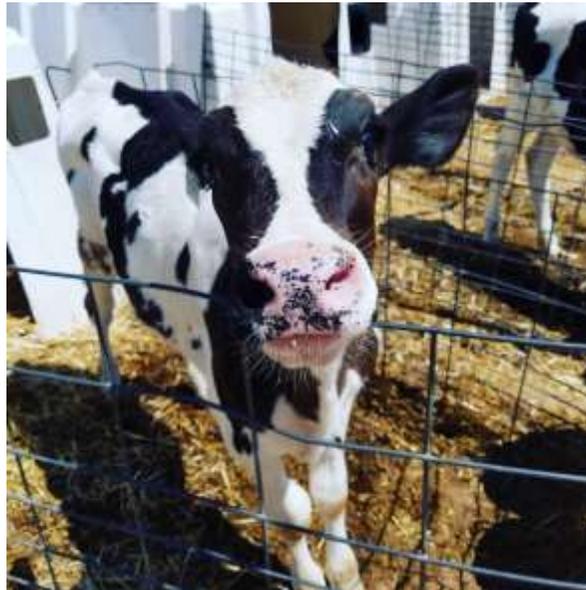




2018 Annual Report

(September 15, 2017 – September 14, 2018)
CDC/NIOSH Cooperative Agreement No. 2 U54 OH008085



*Dairy calf from local Colorado dairy
Photo Credit: E. Brooks*



**HIGH PLAINS INTERMOUNTAIN CENTER
FOR AGRICULTURAL HEALTH AND SAFETY
COLORADO STATE UNIVERSITY**

Letter from the Director

The High Plains Intermountain Center for Agricultural Health and Safety (HICAHS) closed out our grant year on a high note, hosting a half-day research symposium on September 6, 2018. (Pictured below). The event featured presentations from investigators who received HICAHS funding in the last two years through our research core projects or one of our grant programs. At our advisory board's request, we hosted the event in coordination with the annual board meeting. This gave board members the opportunity to engage with researchers and see the full scope of projects funded in the past two years. Though hosted by HICAHS at Colorado State University, the event's seven speakers represented five different academic institutions. Presentation topics included anthropology, communications, economics, education, engineering, and immunology. Preliminary reports from the evaluation team show that participants frequently reported that increased knowledge across all topics, but frequency of changes in research or practice were lower. Going forward we will develop questions for faculty members and industry representatives. Many of the questions relevant to faculty members did not apply to industry participants. In short it was a great showcase of the diversity of agricultural health and safety research that HICAHS supports. We plan to host a research day event on alternate years.



*Research Day held at Colorado State University;
September 6th, 2018
Photo Credit: W. Pennington*

We recently welcomed Whitney Pennington as our new outreach program coordinator. Whitney joins HICAHS with a background in health communications and injury prevention, having previously worked with poison control centers in Washington, Maryland, and at the national level. We wish the best to Allison Cassidy, our previous outreach coordinator, who has moved on to new endeavors.



*Newest team Member Whitney Pennington
Photo Credit: CSU*

We also said goodbye to PhD student, Elise Lagerstrom and MPH student Taylor King. Both have successfully completed their degrees, and we wish them all the best in their careers.

We are excited to continue into the new grant year with additional funding for a new project, the Nasal Intervention Study. More information on this can be found later in the report.

This year brings a renewed commitment from our staff and advisory board to continue outreach in our local and regional communities and to stay engaged in the work of all Agricultural Safety and Health Centers.

Here's to another great year!

A handwritten signature in black ink that reads 'Stephen Reynolds'.

Stephen Reynolds
Director

Vision of HICAHS 2016-2021

“To be the preeminent scientific authority, resource, and site for innovative strategies that improve the health and safety of agricultural and forestry workers and their families in the high plains intermountain region and beyond.”

Core Research Projects

Development of Engineering Controls to Reduce Foldable ROPS Overturn Fatalities

Dr. Paul Ayers - University of Tennessee, Knoxville

Foldable rollover protective structures (ROPS) designs are a popular addition to tractors. The foldable design allows the structure to be lowered for ease of maneuvering under trees and other low clearance structures. However, these devices usually require many steps to raise and lower. They often remained lowered, and once lowered, the ROPS cannot protect the operator in the event of a tractor rollover.

Previously, Ayers developed a universal lift assist lever that allows the operator to raise and lower a foldable ROPS from the operator seat. This reduces the effort required by the operator, and thus aims to decrease the amount of time the operator leaves the device in the lowered position.

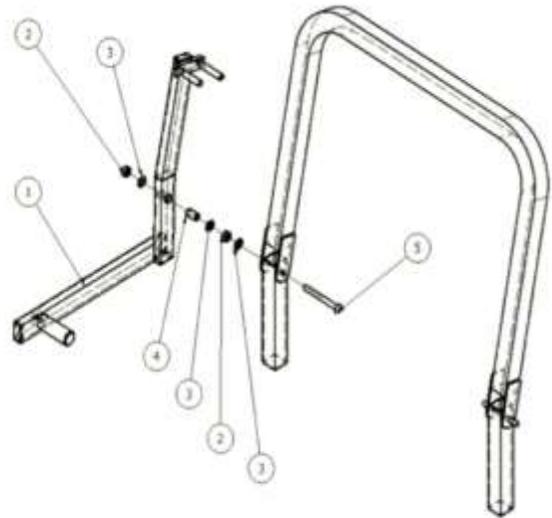
Ayers' work this year was to determine if the universal lift assist lever met appropriate ergonomic standards for operator required force and lever location. This was achieved by measuring the required force to lift the device and establishing the zone of comfort and the

zone of reach for its use on three different ROPS devices.

The lever met the standard for force (less than 100 Newtons [International System unit of Force]) as designed for two average-sized foldable ROPS designs. However, for the largest ROPS tested, forces exceeded the allowable maximum.

To lower the required forces, Ayers integrated a torsion spring into the device. The spring captures the energy from lowering the ROPS and uses it to raise the ROPS. With the addition of the spring to the lever design, the required force fell below allowable maximum.

The other ergonomic standard assessed was the placement of the lever within the operator's zone of comfort and reach: the areas where the body can most efficiently reach and safely lift objects and exert force. On all three tested models, the universal lever met ergonomic standards for being operated within the operator's zone of reach and comfort.



Engineering drawings for the universal lift assist design lever

Photo Credit: P. Ayers

Occupational Safety Management and Leadership on Large-Herd Dairy Farms

Dr. David Douphrate - University of Texas School of Public Health

Dr. Noa Roman-Muniz and Dr. Stephen Reynolds –Colorado State University

In the second year of the “Occupational Safety Management and Leadership on Large-Herd Dairy Farms” project, project leaders finalized development and began testing a training intervention for dairy supervisors.

Over the course of 3 months, the training engages participants in weekly interactive digital lessons and assignments. Extension agents and graduate students reinforce the management practices introduced in digital lessons during hands-on coaching sessions.

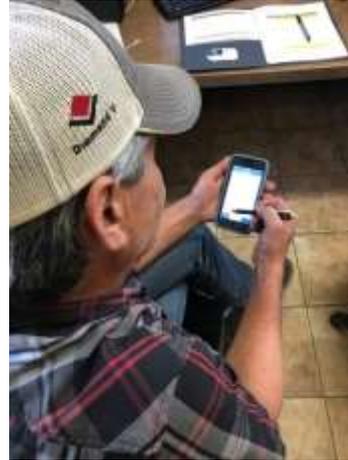
In addition to training modules, participants complete a daily report. This app-based questionnaire assesses the participant’s adherence to practices described in the modules and during hands-on sessions.

This year, project leaders recruited 37 dairy supervisors from Texas, New Mexico, Colorado, and Kansas for the initial round of training. Early feedback from these participants is positive and reveals their satisfaction with the training.

Recruitment for a second cohort of trainees is on-going, and project leaders are working on program adjustments that will make the training sustainable long-term.



Example of earned certificate from Dairy Leadership & Management Program
Photo Credit: D. Douphrate



Training Participant completing a questionnaire
Photo Credit: A. Rodriguez

Agricultural Safety Initiative

Dr. Michael Pate - Penn State University

The “Agricultural Safety Education Initiative” aims to reduce fatalities of youth agricultural workers on U.S. farms by increasing the safety knowledge of agriculture teachers. The teacher training specifically addresses machine safety, and then teachers convey the information to students and guide the appropriate selection of supervised agricultural experiences (SAE) provided by Future Farmers of America (FFA).

In the first year of the project, over 100 teachers attended trainings in Montana, South Dakota, and Utah. This year, more in-depth analysis revealed that the training had a significant improvement in teachers’ knowledge of agricultural safety practices. Analysis also revealed that knowledge at the start of the training (a pre-test score) was related to teacher age, years of teaching experience, and gender.

Pate and collaborators plan to assess teacher knowledge after three years of the program and again after five years. They also plan to determine the impact of teacher training on student outcomes by identifying cohorts of students from teachers who have and have not completed the training.

Nasal Intervention Study

Dr. Stephen Reynolds and Dr. Joshua Schaeffer - Colorado State University

New this year, HICAHS began work on a project entitled, "Evaluation of effectiveness of a nasal rinse intervention to reduce the pro-inflammatory response in dairy workers exposed to bio-aerosols," which we have shortened to Nasal Intervention Study.

Building on previous HICAHS work, Drs. Reynolds and Schaeffer received funding for the project as a competitive supplement to the center's current five-year grant. The project will further investigate the use of a nasal rise as a method for preventing respiratory inflammation and illness in dairy workers. Specifically, it will investigate the effect hypertonic saline has on reducing nasal inflammation and its impact on overall wellness of dairy workers. If successful, the project will lead to the development of a low-cost, easy to use intervention to be administered before and after a work shift.

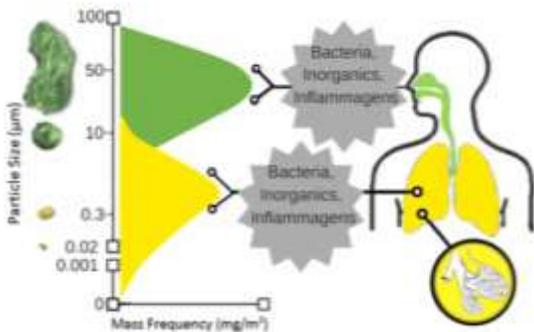


Diagram of size, composition of dust found on dairy farms

Image Credit: K. Ahmed and J. Schaeffer

Grant Program Updates

Emerging Issues

The emerging issues grant program provides a structure for HICAHS to identify and respond to issues of high priority for agriculture and forestry in the region.

Recent projects funded to address some of these issues are described below.

The number of agricultural workers who speak an indigenous language is on the rise. To continue to protect all workers, it is important that safety and training materials adapt to this demographic shift. With the help of funds from an emerging issues grant, Robert Hagevoort from New Mexico State University, expanded the previous "Dairy Stockman Vignettes" project to include videos in K'iche, a Mayan language spoken by populations of farmworkers from rural Guatemala. On some Dairy farms upwards of 20% of workers speak an indigenous language. These videos compliment similar content already created in English and Spanish and teach the safety elements of technical work on dairy farms (moving animals, caring for injured or sick animals, etc). All the videos can be found on the U.S. Agricultural Centers' YouTube page with the page address provided below:

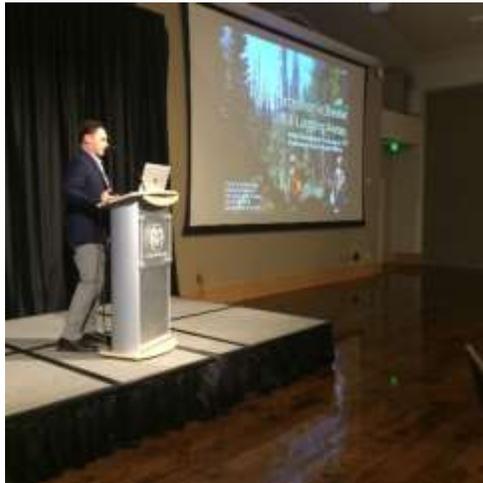


Screenshot of the US Agricultural Center YouTube Channel-

<https://www.youtube.com/user/USAgCenters>

Another emerging issues project funded this year was the "Wildfire Information Project," led by John Volckens at Colorado State University. Much of the work being done on wildfire safety has focused on protecting wildland fire fighters, and community partners expressed concern that there was very little information on respiratory protection for agricultural workers. Thus the goal of the project was to provide information on how agricultural

workers can protect themselves from smoke exposures. Project leaders created a flyer (see to the right) that communicated how to understand the Air Quality Index (AQI), recommendations for choosing a respirator, and steps to reduce air pollution in the home and office. The flyer is part of the public domain and can be easily adapted with information for other regions. Regional partners are helping to circulate the flyer in Montana via public health agencies and extension. The project received additional support from the Mountains and Plains Education and Research Center, Colorado State's Partnership for Air Quality, Climate, and Health, and The School of Global and Environmental Sustainability at Colorado State.



Trevor Durbin speaking at Research Day
Photo Credit: W. Pennington

The final emerging issues project that wrapped up this year was an anthropology study to assess worker perceptions of health and safety risk in beetle-kill forests. For this project, Trevor Durbin, now at Kansas State University, used an ethnographic approach to understand how workers (logging, wildland fire, etc.) perceive or act in relation to beetle-kill. He conducted 20-minute interviews with workers in California, Idaho, Montana, Wyoming, and South Dakota. These conversations highlighted the practice of “situational awareness” and the factors that negatively impact this awareness (stress, normalization of bad

behaviors, etc.). Future work in this area should focus on what contributes to these negative factors and how to prevent them.

Respirator safety during wildfires flyer
Flyer Design; K. Pintauro, CSU School of Environmental and Global Sustainability

Community Initiated Grants

Under the direction of Dr. John Rosecrance, the community-initiated grants program continues to provide funding to agricultural and forestry organizations to help them improve their health and safety programs. This year, the program funded four projects, with ATV safety continuing to be a popular topic addressed.

Montana Logging Association:

Development of training videos for teaching heavy equipment safety to new hires in the logging industry. Materials have a dual-focus on equipment for tree harvesting and firefighting since professional loggers often work as firefighters in the summer months.

Wyoming Stock Growers Association:

Development of an ATV safety campaign for livestock ranchers and farmers in Wyoming. Several worker safety organizations were involved, including the Office of the Wyoming Governor.

University of Wyoming Extension:

Program to train extension agents to become certified as ATV Safety Institute trainers and to develop a curriculum for their agricultural population of workers.

South Dakota State University Dairy

Extension: A total worker health approach in the dairy industry that includes conducting general health assessments (questionnaire) and vision screenings among dairy workers in South Dakota.



*CSU Extension Agents meeting with ranchers in Southwestern Colorado to discuss ATV Safety
Photo Credit: J. Rosecrance*

Pilot/Feasibility Grants

Under the Direction of Dr. Maggie Clark, the Pilot/Feasibility Program enjoyed another successful year providing funding opportunities to young investigators and people new to the agricultural health and safety field. The Research Day held in early September was a real highlight, with three former pilot program grantees sharing their work.

The program granted funding to two projects this year. Only one of these projects was able to begin this year: "Assessment of occupational exposures to aerosolized Mycobacteria in Colorado Dairy Farms." This project is located at CU Boulder with a partnership at Colorado State University and uses culture and sequencing methods to detect the presence of mycobacteria in nasal lavages of dairy workers.

The second project funded this past year, "Global DNA methylation and hydroxymethylation events in murine lung associated with inhaled *Aspergillus fumigatus* exposure," is set to begin soon at Minnesota State- Moorhead. This project will investigate changes in rodent lung DNA caused by mold exposures. This investigation will shed light on the lung-disease pathways in humans.

Previous pilot grantees continue to publish and present their work, resulting in the publication of 3 papers, 4 conference presentations, and 2 web-based reports this year. A complete list of publications and products from across the center may be found on our website.

Outreach and Evaluation

Outreach

HICAHS continues to share new research, administrative updates, and safety and health information on social media. The center is now active on Facebook, Instagram, and Twitter. Across all platforms, users saw HICAHS content more than 47,000 times.

<i>Social Media Platform</i>	<i>Impressions</i>
Facebook	14,586
Twitter	29,877
Instagram	2,302
Total	47,035

HICAHS also continued its electronic newsletter and email campaigns sending 6 different emails throughout the year.

- **September 2017:** Farm Vehicle Safety During Harvest Season
- **October 2017:** Space Heater Safety
- **January 2017:** Grain Safety Training Dates
- **May 2018:** Pesticide Safety and the Worker Protection Standard
- **July 2018:** Dairy Safety & Wildfire Safety
- **August 2018:** Respiratory Protections

Efforts to increase newsletter readership resulted in 100 new subscribers. Active readership of each campaign is now up to 130 people.

Near the end of the year, the format of the newsletter changed to reflect a change in demographics of subscribers. Going forward, newsletters will be distributed quarterly with a greater focus on center news and events.

With several regional partners, HICAHS helped coordinate three trainings from the Grain Handling Safety Coalition in January 2018. Unfortunately, these trainings had to be postponed due to an injury that prevented the trainer from traveling to the region. HICAHS staff are working to reconvene the trainings.

Evaluation

The HICAHS Evaluation Team has pilot tested a Needs Assessment Survey with our HICAHS Advisory Board and are in the process of incorporating feedback into the instrument before sending out to the region. Additionally, the evaluation team is currently collecting data for a social network analysis in order to understand HICAHS' position in the regional landscape of agricultural health and safety. We continue to monitor the publications and products of HICAHS staff and for this Grant year there are 17 peer reviewed journal publications published or in press since October 2018.

Table of HICAHS Outputs for the Grant Year

Publications	17 Journal Articles
Book Chapters	1
Presentations and Conference Proceedings	6
Theses	1 Masters and 1 PhD
Editorial and Board Service	5 appointments

HICAHS Researchers and Staff

Core Leadership and Administrative Personnel

Director & Emerging Issues Program Lead: Stephen Reynolds, Colorado State University
Deputy Director, Evaluation Program Lead, & Outreach Program Lead: Lorann Stallones, Colorado State University

Associate Director: David Douphrate, University of Texas School of Public Health at San Antonio

Research Core Lead: Joshua Schaeffer, Colorado State University

Community Initiated Small-Grants Program Lead: John Rosecrance, Colorado State University

Pilot Program Lead: Maggie Clark, Colorado State University

Research and Administrative Manager: Elizabeth Brooks, Colorado State University

Outreach Program Coordinator (through January, 2018): Allison Cassidy, Colorado State University

Outreach Program Coordinator (beginning August, 2018): Whitney Pennington, Colorado State University

Evaluation Coordinator: Cheryl Beseler, Colorado State University

Evaluation Program Assistant: Annie Keeney, Colorado State University

Research Associate: Mary Bradford, Colorado State University

Financial Manager: Kathy Peterson, Colorado State University

Students

Kyle Hancock, Colorado State University, doctoral student, ergonomics

Elise Lagerstrom, Colorado State University, doctoral student, ergonomics

Anabel Rodriguez, University of Texas School of Public Health at San Antonio, doctoral student

Amanda VanDyke, Colorado State University, doctoral student, Industrial Hygiene

Rebecca Foos, Colorado State University, masters student, ergonomics

Taylor King, Colorado State University, masters student, public health

Luke Martin, UT Knoxville, undergraduate student

Emily Rice, UT Knoxville, undergraduate student

Research Core Key Personnel & Contributors:

**denotes contributor*

“Development of Engineering Controls to Reduce Foldable ROPS Overturn Fatalities”

Paul Ayers, Principal Investigator, University of Tennessee

“Occupational Safety Management and Leadership on Large-Herd Dairy Farms”

David Douphrate, Principal Investigator, University of Texas School of Public Health, San Antonio

Stephen Reynolds, Colorado State University

Noa Roman-Muniz, Colorado State University

David Gimeno, University of Texas School of Public Health, San Antonio

Lisa Pompeii, University of Texas School of Public Health, Houston

Robert Hagevoort, New Mexico State University

Luis Mendonca, Kansas State University

Pete Kines, National Research Centre for the Working Environment (Denmark)

“Agricultural Safety Education Initiative”

Michael Pate, Principal Investigator, Penn State University

Dustin Perry, Montana State University

Scott Smalley, Iowa State University

Rebecca Lawver, Utah State University

***Rhonda Miller**, Utah State University

***Xin Dai**, Utah State University

***Alyx Shultz**, Murray State University

***Lorann Stallones**, Colorado State University

“Nasal Intervention Study”

Stephen Reynolds, Principal Investigator, Colorado State University

Joshua Schaeffer, Principal Investigator, Colorado State University

Kenneth Jones, Principal Investigator, University of Colorado Denver

***Julia Sharp**, Consultant, Colorado State University

For investigator contact information, please email HICAHS@colostate.edu.

HICAHS Advisory Board

Cooperative Extension & Academia

Ragan Adams, Veterinary Extension Specialist, Clinical Science, Colorado State University

Shawn Archibeque, Associate Professor, Animal Sciences, Colorado State University

Keith Belk, Professor, Animal Sciences, Colorado State University

Robert Ellis, Professor/University Biosafety Officer, Microbiology, Immunology and Pathology, Colorado State University

Alvaro Garcia, Professor/Agriculture & Natural Resources Program Director, Dairy and Food Science, South Dakota State University

Robert Hagevoort, Associate Professor/Dairy Extension Specialist, Animal Sciences and Natural Resources, New Mexico State University

Peter Kolb, Associate Professor/Forestry Extension Specialist, Forest Management, Montana State University

Matt Nonnenmann, Air Quality Improvements Project Leader, Great Plains Center for Agricultural Health, University of Iowa

J.W. Schroeder, Retired Extension Specialist, North Dakota

Bruno Sobral, Director, One Health Institute, Colorado State University

Greg Whipple, Professor/Director of Extension, University of Wyoming Extension

Allen Young, Professor/Dairy Extension Specialist, Animal, Dairy, & Veterinary Sciences, Utah State University

Agricultural Producers

Emily Prisco, Director of Farm Resources, Aurora Organic Dairy

Olga Reuvekamp, Owner, Hilltop Dairy

Jon Slutsky, Owner, La Luna Dairy

Juan Velez, VP Farm Operations, Aurora Organic Dairy

Agriculture-Related Businesses, Non-Profit Associations, & Faith-Based Organizations

Kevin Dole, Owner, Alpha Technology USA Corp

Jessica Lemmel, Director of Communications, Colorado Livestock Association

Mike Taylor, Chief Safety, Health & Environment Officer, The Church of Jesus Christ of Latter-day Saints: Risk Management Division

Government

Herb Gibson, Area Director, Denver Office, Occupational Safety and Health Administration

Healthcare

Ed Hendrikson, Director of Environmental Health, SALUD Family Health Center

Insurance & Workers' Compensation

Dan Hair, Senior VP/Chief Underwriting and Safety Officer, Workers Compensation Fund

David Knell, Safety Consultant, Pinnacol Assurance

Brian Schiller, VP/Agribusiness Department, Flood and Peterson

Clyde Serna, Safety Consultant, Pinnacol Assurance

Thank you to Greg Whipple and Emily Prisco who have concluded their service on the board.