youth and full sized UTV and ATVs** for attendees to learn and apply skills and use recommended PPE thanks to Progressive Agriculture Safety Day's Brian Kuhl and University of Minnesota Extension's Emily Krekelberg.
- **Critical grain site safety** demonstrations on the dangers of engulfment and rescue procedures thanks to South Central College's Jim Zwaschka and retired fire chief and farmer Max Radil.
- **Confined space entry for manure pit entry** for pumping companies, farm operators, workers, and agriculture business owners. Included entry and lock-out tag-out procedures thanks to the National Education Center for Agricultural Safety's (NECAS) and Dan Neenan.
- **Power take off (PTO) safety**, including care and replacement of guards and shields.

Over twelve live demonstrations took place, with attendees interacting with exhibits and experts for all three days of Farmfest. In addition, free health screenings were provided to attendees by the Mobile Health Initiative of the University of Minnesota and UMASH partner, Dr. Jonathan Kirsch, MD. In addition, Roadmap to Health also provided free health screenings for show attendees, providing two days of services and healthcare provider connections for Farmfest 2022.

In the Field:

Catch your Breath: Respirator Fit Test Training and the Worker Protection Standard

In partnership with University of Minnesota Extension's Pesticide Safety Education Program, Minnesota Department of Health's Pesticide and Fertilizer Management, and Ag Health and Safety Alliance's Carolyn Sheridan, two sessions prepared participants to complete **respirator fit testing** and understand the **Worker Protection Standard, hazardous respiratory agents, and effective respiratory protection** for working around them.

National Occupational Research Agenda (NORA) Annual Symposium

UMASH annually collaborates with the Midwest Center for Occupational Health and Safety, an Education and Research Center housed at the University of Minnesota School of Public Health and funded by NIOSH. The May 2022 Symposium focused on "**Impacts of COVID-19 on our Healthcare Workforce**," where Dr. Lotte Dyrbye, MD, MPH, presented the keynote and many UMASH students presented. Continuing education credits were provided to attendees.

Public Service Announcement: Video contest with College Students A Success

UMASH worked with the University of Minnesota's Department of Agricultural Education, Communication, and Marketing **to make farm safety a student project** for a second year in a row. Students in Dr. Troy McKay's Agricultural Communications Advanced Video class created short videos or Public Service Announcements (PSA's) on a topic of choice (like grain bin safety, respiratory or PPE safety, roadway safety, and silage) and defined the risks and prevention strategies. In addition to class credit, students had the option to enter their videos into a UMASH-sponsored contest to add a bit of friendly competition. Dr. McKay noted that the students were excited about the project and

developed new skills in the process. Some of the students plan to use their video as a capstone project and also to enter the project in other national competitions. UMASH will offer the project again in 2023.

Midwest Regional Agricultural Safety and Health (MRASH) Conference

The 2021 MRASH conference was held November 8-12, with a theme of "Spotlighting Safety and Health for Agriculture's Essential Workers: Raising the Cloak of Invisibility" and the conference agenda included presentations, speaker panels, roundtable discussions, posters, and virtual networking opportunities, where UMASH staff were busy with presentations and connecting with other attendees.

International Society of Agricultural Safety and Health (ISASH) Conference

This international conference, held in June 2022 in person in Fort Collins, CO, provided an excellent opportunity for staff development and the chance to network with other professionals to share ideas, resources, and research for the betterment of occupational safety and health for the agricultural community. UMASH attended and presented in several areas:

- **Telling a Story to Save a Life: Creating an Impactful First Person Narrative** with Scott Heiberger, Melissa Ploeckelman, Devon Charlier, Stephanie Leonard, Ellen Duysen, Kelsey Palm, Risto Rautianen, Aaron Yoder, and Megan Schossow
- **Justice, equity, diversity, and inclusion (JEDI)** session sponsored by UMASH: Migrant Clinician's Network's Alma Galvan presented on creating meaningful resources when translating (or transcreating) into different languages
- **Get your science shared by building a Media Toolkit**, collaborators Melissa Ploeckelman, Devon Charlier, Cassandra Edlund, Kelsey Irvine, Scott Heiberger, Amanda Wickman, and Megan Schossow

Featured Outreach Resources

UMASH continues to create new and updated resources to meet the safety and health needs of farmers, families, and workers. The following is a sample of resources developed in the past year.

Cold Stress Resources

UMASH created a Cold Stress toolkit with resources, including a fact sheet and poster, to recognize signs and symptoms of cold stress so workers can stay safe while working through the winter.

Farm Safety Check

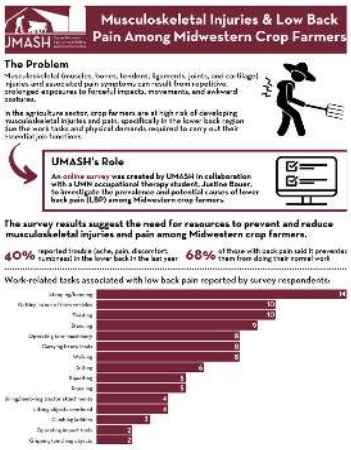
The UMASH Farm Safety Check provides a quick review to help farmers, producers, workers, and families identify and fix potential hazards before they cause harm. We have checklists for many topics, from roadway safety to managing fatigue. This year, we developed three new checklists: 1) Preventing Field Fires, 2) Towing Safety, and 3) Healthy Habits.

Research Briefs from 2011 – 2016

UMASH summarized the innovative research conducted in our first years as a center (2011 – 2016) into "research briefs" for each project and a summary flipbook.

Protect your back: Ergonomic Strategies for Preventing Pain while Farming

UMASH hosted University of Minnesota Occupational Therapy student, Justine Bauer, during the 2022 summer months as she worked on her doctoral capstone project. Justine surveyed and observed crop farmers about their regular farm tasks and their experience with pain while working. As a result, Justine better understood the prevalence of back pain in farming and the tasks associated with it. Based on the findings of her project, Justine developed two graphics and a fact sheet to share practical strategies for protecting the low-back region while farming.



Telling the Story Project

Telling the Story Project, a collaboration between UMASH, the Great Plains Center for Agricultural Health (GPCAH), and the Central States Center for Agricultural Safety and Health (CS-CASH), turns farmers' first-hand stories about close calls and fatalities into teachable moments. The project website hosts multimedia stories and prevention resources aimed at farmers, agricultural workers, communicators, educators, and policymakers. To celebrate **Ag Literacy Week** in 2022, UMASH worked with the Telling the Story team to create a media toolkit to encourage health and safety partners to share these stories far and wide, especially with the next generation of agriculture, such as middle school, high school, and college students.

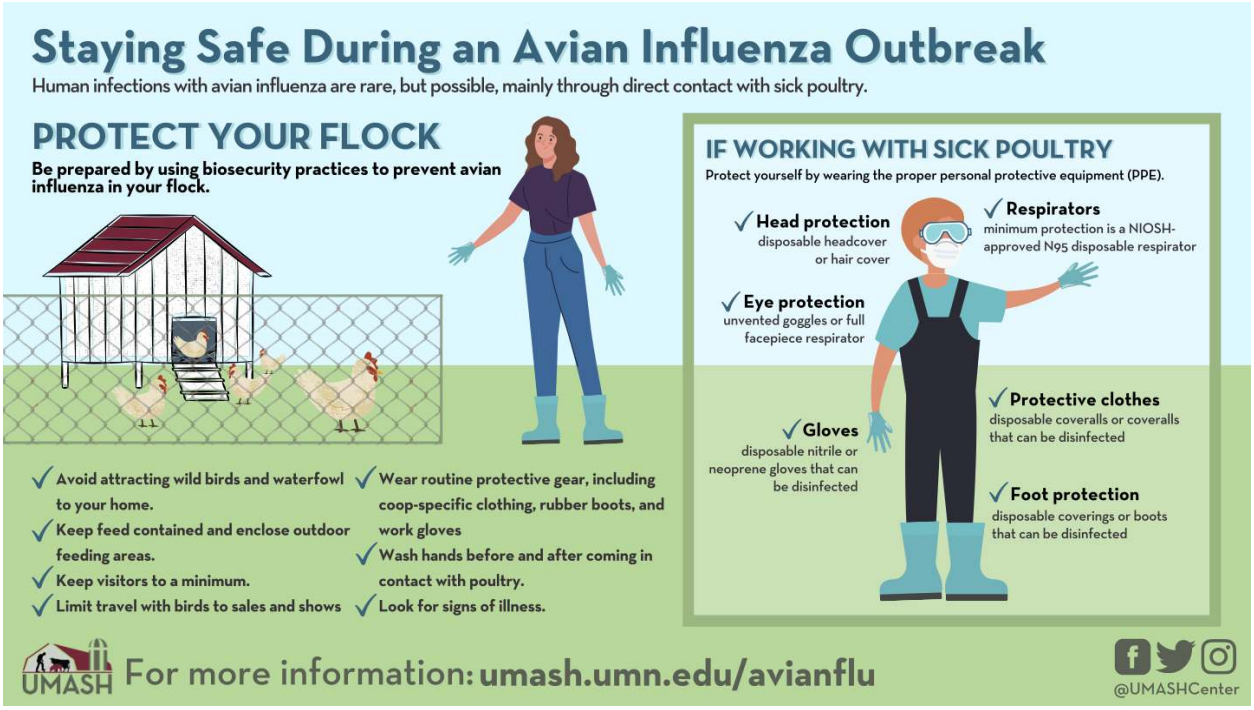
Agritourism and Zoonoses

Public Health Veterinary Residency with UMASH:
UMASH is fortunate to partner with the University of Minnesota College of Veterinary Medicine and the Public Health Residency program. These residents are DVM's and are adding public health coursework for an additional MPH degree. UMASH has utilized their expertise in several areas, including resource development (sow behavior), on-site outreach activities, developing surveys, and researching material for farmer-friendly fact sheets. Three highlights of their work this past year include 1) developing and filming pig resources, 2) support for veterinarian technician training in health and safety, and 3) finalizing research briefs that distill UMASH research into publicly understandable resources. In all cases, the residents were technical experts and were an asset to UMASH by translating research and science-based content for use by the agricultural community.

Minnesota Department of Health (MDH): Keeping visitors safe on agritourism farms remains a priority, and UMASH supports this through training and outreach. The self-paced, voluntary certification program called Safer Farm Animal Contact Exhibits (FACEs), a training program based on national best practices and is offered at no charge. Over 300 people have registered for the course.

Highly Pathogenic Avian Influenza (HPAI)

MDH was also a critical partner in the response and development of resources during the **2022 Highly Pathogenic Avian Influenza (HPAI)** outbreak. UMASH focused on protecting the workers handling avian livestock, updating personal protective equipment (PPE) guidelines, and protecting backyard flocks which were particularly impacted in this outbreak. UMASH created a 'clearinghouse' of resources ranging from biosecurity practices, monitoring flock health, and providing clear steps for reporting sick birds and what to expect following an outbreak.



NIOSH Ag Centers Evaluators, Coordinators, and Outreach (ECO) Group

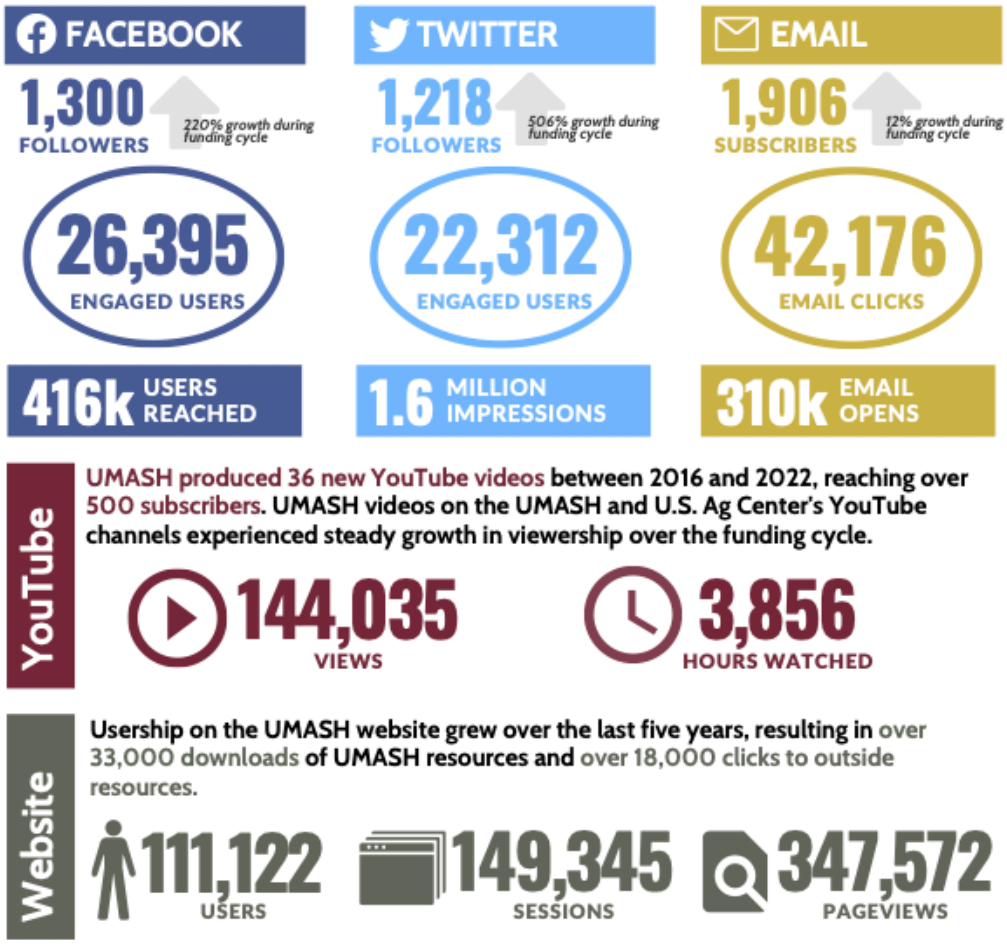
As a part of the larger US Ag Center collective, UMASH participates in regular Evaluator, Coordinator, Outreach (ECO) meetings. UMASH outreach staff lead planning for the centers' collective participation in two national campaigns: Ag Safety Awareness Program (ASAP) Week (March) and National Farm Safety and Health (NFSHW) Week (September). UMASH created and disseminated the national social media toolkit for the 2022 National Farm Safety and Health Week campaign, equipping partners, including NIOSH and all US Ag Centers, with social media content, photo resources, and an evaluation worksheet that assesses the impact of the campaign.

Digital Presence and Engagement

UMASH leverages digital platforms to grow our reach to and engagement with agricultural health workers and those that serve them

- UMASH website
- UMASH YouTube
- US Ag Centers YouTube
- UMASH Facebook
- UMASH Twitter
- UMASH Instagram
- UMASH LinkedIn
- Weekly emails
- UMASH Connector (quarterly newsletter)

These platforms have successfully grown over the course of the last funding cycle. In 2020, UMASH added an Instagram account. In approximately two years, UMASH has over 250 followers on Instagram, reaching 9,300 users with over 1,700 engagements! The infographic below summarizes UMASH's work to reach and engage its online audience between 2016 and 2022.



Evaluation

Background

UMASH Center leadership prioritizes evaluation and strategic planning activities that promote thoughtful decision-making, targeted use of resources, and continuous improvement. The evaluation team utilizes a systems perspective to understand and assess Center activities.

Evaluation update

This year, the evaluation team has focused on building capacity and strategic visioning for the future. Dr. John LaVelle has provided expertise in evaluation theory and practice, as well as mentorship for student workers. In January 2022, Devon Charlier, MPH transitioned from serving as a graduate research assistant to a new staff role managing the team. The evaluation team participates in cross-center evaluation opportunities, supports outreach activities and emerging issues projects, and facilitates organizational development and strategic planning.

Cross-Center Evaluation

Throughout the year, UMASH continued to participate in NIOSH's contribution analysis process, collaborating with other U.S. Agricultural Safety and Health Centers to build and update a logic model to understand the cumulative impact of our work to improve the health and safety outcomes of livestock workers. The UMASH evaluation team also continued to facilitate a process for assessing and reporting on the collective impact of the Centers' coordinated social media efforts during the National Farm Safety and Health Week campaign.

Outreach, Research, and Emerging Issues Support

The evaluation team continues to provide monitoring and evaluation support for UMASH outreach activities, including events and online engagement. Additionally, the team has supported the work of the outreach and research project teams as they plan for the next funding cycle through logic model development and strategic planning. Finally, the evaluation team assists with the Emerging Issues program by 1) supporting the 3-Step Model (Scan-Prioritize-Select) to choose emerging issues to pursue annually and 2) synthesizing reports and successes from partner projects to understand and build upon their impact.

Organizational Development & Strategic Planning

This year, our team facilitated the development of an updated strategic plan, incorporating the findings gathered throughout recent needs assessment processes. This plan highlights short- and long-term goals to advance the following:

1. Expanding & Strengthening Relationships
2. Promoting Justice, Equity, Diversity, and Inclusion (JEDI)
3. Enhancing Research - Outreach Integration
4. Building Emerging Issues Program Capacity
5. Building Evaluation Program Capacity

The evaluation team also developed a system for conducting Center-wide monitoring, evaluation, and learning (MEL) activities to assess the degree to which UMASH activities are delivered with fidelity and are effective at promoting the health and safety of agricultural workers and their families.

Looking forward

In the coming year, the evaluation team will continue to support collaboration, learning, and adaptation throughout the Center and will pilot and refine the Center-wide MEL system. We will also be working to understand the UMASH network and identify strategies for intentionally expanding and deepening our partnerships with those involved in or affected by ag health and safety in the Upper Midwest.

Other Center Activities

Minnesota Farm Safety Working Group

UMASH participates in the Minnesota-based farm safety working group with state agencies, professional farm organizations, Extension, agribusiness, and others. This initiative led to the MN State Legislature funding the Minnesota Rollover Protection System (ROPS) Rebate Program. The group continues to meet quarterly to discuss current issues and opportunities for collaboration.

U.S. Agricultural Safety and Health Center Collaborations

UMASH collaborates with the other ten NIOSH-funded Ag Centers throughout the year and participates in bi-monthly calls with the Evaluation, Outreach, and Coordinators (ECO) group to discuss, plan and implement multi-center collaborations on evaluation and outreach initiatives. This working group has resulted in stronger connections and collaboration across the US Ag Centers over the past years. UMASH has provided leadership, social media content, and evaluation strategies to support collaborative Ag Center participation in two major national campaigns. We continue to collaborate and partner with other US Ag Centers and participate in the ECO group to plan, implement, and assess collective outreach initiatives, including the US Ag Center YouTube, which has more than 3,180 subscribers and 171 education and training videos (33 from UMASH) on a wide range of agricultural safety and health topics (many in Spanish and other languages).