



Central States Center for Agricultural Safety and Health

Annual Report

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University of Nebraska Medical Center, College of Public Health

Section 1

Center Summary

The Central States Center for Agricultural Safety and Health (CS-CASH) was funded as one of nine NIOSH agricultural health and safety centers, starting September 2011. CS-CASH is based out of the University of Nebraska Medical Center, College of Public Health in Omaha, Nebraska. The Center serves seven states in the central United States: North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri. CS-CASH is a partnership where public health, agricultural, and grass roots organizations contribute to a common goal of reducing injury and illness in agriculture by utilizing their strengths and regional presence. We envision a vibrant agricultural sector in our region and the United States where health and safety is highly valued and work-related injuries and illnesses are rare. Our mission is to work with the agricultural community in the Central States and beyond, conducting research, intervention, education, and outreach activities, with the aim of discovering the mechanisms of injury and illness, and developing, implementing and evaluating prevention strategies that measurably improve the health and safety of all members of the agricultural community.

Relevance

CS-CASH aims to improve the safety and health of farmers, ranchers, agricultural workers, and their families. The Center conducts research and translates findings into practical applications. Research teams from different states and institutions bring expertise and access to farm audiences in the Center's region. With strong public health, agriculture, and grassroots partnerships we can address local, regional and national issues. The Center research projects focus on injury prevention and surveillance, respiratory disorders and hearing loss. The Center has funded pilot projects since 2011 on a broad range of existing and emerging health and safety issues. Information is disseminated to the agricultural community through agricultural shows and events, school programs, agricultural medicine courses, presentations, articles, and messages in electronic and printed media.

Key Personnel

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CS-CASH Website: www.unmc.edu/publichealth/cscash/

CS-CASH Facebook page: <https://www.facebook.com/unmccscash/>

CS-CASH Twitter: @unmc_CSCASH

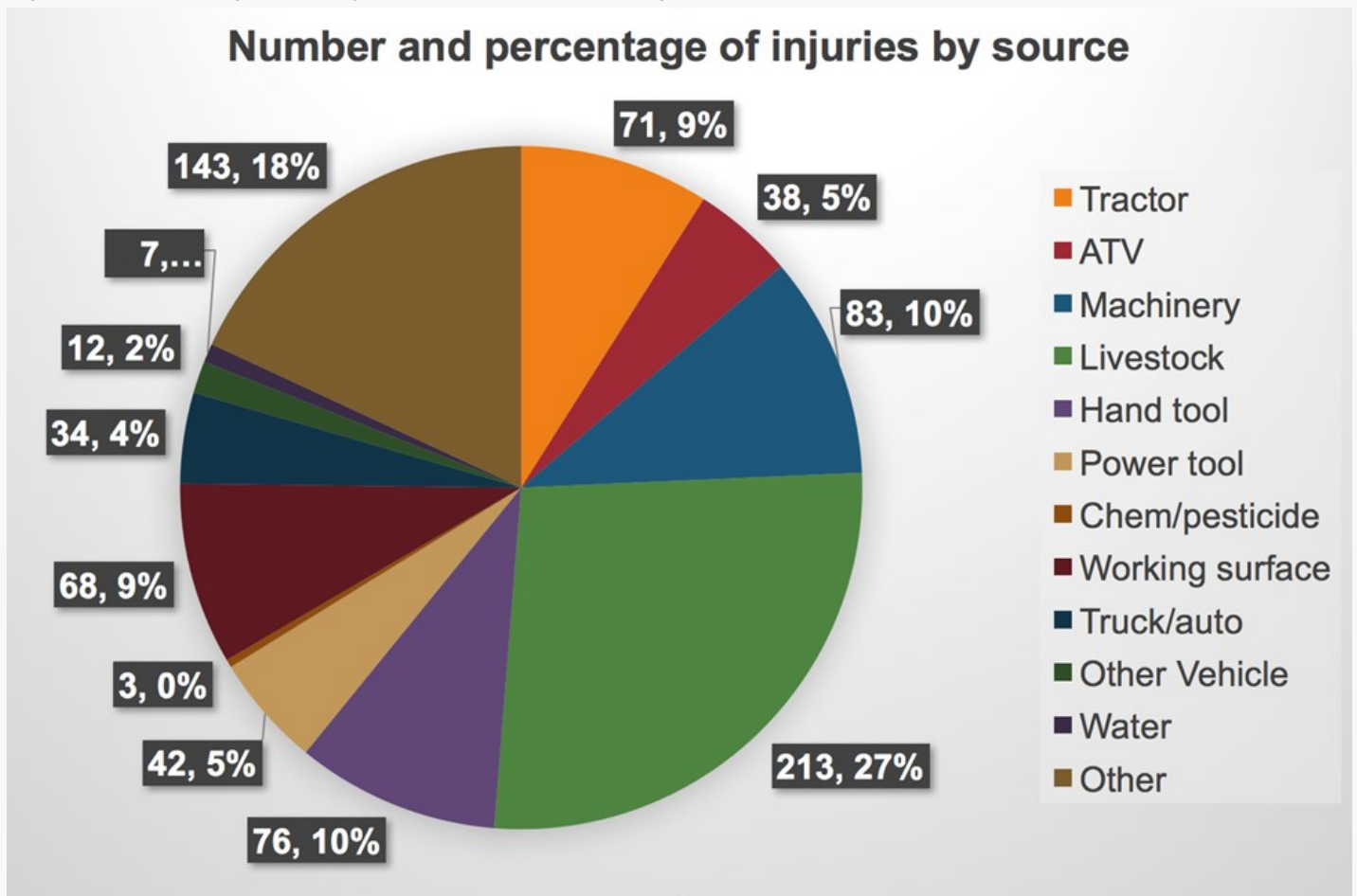
Surveillance of Agricultural Injuries in the Central States Region Risto Rautiainen PI

The objective of this project is to improve the surveillance of injuries in agriculture by developing an innovative, cost-effective surveillance system using a combination of existing data sources. CS-CASH collaborates with the National Agricultural Statistics Service (NASS) to accomplish two specific aims: 1) to implement an annual injury survey, linked with existing data from the Census of Agriculture, and 2) to describe injuries, injured persons, rates of injury, and risk factors for injury.

Five rounds of data collection have been completed, and four years of data have been analyzed. The response rates ranged from 29 to 37% of farms/ranches. The majority of the operators were male (84%), and the majority spent more than half of their time working on a farm or ranch (52%). The incidence of injuries among farm operators (principal operator and up to two other operators per farm) was 7.64% in 2011, 7.44% in 2012, 6.11% in 2013, 8.17% in 2014; and 7.20% for all years combined. The injury rates varied by state, from 5.97% in Missouri to 8.68% in North Dakota. The average cost of injury consisted of \$2,250 paid out-of-pocket cost and \$8,786 paid by insurance; \$11,036 total during the four-year period. More than half of injuries (56%) required professional medical care, 9% resulted in hospitalization, and most injured operators lost work time ranging from less than half a day to 30 days or more. Frequently the injuries were sustained when working with machinery or livestock. The breakdown of injuries by source are shown in Figure 1.

The injury surveillance involves tracking injury cases through a press clipping service. In 2014, this system found 75 fatal (92 in 2012) and 90 non-fatal (102 in 2012) agricultural injury cases in the Center's seven-state region. Individual case information from the media can be helpful in understanding the circumstances resulting in injuries. Together these data sources provide valuable information for prevention of injuries in the region.

Figure 1. Sources of agricultural injuries in the Central States Region, 2011-2014.



ADMA: A Novel Pathway in Organic Dust-mediated Allergic and Non-allergic Asthma

Todd Wyatt PI

Agricultural workers who are exposed to organic dusts during the workday may be at risk for increased lung injury possibly leading to chronic illness. In particular, dusts generated in confined animal feeding operations appear to produce the greatest amount of inflammation when inhaled in significant amounts over long periods of time. Perplexingly, different degrees of responses are seen in exposed individuals.

All humans have innate lung defenses protecting us from the particles, toxins, and germs that we inhale from our environment. Many of these defenses are regulated by a key molecule known as nitric oxide, which is produced by the lung itself in response to various environmental conditions. Alternatively, the lung also produces its own inhibitor to nitric oxide. This is a compound known as asymmetric dimethylarginine (ADMA). Our hypothesis is that controlling the balance of nitric oxide and ADMA can impact the individual inflammation responses to organic dust.

Utilizing a preclinical animal model of genetically altered mice that overexpress a natural inhibitor of ADMA, we have been able to demonstrate that the nitric oxide pathway favors a decrease in dust-mediated inflammation, while the suppression of this pathway enhances lung injury in response to organic dust exposure in the mice. We have identified key enzymes, known as protein kinases, responsible for mediating the production of key inflammation switches leading to lung injury. Specifically, organic dust increases lung inflammation through the activation of protein kinase C while inhibition of ADMA increases nitric oxide-dependent activation of protein kinase A, thus decreasing dust-mediated inflammation.

We are now examining the context of how this fundamental balance of “on-switch/off-switch” regulation to dust exposure could be impacted at the level of the individual. In doing so, we are exploring the composition and conditions of the exposure, worker co-morbidities such as cigarette smoking and alcohol abuse, and the impact of nutrition. With this in mind, we hope to translate our findings into effective risk-benefit information for the improved respiratory health of agricultural workers.



Preventing Hearing Loss Among Farmers by Point-Source Hearing Protection Strategy Chandran Achutan PI

The overall objective of this study is to develop, implement and evaluate a novel point-source hearing protection strategy to increase the use of hearing protection devices. This randomized controlled trial tested the effectiveness of this highly participatory intervention. Fifty-one farms were randomized into intervention and control groups. There was low attrition rate. The Point Source intervention included a weatherproof box containing ear plugs and ear muffs. The ear muffs sat on a counter that advanced every time the muff is taken off or replaced. There were 3-6 boxes on each farm, depending on the size of the farm. The farm operator helped identify areas where hearing protectors would be most helpful. These locations included the workshop, grain bins, and combines. Earmuffs were used at least once in 36 of the 41 sites (88%). The median number of times the ear muff counter advanced was 7.5. One factor that affected readings of the counters includes participants not returning the ear muff to the counter after use.

New knowledge created: characterization of noise sources on farms; personal noise exposures during planting and harvesting; knowledge, beliefs, and attitudes of farmers towards HPDs; hearing test results and innovative methods to educate farmers about their hearing loss; understanding how farmers receive health and safety information; understanding challenges of farmers in protecting hearing; how to estimate duration and intensity of exposure; understanding the concerns of younger farmers regarding noise and other hazards on the farm.

Development of HPD box Identified a manufacturer who was able to assemble the boxes in a timely manner; determined the best locations for installation, calculated the optimal number of boxes needed; educated farmers on methods to caring for hearing protectors.

Other findings: Farmers appreciate that the HPDs are protected in a clean environment. Intervention participants have shown the boxes to friends and coworkers. Several participants would like to see a similar study that uses respirators in conjunction with a point-source strategy as this is another health concern in the community. Some participants who have reportedly “burnt” their lungs from dust and sediment inhalation say that this would be another beneficial and frequently used resource.

“I’m using my earplugs four times more than before the study”;

“Having HPDs nearby, helps eliminate the hassle of forgetting them in trucks, shops,

“The study has been a great service. It has made me more aware of noises in agriculture.”;

“When I see your box, I am reminded to wear my ear muffs”.

YOUTUBE VIDEO

“Protect What’s Yours” an educational YouTube video features one of the study participants discussing the importance of wearing hearing protection on the farm.

<https://www.youtube.com/watch?v=uYSdAuz6ba8>



Protect What's Yours - Hearing



U.S. Agricultural Safety and Health Centers

✓ Subscribed  424

397 views

Safety and Health Education for Non-Traditional Farm Families Shari Burgus PI

Changing farm demographics influence hazard exposure, prevention tactics, communication channel choices, and resource preferences. This project seeks information from traditional, retired, residential/lifestyle, and organic farmers to identify differences and similarities in information needs. In year 5 of this project the following aims were accomplished:

Survey of Midwestern farmers seeking information about preferences of for injury prevention delivery strategies and educational resources. Questions included: wording, length, images, and what encourages and discourages resource use. Findings suggest:

- a preference for general or simple terminology.
- materials suggesting realistic, easy-to-use strategies, and having material directed to youth and children were preferred.
- images depicting similar farming practices and useful prevention strategies encourage resource use, while materials that are too technical, having received information previously, using offensive images, and using offensive terminology discourage the use of materials.

Presentation of interview, focus group and survey findings

- A presentation at the 2016 International Society of Agricultural Safety and Health summarized interview data from Midwestern farmers (n=513). Findings indicated that gender, age, and farming operation influence PPE use and communication preferences. Information deemed as too technical was the top reason for not using farm safety and health resources. Preference for fact sheets and article length is two pages or less. Images reflecting individual farming practices were the primary reason farmers accept materials.
- Results about hazard perception, health screening, training, injury prevention, child safety, distribution and delivery of farm safety and health education material were published in the journal "Safety". The article is entitled *Reaching Farmers with Safety and Health Messages* (Burgus and Duysen).
- Additional information from the electronic survey of Midwestern farmers can be found in the Journal of Extension article entitled *What Influences Farmers to Use Farm Safety and Health Information* (Burgus, Duysen and Wendt).

Creation of Radio Messages

Retired farmers and those with the majority of their income from farming indicated a preference to receive information via radio messaging. This finding prompted the development of audio PSA messages. Topics include: tractor safety, hearing protection, and ATVs and will be expanded to address other topics in the future. Both a child and an adult voice are included in the PSAs since farmers often refer to children and youth when discussing safety and health. Eagle Communications out of St. Joseph, Missouri will distribute the PSAs during Fall 2016.

Customizable Educational Fact Sheets

- Customizable 2-page educational fact sheets (example shown below) will be a free online resource on the CS-CASH website <https://www.unmc.edu/publichealth/cscash/>. The electronic survey indicated farmers are more likely to use simple, 1-2 page resources containing images that reflect their farming practices lead to the creation of short customizable fact sheets. The topics chosen for the fact sheets based on farmers' preferences include tractor safety, hearing conservation, part-time farming, child safety, ATV safety, ergonomics, chemical safety, farm machinery safety, safe livestock handling, and rural roadway safety. The CS-CASH photo sharing site will provide a range of options for portraying farm type, farmer demographic (gender, age, ethnicity), machinery, livestock, and farm activity. (<https://www.surveymonkey.com/r/9NWCML2>)



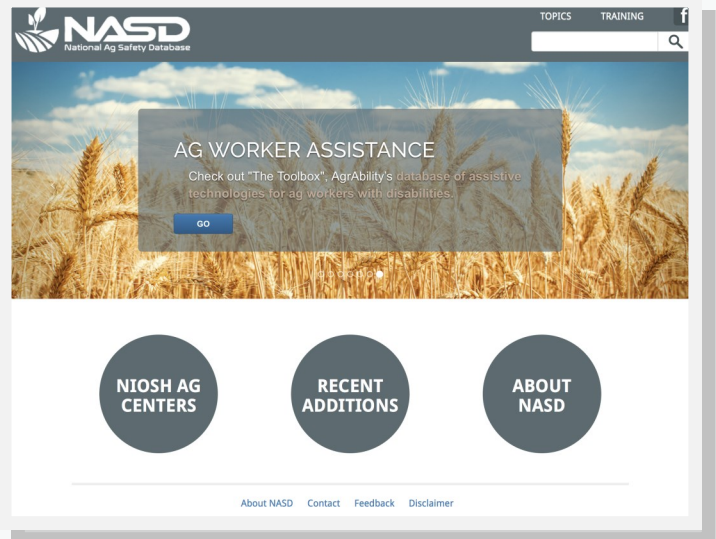
Example of a 2-page, customizable safety flyer. Flyers were reviewed and approved by content experts. Users can change images to portray differing farming practices, demographics, age and gender. User logos can be added to these materials.

The CS-CASH photo-sharing website provides high quality agriculture-related images that portray safe and unsafe practices and situations. These images are provided free of charge to safety professionals and the agricultural community for use on educational materials and in presentations.

National Ag Safety Database Aaron Yoder PI

The National Ag Safety Database (NASD) (<http://nasdonline.org>) is the most widely recognized and used Internet based assemblage of educational resources related to human health and safety in production agriculture. The goal of this project is to make audience-targeted educational resources from NIOSH Agricultural Centers, researchers, educators, and standards accessible to end users in the agriculture, forestry, fishing, and hunting industry. To accomplish our goal, researchers identify, solicit and add new safety and health print, non-print and online materials; review materials on an ongoing basis for accuracy and usefulness; develop new original on-line training units for the NASD website; solicit and develop more multilingual resources and promote NASD and NIOSH safety and health efforts. Additional consultants were added to this project in the final year to help meet these goals.

Conceptual Arts, Inc., under the direction of Dr. Yoder, has continued to expand the content of the NASD. Ninety-four documents, totaling 653 pages, were added or updated. Additionally, 10 videos, 1 organizational record and 4 collections were also added or updated. Curriculum entitled "Materials for Teaching Agricultural Safety in the College Classroom" was added. This curriculum includes 11 PowerPoint presentations and assessment materials. Conceptual Arts, Inc. has started a Facebook page for NASD (<https://www.facebook.com/NASDOnline/>) which has generated noteworthy traffic. The NASD supported a CS-CASH pilot project by providing support to the Certified Safe Farm (CSF) project, mainly by maintaining the CSF Committee Portal website. Regular meetings were held with representatives from other NIOSH funded Agricultural Safety and Health Centers to present updates of the NASD and to encourage other centers to contribute materials to the NASD. Opportunities are provided on the NASD Web site for users to ask questions, report problems, or recommend materials. Most of these messages are questions about safety or health issues, and they all receive a response in a timely manner.



Education/Translation Core Aaron Yoder PI

Over 90 participants from across the US have participated in the week long Agricultural Medicine course offered by CS-CASH since the first course was offered in 2011 at the UNMC College of Public Health. CS-CASH held the 6th Annual Course July 12-15, 2016.

The course provides an overview of key health and safety issues specific to rural and agricultural workers and is designed for professionals who work with or have an interest in agricultural health and safety including: physicians, physician assistants, nurses, advanced practice nurses, veterinarians, health educators, migrant health clinicians, physical therapists, Ag extension, graduate students, insurance specialists, and NIOSH Ag Center personnel. Participants spend 32 hours in class and 4 hours of hands-on training at the University of NE Lincoln research farm in Mead Nebraska. Course evaluations have been excellent.



Outreach Program Debra Romberger Program Director

Since the Central States Center for Agricultural Safety and Health (CS-CASH) Outreach Program was established in 2011, the program has aimed to ensure that evidence-based prevention and intervention findings, best practices, tools, approaches, technologies, guidelines and policies reach agricultural workplaces and the people who can benefit from them. Using social marketing strategies we disseminated this information through channels that effectively reached large numbers of farmers through the National Agricultural Safety Database (NASD), email communication, social media, agricultural events and leveraging networks of collaborating organizations. Outreach Program staff have proven to be adept at reacting quickly to emerging issues, using the Community Contact Network (CCN) database for dissemination of needed information and support.

Each year the focus of the Outreach program is aligned with a CS-CASH prevention, research or education project. Educational materials, exhibits, demonstrations and presentations were focused on the following topics: Year 1 - respiratory protection (aligned with Dr. Todd Wyatt's agricultural dust research project). Year 2 - hearing conservation (aligned with Dr. Achutan's point-source hearing project). Year 3 - safe handling of livestock (aligned with Gordon Moore's low-stress cattle handling pilot). Year 4 - injury prevention (aligned with Dr. Rautiainen's injury surveillance project) and Year 5 - aging farmers (aligned with Shari Burgus' farm demographic project).

Highlights of Outreach accomplishments in Year 5:

- Boots on the Ground Demonstrations and Trainings. CS-CASH provided demonstrations, trainings and presentations at 29 agricultural events in all 7 of the CS-CASH regional states with an emphasis on topics related to aging farmers.
- Tractor Safety Training. In collaboration with University of Nebraska at Lincoln Extension Aaron Yoder and Ellen Duysen conducted 8, 2-day tractor safety certification courses, training 98 agricultural workers ranging in age from 13-28.
- Agricultural Respiratory Protection Selection Web Guide. In collaboration with the AgriSafe Network CS-CASH created a web guide for agricultural workers to use for the selection of appropriate respiratory protection.
- Community Contact Network (CCN) is a CS-CASH database with contact information on individual and group stakeholders, all who have an interest in agricultural safety and health. The database was grown by over 3000 contacts in year 5 to 26,540.
- Agricultural Medicine: Occupational & Environmental Health for Rural Health Professionals CS-CASH held this week-long course for health care providers in July 2016. Attendees (n=17) received continuing education credit and AgriSafe certification.
- Email, Facebook and Twitter communication. We use email and social media to forward pertinent information to stakeholders. An email sent in celebration of National Ag Day to our CCN farmer database had 1,431 opens and 15,005 clicks on the 12 links.
- Outreach through Presentation and Interviews. In FY05 Outreach staff and Center investigators continued to make public presentations and interface with the media. Numerous rural radio station interviews of CS-CASH Ag safety experts took place.
- Traditional News Media. In collaboration with 3 (AP) Ag journalists, CS-CASH produced articles for farm journals on the topics of grain handling safety, livestock handling safety, respiratory and hearing protection, ATV safety and tractor safety training.
- Photo Sharing Website. A photo sharing site housed on the CS-CASH website allows free, unrestricted access to high quality photos depicting Ag equipment, processes and landscapes that can be used to create documents, flyers and presentations.



Tractor Safety Certification Course May 2016



CS-CASH outreach team discussing respiratory protection options

Evaluation Program Mary Cramer PI

The CS CASH activities during the past five years have been directed toward improving the safety and health of agricultural communities in our seven-state region concentrating on reducing injuries, improving respiratory health, and reducing hearing loss through reduced risk exposures. The Evaluation Team monitored the Center's progress using the CS-CASH Logic Model, which has identified targets for Outputs, Outcomes, and End Results. The Evaluation Team collected baseline data for the region in 2013/14 using the Population Based Outcomes and End Results Evaluation Survey, and the survey will be re-administered in Year 4 of the next funding cycle to compare baseline with longitudinal follow-up data.

New models and methodologies have been implemented for 1) analyzing our Center's partnerships using Social Network Analysis that guides program development and leverages our connections for achieving End Results; 2) measuring social impact using core metrics adapted from the Institute of Medicine (2015) for population well-being and safety; and 3) determining economic impact using cost benefit analysis.

In year five, the focus has been on scholarly works dissemination related to the evaluation of the Center, which included three manuscripts: Tracking knowledge, attitudes, and practices on respiratory and hearing health among the mid-western agricultural population in Public Health Nursing, Social networking in an agricultural research center: Using data to enhance outcomes for the Journal of Agromedicine and Evaluating Effective Leadership and Governance in a Midwestern Agricultural Safety and Health Coalition for Workplace Health and Safety. A poster (Health Status and Preventive Health Practices Among Agricultural Principal Operators) was presented at the American Evaluation Association Annual Conference. Two oral presentations included: Knowledge, Attitudes, and Practices for Health and Safety among U.S. Midwestern Farmers: Implications for Community-based Programs and Advancing Outcomes with Social Networking at the International Society for Agricultural Safety and Health. Exploring how complex science consortia contribute to social and economic population outcomes was presented at the Nordic Meeting on Agricultural Occupational Health & Safety.

Annual field visit interviews were conducted with six new pilot investigators to assess Center governance and leadership. The outcome of this study revealed that annual field visit interviews need to be continued in the new funding cycle as they are helpful with orientation of new investigators to the CS-CASH project, provide reminders of reporting deadlines, and are motivators regarding timeline tracking in addition to giving meaningful information back to the leadership team.

Professional outreach activities to further collaborations in order to reach Center goals included Dr. Cramer being named as an Associate Editor for the Journal of Agromedicine and continued participation with the Ag Centers Evaluator, Coordinator and Outreach (ECO) bi-monthly phone conference meetings to benefit our efforts with resources and shared learnings about evaluation practices.



Pilot and Emerging Issues Projects Eleanor Rogan Program Director

The Pilot/Feasibility Projects and Emerging Issues Program has been an essential component of the Central States Center for Agricultural Safety and Health (CS-CASH) since the Center was established in 2011. This program supports projects with funding up to \$20,000 over an 18 month period. The program goal is to enable investigators to collect preliminary data to support submission of grant applications for independent, longer-term, larger projects related to agricultural safety and health. The central hypothesis of this program is that pilot and/or feasibility projects funded from this Center will result in subsequent grant submissions to NIOSH or other funding agencies to advance agricultural health and safety research. The projects selected for support by this program must address a critical issue in agricultural safety and health and clearly lead to future, more extensive study of the selected critical issue. In addition to NIOSH AFF funding (\$300,000), generous funding from the University of Nebraska Medical Center's Vice Chancellor for Research (\$180,000), has allowed CS-CASH to fund 26 pilot projects over a 5-year time period in all 7 service States.

Year 1 - 5 Pilot Projects funded with \$60,000 contributed by the UNMC Vice Chancellor of Research.

Year 2 - 7 Pilot Projects funded with \$40,000 contributed by the UNMC Vice Chancellor of Research.

Year 3 - 4 Pilot Projects funded.

Year 4 - 5 Pilot Projects funded with \$40,000 contributed by the UNMC Vice Chancellor of Research.

Year 5 - 5 Pilot Projects funded with \$40,000 contributed by the UNMC Vice Chancellor of Research.

To date, Pilot Project data has been successfully used to generate larger awards totaling \$3,400,000 including:

- AgHealth Nebraska -Nebraska Research Initiative Grant - \$100,000
- Prevention Treatment of Agricultural Respiratory Disorders: A Pilot Educational Program of Rural Health Care NPs and PAs - HRSA Grant \$769,000
- AgHealth Nebraska Network- HRSA Planning Grant - \$85,000
- Role of pattern recognition receptors in organic dust induced airways disease - NIEHS R01 (ES019325) \$1,650,000
- Enhancing the Health and Safety of Range Bison Herd Workers - NIOSH AFF - \$400,000
- Health and Safety Risks Among Immigrant Cattle Feedyard Workers - NIOSH AFF - \$400,000

Results from Pilot Projects were used as preliminary data to support other proposals either pending or not successfully funded.

These projects include: Alcohol-mediated Ciliary Dysfunction and Shipping Fever- USDA-NIFA (Clayton Kelling, DVM Co-PI); Pulmonary exposure to hog confinement dust induces a hyper-inflammatory response in the elderly- NIEHS (NIH/NIA; Kristina Bailey, MD PI); (PENDING) Mechanisms of impaired pulmonary innate immunity in aging (VA Merit grant; Kristina Bailey, MD PI); Rural People Dealing with Stress: Dissemination and Evaluation of On-line Workshops across a Four-State Area (HRSA GRANT11782650; Kay Slama PhD PI); Mucociliary clearance in aging (NIH/NIA; Kristina L. Bailey, MD PI) PENDING Bone Mineral Density Loss as a Potential Emerging Health Condition in WTC-collapse exposed workers (CDC/NIOSH; Jill Poole, MD PI) Molecular genetics of pathogen recognition receptors in COPD (VA Merit Grant; Tricia LeVan PhD PI)

A review of each funded pilot project follows:



Hyper-inflammatory Responses to Organic Dust Exposure in the Elderly Kristina Bailey PI

Nearly one third of working farmers are 65 or older. The aging of the agricultural work force leaves many workers more vulnerable to environmental exposures that are incurred in their daily work. For instance, aging farmers have more respiratory symptoms than their non-farming counterparts. To effectively serve this population, more needs to be known about how aging affects lung responses to agricultural exposures. We investigated how airway epithelial cells and peripheral leukocytes from “young” (19-45yrs) and “older” (65-80 yrs) donors respond to exposure to agricultural dusts and its components.

Findings: Airway epithelial cells from older donors demonstrate a hyper-inflammatory response to stimulation with organic dust and its components, compared to those of younger donors. This is due to an upregulation of toll-like receptor 2 in aging, as well as increased protein kinase C epsilon activity. Peripheral leukocytes from older donors demonstrate a higher baseline level of inflammatory cytokines, but are less able to respond to stimulation.

Presentations: This work was presented at the American Thoracic Society in May 2016, and a manuscript is in preparation.

Farmer Evaluation of Agricultural Fatality Messaging: Best Practices for Disseminating Prevention Messages Based on FACE Cases Stephanie Leonard PI

One-third of Iowa occupational fatalities occur in the agricultural sector, which ranks highest in occupational fatalities in the state. The Iowa Fatality Assessment and Control Evaluation (FACE) Program’s goal is to reduce injuries through surveillance, fatality investigation of root cause and contributing factors, and dissemination of prevention messages. Iowa FACE provides prevention messages through detailed case investigation reports, hazard alerts, and media articles. While these formats are widely used in other industry sectors, Iowa FACE products targeting the agricultural sector have not been evaluated by farmers. This project will 1) use farmer focus groups to evaluate existing FACE products and dissemination methods; 2) develop new FACE products that incorporate farmer feedback and narrative texts gathered through interviews with decedents’ survivors; and 3) use farmers to evaluate these new products.

Specific examples of three forms of Iowa FACE prevention messages – media stories, hazard alerts, and full case investigations – have been selected for farmers to review, and evaluation survey forms have been developed for use in ranking and providing feedback. A first round of invitations to participate has been mailed to 15 Eastern Iowa farmers. We are currently following up this initial contact with phone calls. We anticipate interviews will occur during winter 2016-17.

Cardiovascular Disease Risk and Physical Activity in Farmers Paula Schulz PI

Adults living in rural Nebraska have higher rates of heart attack, stroke, hypertension and diabetes compared to overall state statistics. Rural farming communities have high cardiovascular disease (CVD) risk with limited data available to identify strategies to reduce risk in this population. Changes in technology, automation, and the economic environment have changed farmers daily work patterns. However, little is known about the physical activity levels and dietary habits of today’s farmers and no studies using objective measurement of physical activity in this population have been reported.

This pilot study was developed to describe the impact of the unique lifestyle of farmers in rural Nebraska on their physical activity, diet habits and quality of life. We will examine these health behaviors as well as overall cardiovascular disease (CVD) risk in rural residing adults (≥ 19 years) reporting farming as their major occupation. Data will be collected in both peak farming season (planting or harvest) as well as off season to determine if there are seasonal differences in physical activity and dietary patterns.

We have obtained IRB approval for the study and to date have completed baseline data with 30 Nebraska farmers from a several counties. Participants represent farmers of all ages with all types of operations (livestock, crops, or combination). Data collection is ongoing beginning April 2016 to the present.

This preliminary work will be used in a larger grant proposal to develop tailored CVD risk reduction strategies specific to the rural lifestyle. The long-term goal is to develop a sustainable intervention which will result in reduced CVD risk in rural communities.



Photo courtesy of the CS-CASH Photo Sharing Website

Evaluation of Medication-Related Agricultural Injury Among Missouri Farmers Kelly Cochran PI

This project aims to determine the extent to which farm-related injuries that result in hospital admission or emergency department visit are associated with drug-related problems in the farmers' home medication regimen and characterize and measure the frequency of drug-related problems. Medication-related problems will be collected from the medical record for cases of farm injury resulting in a hospital admission or emergency department visit, as home medications are a component of the questions asked upon entry to the Level 1 Trauma Center. The defined comparison group of farmers in the community, who have not experienced a farm injury resulting in hospital admission or emergency department visit, will be recruited through advertisements located in rural clinics/pharmacies. The data collection instruments, questionnaires, and advertisement have all been developed. Additionally, a strategy for data collection and recruitment of farmers for the comparison group has been outlined. Dr. Cochran will begin the recruitment of the comparison farmers and data collection from the medical records of cases of farm injury in Fall 2016.

Safety in the Agricultural Work Camp Comic Book Development and Evaluation for Latino MSAW Families Jill Kilanowski PI

This is a multidisciplinary, multistate research project. A comic book (graphic novel) has been completed and developed with artist collaborators from the Columbus College of Art and Design. It features 8-pages of English and a "flipped" side of 8-pages of Spanish safety information focused on Latino migrant and seasonal agricultural worker families and their children who live in a migrant camp. The storyboard begins with a research project conducted in Lawrence, Michigan at a summer Migrant Education Program that was funded by the National Children's Center on Rural and Agricultural Health and Safety (NCCRAHS). In this project children in grades 3-to-5 were given disposable cameras to take pictures of the places they play in the migrant camp. The middle school students then created safety videos – one using the photo-voice images taken by the lower school students that were then shown to all classes at the Migrant Education Program. This comic book shares safety message developed by the NCCRAHS and is written in consideration of low literacy levels and cultural appropriateness.

In September and October 2016, focus groups will be conducted with parents and children to evaluate what participants like about the messaging and if any improvements need to be made. The participants will also complete two short surveys on the comic book satisfaction and usability. Quantitative data will be analyzed for measurements of central tendency and the qualitative data will be analyzed for categories and themes. The focus groups will be conducted in Missouri facilities that support migrant workers including churches, the SEMO Health Network, and the Kennett Family Migrant Clinic/Kennett Dental Clinic. After data gathering and analyses a third colleague from Kansas State extension will be the lead in the dissemination of the comic book to appropriate agencies and migrant service providers.

Health and Job Hazards of Latino CAFO Workers in Missouri Athena Ramos

Hog production has changed dramatically over the last few decades and the number of CAFOs are increasing throughout the country. The *Health & Job Hazards of Latino Immigrant Hog CAFO Workers in Missouri* study was developed to systematically understand and describe occupational risks; CAFO job processes among the phases of hog production including: sows, nursery pigs, and finishing; and explore opportunities for safety and health educational interventions through the identification of perceptions and acceptance of occupational risk, health effects, healthcare needs, and health beliefs among CAFO workers and their families.

We recruited a cohort of 40 Latino immigrant CAFO workers from Audrain, Linn, and Sullivan counties in Missouri. First, interviews were completed with a worker and a household member at the baseline and then again a year later. Interviews consisted of 130 questions divided into six sections: (1) health status, (2) occupational health and perception of risk, (3) emotional health, (4) stress, (5) prevention, and (6) demographics. We also conducted seven focus groups with Latino immigrant CAFO workers. During these focus groups, workers were asked why they work in the hog CAFO, how they found out about the job, what they do each day at work, why the job was dangerous or not, and potential prevention opportunities.

Currently, the team is analyzing the data that has been collected. Key findings from the first wave of data collection include: (1) Most workers do not believe that their job is dangerous; (2) Even though PPE may be available, workers are not using PPE consistently; (3) Spanish-speaking workers were less likely to report receiving job-related training; (4) Workers experience high levels of behavioral health concerns; and (5) Workers are unfamiliar with their local community and the resources that may exist. Additional findings based the two waves of interviews and the focus groups are forthcoming.

We are in the process of developing presentations, papers, and outreach materials including a community resource guide for the workers to better understand what resources exist in their community. To date, we conducted two presentations at the ISASH Annual Conference in Lexington, KY: (1) behavioral health and (2) perception of risk and safety practices. In November 2016, we will present at the Midwest Rural Agricultural Safety & Health Conference (MRASH) in Iowa. We have also submitted a paper about perception of risk and safety practices to a journal.

Vitamin D Supplementation Protects Against Bone Loss Following Inhalant Organic Dust and Lipopolysaccharide Exposures in Mice

Jill Poole PI

Chronic inhalation of organic dusts from agricultural environments, which are enriched with microbial cell wall components, cause significant airway inflammatory diseases including asthma, bronchitis and chronic obstructive pulmonary disease (COPD). Work in agriculture is also associated with high lifetime prevalence (~90%) for musculoskeletal disorders. Whereas these 2 systems of respiratory disease and musculoskeletal health may appear unrelated, there is increasing evidence supporting that airway injury and inflammation significantly contributes to debilitating systemic skeletal diseases such as osteoporosis and fracture. Recent studies demonstrate that bone mineral density loss can occur independently of established risk factors in patients with COPD and asthma, common airway diseases among agriculture workers. Moreover, this observation suggests a pathogenic association between lung injury and reduced bone mineralization; yet the underlying mechanisms to explain this relationship are not known. Understanding the mechanisms governing the lung-bone inflammatory axis might lead to novel preventative and/or therapeutic strategies to halt lung and bone disease in at-risk agriculture workers.



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Our investigations have demonstrated novel aspects related to organic dust-induced inflammation with relevance to human airway disease. Overall, our findings are consistent with our central hypothesis that TLR-dependent pathways are central in regulating the crosstalk between lung injury and systemic bone loss induced by organic dust inhalant exposures. We demonstrated that TLR2 and TLR4 pathways mediate large animal confinement facility organic dust induced airway inflammation, but bone deterioration following inhalant organic dust treatment is strongly dependent upon TLR4. Inhalant ODE exposures significantly increased the number of bone-resorbing osteoclast precursor cells, which directly depends on the presence of TLR4. These observations suggest that manipulation of TLR4 signaling pathway could have implications for future therapeutic and/or preventive strategic interventions.

Lungs For Life Carolyn Sheridan PI

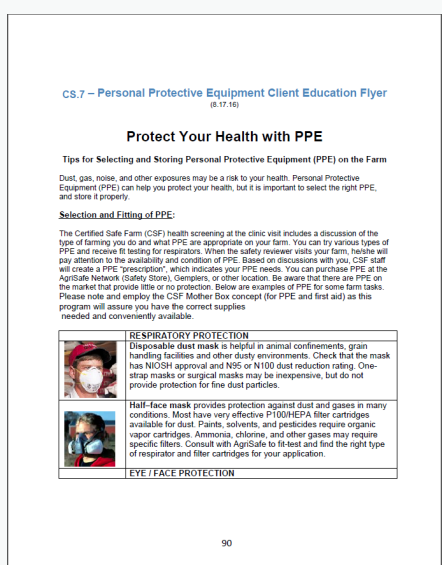
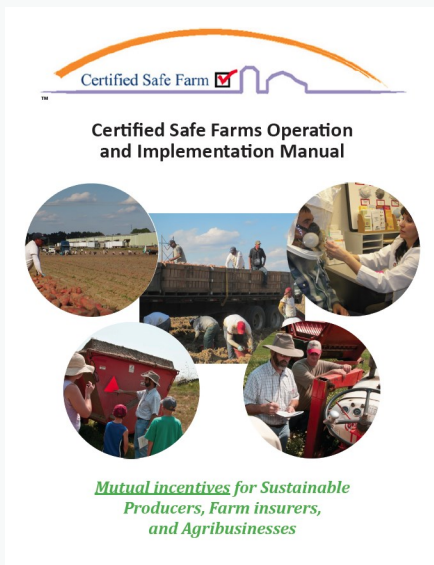
Lungs for Life, a concept developed by AgriSafe, was specifically designed to prevent chronic debilitating lung illness and disease by focusing on the respiratory health of the agricultural population. The Lungs for Life program established standards of clinical care for Ag producers working in high exposure respiratory settings based on applying principles of respiratory health monitoring and adapting those principles to the agricultural industry. A standard respiratory health program includes an agricultural occupational history and education on use of personal protective equipment. The combination of the occupational history and baseline lung function test provides the health care provider with the information needed to make referrals to family practice physicians or specialists as necessary and the ability to provide respirator commendations. Respirator fit testing ensures the mask provides adequate protection for specific hazards. These components are part of a comprehensive plan that has been adapted for those working in agricultural.

AgriSafe researched existing respiratory protocols and prevention standards of practice to apply that information to the agricultural sector. Five health care providers collaborated with AgriSafe and have experience and specialty areas in research, primary care, pulmonology, allergy and asthma specialty and occupational health. The second phase of this project included the development and testing of a Lungs for Life Toolkit for Ag producers. This toolkit includes an Algorithm for screening spirometry in Ag, information on lung function tests, basic patient education, and personal protective equipment (PPE) selection and fit testing. of practice draft to apply to the agricultural sector. Once the clinical protocol is reviewed and established, AgriSafe will complete phase two of this proposal. The second phase includes the development and testing of a Lungs for Life Toolkit for Ag producers. This toolkit will include an algorithm for screening spirometry in Ag, information on lung function tests, basic patient education, and PPE selection and fit testing. We are reviewing successful tool kit models and the development of design formats for educational and marketing materials to be included in the Lungs for Life Tool Kit. To ensure that this resource is practical and user friendly this proposal also includes collaborating with AgriSafe partners who will evaluate the Lungs for Life Tool Kit. Webinar based training will be offered to AgriSafe state affiliates who are interested in adapting the Tool Kit.

Vision for a National Sustainable Certified Safe Farm Intervention Program
Kelley Donham PI

The Certified Safe Farm (CSF) is an evidence-based multimodal total worker health program that has resulted in long term reductions in medical costs, increased use of personal protective equipment (PPE), decreased occupational respiratory illnesses and remediation of farm hazards. Deriving in part from concepts originating in Scandinavia, the CSF was founded in Iowa, and now has been translated to Wisconsin, North Carolina and Nebraska. Currently no coordination exists among these programs. Our consultants from agribusinesses have advised us that to achieve national sustainability CSF must be consistent in programming and quality across state lines. This project aims to develop a National Sustainable Model CSF Program by establishing a coalition of stakeholders active in CSF programming. We have established a well working consortium committee representing seven states and have attained consistency, quality, and coordination across state lines. Further we have developed methods to account for regional/local variances in CSF programs as necessary. Project accomplishments are listed below.

- The Certified Safe Farm (CSF) Consensus Consortium and process was formed and has continued very well throughout the course of this grant. The group remains intact, and there is momentum to remain active to achieve the longer range goal of the “Vision for a National CSF Program. The Consortium includes individuals from four NIOSH agricultural Health Centers, two state agricultural health and safety centers, and other stakeholders from seven different states.
- New Key members to the Consortium group were added during the spring and summer of 2016. New persons representing the farm insurance industry, various agribusinesses, and the National Agricultural Safety Data Base have been added to the consensus committee, developing and strengthening critical relationship to achieving collaboration for building sustainability. A key alliance with the Agricultural Safety and Health Council of America (ASHCA) was established at their Board meeting. ASHCA intends to incrementally incorporate the CSF as their “signature national program”, with a targeted roll-out of 2018.
- Monthly phone conferences with the Consortium, supplemented by two face-to-face meetings were held in conjunction with the annual ISASH meetings.
- A CSF presentation about this grant was given by the PI at the 2015 ISASH meeting. A panel presentation with several key member of the Consortium group was presented at the 2016 ISASH presentation.
- A key component of the 2016 ISASH Agricultural Health and Safety Certificate Course included the CSF program in the prevention section as a proven total worker health program for the farmers and their workers.
- A new National Certified Safe Operations and Implementation Manual has been produced. This Manual include four proposed new subproject modules (producer education module, OSHA relevance module, a Worker Protections Standard Relevance Module, a Reviewer training module, and a Web Base project management module. Further specific components of the previous manual e.g. PPE selection, fitting, and accessibility, wellness modules) have been revised and updated.
- The CSF Consortium Committee remains active following the ending of this pilot grant. This is critical in maintaining momentum continued progress in establishing the versioned National Sustainable Certified Safe Farm Program.



Best Practices for Range Bison Herd Workers Clayton Kelling PI

It is widely recognized that agriculture is one of the most hazardous occupations in the United States. Livestock-handling injuries are among the most severe of all agricultural injuries. The bison industry is growing in the central states and handling bison is hazardous, especially on Indian reservations. Tribal herds, free to roam in large pastures on reservations, are gathered once each year and processed, which requires working the animals through alleys and restraining the bison in chutes. Dr. Kelling has worked with these herds carrying out herd health practices for six years, gaining first hand, real world insight into the high occurrence of worker safety hazards and risks typically-associated with handling bison under these conditions.

This pilot project conducted preliminary studies to begin characterizing safety hazards and risks associated with bison herd management practices on reservations. During the fall of 2014, onsite observational worker safety audits were conducted during roundup work on eight reservation herds in ND, SD, IA, NM and OK and three herds located off reservations in ND, SD and MT. This preliminary work confirmed common occurrence of worker safety risks, which were associated with use of high stress handling methods as well as with use of substandard facilities and equipment.

Tribal bison managers were surveyed and based on 25 responses, a widely-shared concern among respondents, consistent with our observations, is persistent occurrence of bison worker safety issues. This work has led to development of tribal outreach activities on bison handling and worker safety co-sponsored by Intertribal Buffalo Council, including: safety workshops at bison roundups, and creation and dissemination of the Bison Handler Tailgate Training manual, https://www.unmc.edu/publichealth/cscash/documents/Bison%20Handler%20Tailgate%20Training%20Safety%20Manual%20V1_2016.pdf

This pilot work has lead to NIOSH funding a larger five-year project to implement widespread awareness of One Health best management practices to enhance bison worker safety.

Kelsey Palm, Ellen Duysen, Risto Rautiainen and Clayton Kelling. Improving the Safety and Health of Bison Handlers. National Institutes of Occupational Safety and Health (NIOSH) Science Blog <http://blogs.cdc.gov/niosh-science-blog/2015/08/10/bison/>



Workers in South Dakota processing bison through a squeeze chute.

Community Driven Solutions to Address Farm Injuries

Lea Pounds PI

Social marketing has been used as an approach to tackle many public health issues. In the agricultural sector social marketing has been used to improve campaign offerings as well as to identify effective communication and distribution channels to reach farm workers. Community Based Participatory Research (CBPR) has also been used to engage affected populations. Anecdotal evidence and limited empirical evidence suggests that farm women serve as the primary gatekeepers for their families when it comes to health seeking behaviors. This evidence formed the basis for the inclusion criteria of women farmers and farm wives as participants in this study that explored community driven solutions to address farm injuries. In this project the participants acted as a long-term focus group because a primary goal of the project was to solicit in-depth insight. This goal required that the Principal Investigator (PI) be able to interact one-on-one with participants as well as observe interactions between participants in order to analyze the effectiveness of the project in creating a sense of ownership of the process and the outcomes. This goal also required that the participants be comfortable enough to engage in frank and open discussions about the process and decisions made.

The group met to examine existing data on farm injuries and discuss the impact of farm injuries. Working with the PI the women developed a matrix of ideas for a possible project focus by looking at high/low occurrence and high/low impact of various types of injuries. The study participants and the PI visited an equipment dealership and a local farm operated by a farmer who holds an engineering degree and also conducts safety training for employees of John Deere dealerships.

Study participants identified equipment safety as a key farm injury prevention strategy. They identified farmers themselves the priority group for the focus of the project and equipment dealers and repair technicians as a secondary group. Formative research to identify barriers and motivators consisted of previous and current discussions the study participants had with farmers within their social circles as well as their personal experience. Perception of time constraints was identified as the primary barrier to engaging in equipment injury prevention behaviors. Independence was identified as the primary motivator for engaging in equipment injury prevention behaviors.

Antelope Memorial Hospital Ag Safety Program

PI Carol Anderson

Antelope Memorial Hospital (AMH) is a not-for-profit corporation located in Northeast Nebraska serving approximately 7,500 rural residents in 15 communities. Medical clinics are located in five communities in its service area of seven counties. Antelope Memorial Hospital and its providers address the overall health care and wellness of area farm families. However, there was not a specialized program available for educating farmers and ranchers of the occupational hazards of production agriculture. This pilot project integrated wellness with evidence based primary prevention to create a sustainable program geared toward the occupational health and safety of farm and ranch families. Wellness, Farm Safety Events, personal protective equipment demonstration and health screenings were designed as part of the sustainable hospital program to promote safety on the farm and ranch.



Nebraska Pesticide Poisoning Surveillance Review and Outreach

PI John Lowe

Nebraska Pesticide Poisoning Surveillance Review and Outreach Pilot project is a collaborative effort by the Nebraska Department of Health and Human Services, Nebraska Regional Poison Center and investigators at UNMC/CS-CASH. The primary focus of this pilot research was to analyze pesticide poisoning case data to improve the Nebraska pesticide surveillance program. In addition to data



analysis the pilot project also initiated various outreach efforts aimed at improving awareness and engagement to ultimately increase reporting of pesticide poisonings. The pilot project collaborators developed a coordinated messaging campaign delivering pesticide poisoning information, pesticide poisoning data, and reporting requirements to health care providers and public health departments throughout Nebraska. Additionally, project investigators contracted with the Pesticide Safety Education Program at the University of Nebraska - Lincoln using pilot project funds and in-kind matching funds obtained by the Nebraska Department of Health and Human Services collaborator to develop public service announcements that aired on rural radio stations. Creation and delivery of Spanish language public service announcement through Spanish radio stations is also being explored through a potential collaboration with the CS-CASH Stress and Mental Health Among Latino Farmworkers pilot project.

Feedlot New Hire Safety Orientation Gordon Moore PI

This pilot project was initiated by filming three feedlot employees and/or managers reading a safety orientation script written by Gordon Moore of Moore Ag Safety. The scripts were customized to each feedlot. The videography was done in much the same manner as a YouTube “How To” video. This was done in order to help with employee buy in for the project and to aid with the initial cost. Each yard was chosen for its number of employees, accessibility and proactive mindset towards safety. Each feedlot took a different approach to producing their video. One feedlot used all supervisors, another used only management level employees while yet another used a majority of entry level employees. The script was provided in English and Spanish in order to accommodate Spanish speaking workers. The intent was to limit the length of the video, but it was found in order to cover all the information pertinent to orientation the length needed to be extended. After the videos were completed each feedlot was given a copy to use as an orientation for new employees and/or continued training for existing employees.

“We used the videos to train new employees and to provide refresher training to our seasoned employees.”

Texas Feedlot Manager

During the production of these videos a Safety Management System was introduced within the industry. One of the Pilot Project orientation videos was added to this computer based training system. Although the use of this type of training is relatively new to the feedlot industry, this computer based training has been well received. The other two feedlots are using their videos for orientation without the computer based system. All feedlots were pleased with the finished product. Surveys were conducted at each feedyard one year post video production. The results of the survey indicated that the videos were used throughout the year for initial and refresher training. The feedlot managers indicated that they were still satisfied with the videos and would continue to use them for training purposes. The employees had no problems viewing the videos. The managers noted that there would need to be updates added as the videos became out of date. This project demonstrated the feasibility of using customized feedyard training videos.



AgHealth Nebraska: a novel preventive health services model for Nebraska Farm Families

Matthew Beacom PI

The AgHealth Nebraska model addresses the medical and farm safety education needs of farm families. The AgriSafe Network, Certified Safe Farm, and wellness concepts have been incorporated into modern rural clinical practice. It is the aim of the AgHealth model to detect serious health conditions at an early stage, identify and remove injury and illness hazards, set personal wellness goals, and provide incentives for farmers to manage their health and wellness. AgHealth is designed to be sustainable with client fees, insurance reimbursements and agribusiness support. It is anticipated that participants will improve their health behaviors and reduce health and safety hazards. In the long term, this model will reduce injuries, illnesses and related costs.

Ten farms in Nebraska participated in this study. An occupational nurse with a farming background was trained to perform the farm visits. The nurse performed both the health and farm safety assessments. Using a customizable iPad application (BioCheck™) the health screening data are safely stored and can be readily accessed by the clinic physician. Working in collaboration with a business consultant and the AgriSafe Network, a business model is currently being developed that will guide future studies and assure long term sustainability. This model will provide a financial platform to identify insurance and industry business partners.

Grain Dust Exposure in the Allergic Lung

Jane Schuh PI

Agricultural workers and farming communities are repeatedly exposed to grain dust during harvest, transport, and storage. The objectives of this study were to investigate the impact of repeated grain dust inhalation on normal lungs and to compare/contrast that with the effect on allergic lungs. Our intent is to characterize the occupational risk of dust inhalation to an individual who is sensitized to fungus in order that evidence-based decisions on personal protection can be implemented. Dust samples were collected from the rafters of commercial grain elevators dealing in each commodity. Three fungal species were identified in the corn dust sample while only 2 fungal species were identified in the soy bean dust sample. There were nearly 3.5 times as many colony-forming units per gram of dust in the soybean sample as compared to the corn sample.

Using an inhalation model of fungus-induced asthma that was developed in our laboratory, we used mice that had been sensitized to and challenged with *Aspergillus fumigatus* fungus to examine the effect of repeated exposure to corn or soybean dust. Interestingly, when compared to allergic animals that did not receive dust exposure, both IgA and IgE were significantly decreased in the blood of allergic animals after exposure to sterilized soybean dust. We speculate that it may be due to anti-inflammatory properties of the soybean itself. Although caution should be taken in extrapolating these data to a broader context, our work shows no deleterious link between fungal allergic asthma and increased morbidity after inhalation of grain dust from corn or soybean.

Stress and Mental Health Among Latino Farmworkers

Athena Ramos PI

The Migrant Farmworker Health Study was developed to gather baseline data on the health of Latino migrant farmworkers in Nebraska, to better understand the migratory pattern of these workers, and to develop recommendations to improve working and living conditions for migrant farmworkers. As part of the project, a Migrant Health Task Force was created and facilitated to engage a diverse group of community partners in the initiative. Members of the Migrant Health Task Force include: University of Nebraska Medical Center, Center for Reducing Health Disparities; Creighton University, Office of Multicultural Affairs; Nebraska Migrant Education Program; Justice for Our Neighbors-Nebraska; and El Centro de Las Americas. The Task Force developed a survey that consisted of 103-questions about demographics, current health status, stress, depression, and substance use. The research team held community meetings in towns where farmworkers lived to discuss the importance of the project and obtain their participation in the study. The team visited eight communities in central Nebraska counties and had 200 people participate in the study. Participants were given a resource booklet on mental health, managing stress, substance use, and a listing of community health centers.

The team found that there were high levels of stress and depression among Latino migrant farmworkers with almost 46% of workers reporting symptoms of depression. There is a relationship between stress and depression. Among those who were stressed, over 70% were also depressed. The team developed categories of stress and a system to understand which stressors affect the feelings of depression. Almost 50% of stress was related to economics, living conditions, acculturation, and being socially isolated. Additionally, among those who were depressed, 24.5% reported that they had been injured on the job as compared to 12% among those who were not depressed. These results highlight the need for a comprehensive strategy to provide culturally, linguistically, and contextually relevant health education and interventions to improve mental and emotional health, occupational safety training, and access to appropriate social support services.

This project has had an impact by starting a discussion on migrant farmworker health in Nebraska. A relationship with the Consulate of Mexico in Omaha, Department of Labor, and Legal Aid of Nebraska has been established. There are a number of organizations across the state including the Center for Rural Affairs, Heartland Worker Center, and Justice for Our Neighbors-Nebraska among others who are now working to organize and educate Latino immigrants in rural areas, which may have implications for improving conditions for migrant farmworkers.

Chronic Bacterial Colonization, Agricultural Exposure and COPD Tricia LeVan PI

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death and a major cause of morbidity among persons greater than 45 years of age. Farming has been associated with COPD. Among farmers, it has recently been estimated that the prevalence of COPD is 30% in smokers and as much as 17% in never smokers. This study provides an opportunity to examine the airway microbial structure and function. The central hypothesis is that the indigenous airway microbiome changes with airway obstruction and agricultural exposure. The cohort consisted of 20 COPD patients with or without agricultural dust exposure. Induced sputum samples were collected. These samples were analyzed by 454 pyrosequencing, the data have been downloaded and the initial analysis phase of the mega-dataset has begun. To facilitate successful collection of induced sputum, a high-pressure nebulizer was purchased. A VA Merit application has been submitted using preliminary data generated from the CS-CASH program. Using these data a grant application to NIH was submitted. Breakthroughs in understanding the types of bacteria that infect the lungs of farmers and ranchers after exposure to agricultural dust will lead to better treatments and outcomes.

Imminent Hazards in English and Spanish Jason Stratman PI

A survey of 20 hazards common to agricultural sites was developed and distributed to agricultural workers in the central and western Nebraska regions. Surveys were distributed during agricultural training sessions and at regional farm and ranch shows. There were a total of 169 respondents, of which 69% were from feedlot operation and 31% were from harvest operations. An advisory committee was assembled to review the survey data and determine the final hazards to be depicted on pictograms. Members of the advisory group included: safety consultants, feedlot operation managers and a professional appraiser whose main focus is agricultural operations. The top 15 hazards were depicted into 10 pictograms as well as information on the dangers of talking and texting while driving.

The pictograms were developed in Microsoft PowerPoint. This software allows for easy modification. The intent of the pictograms is to bridge the growing English-Spanish communication gap; particularly for hazards that are imminent. Employers and employees have free access to the materials for distribution. It is anticipated that they will be used as part of short training sessions and reference material. The pictograms have been added to the National Agricultural Safety Database (NASD) and are available on the CS-CASH website.



Pre-Professional Perceptions of Safety and Quality Concerns in Agricultural Work Environments Gretchen Mosher PI

A strong positive correlation between agricultural quality problems and increased occupational safety risk has been documented, yet no empirical evidence demonstrated that pre-professional college students in the field of agriculture were aware of the association between the two concepts. The objectives of this study were to determine if agricultural pre-professionals perceived a positive correlation between occupational safety and quality management in agricultural work environments. The secondary objective was to determine if their perceptions differed by gender, their academic discipline, their academic classification, their agricultural work experience, or their childhood environment (i.e. raised on a farm or raised in non-farm environment).

An existing safety instrument was modified to include quality management components. The instrument was administered to approximately 4,000 undergraduate students in Iowa State University's College of Agriculture and Life Sciences.

Students perceived a high importance of both safety and quality, but a lower level of awareness and experience with the two concepts in agriculture. Furthermore, students also perceived a high impact of quality management systems on reducing agricultural safety hazards, but they did not feel that the mitigation of quality issues would actually lower the number of incidents. Perceptions of students did not differ significantly by their discipline of study, their childhood environment, or their work experience in agriculture. Females perceived quality management systems to have a stronger mitigating influence on safety incidents and hazards than did male students. Quality management education represents an alternate method of reaching agricultural students regarding work-place safety issues before they enter the field of agriculture. For this reason, solidifying the perception of students on the interconnectedness of managing quality and safety in agriculture is critical.

Certified Safe Farm Pilot Program - AgHealth Nebraska Dennis Holtz PI

The Nebraska Safety Center in Kearney Nebraska partnered on an AgHealth Nebraska farm safety assessment project with CS-CASH and University of Nebraska Medical Center (UNMC) College of Nursing at Kearney (UNK). The assessments and health screenings take place on farms in the Kearney area. Health screenings are conducted by first-year nursing students from the UNK College of Nursing using a mobile lab brought to the farm sites. Farmers, their families and employees are screened on site for blood pressure, blood glucose levels, hearing loss, skin cancer and other health issues. This screening allows study participants to identify potential health issues, set personal wellness goals and provides help in managing their healthcare. In addition to health screenings, Nebraska Safety Center personnel conduct safety assessments that include identifying, removing or fixing injury hazards on farm properties. The health screenings and safety assessments have become a successful components of the UNK Nursing program.



Development of a Multi-State Capacity to Disseminate and Evaluate the Efficacy of a Web-Based Stress management Program for Agricultural Producers Katherine Slama and Patrick Hart PIs

In an effort to address the unmet needs for prevention of behavioral health problems in agricultural communities, a symposium was assembled to provide input on online Dealing with Stress (DWS) workshops and forming a consortium to disseminate and evaluate them. The symposium successfully engaged a variety of stakeholders from 4 states. Their input was most useful in setting out guidelines for further grant proposals.

Identification of critical stakeholders is an important outcome. These participants and their organizations are likely to form the core of the advisory boards involved in carrying out future grants. These participants and their organizations will be invaluable in the effort to obtain further grants, where the greater leveraged impact will occur. The qualitative output consists of the detailed comments and suggestions that symposium participants provided. Their sharing of information about rural behavioral health needs of the population in their respective states is a valuable outcome.

Beyond the dissemination and evaluation grant, there are any number of opportunities for additional research involving the DWS Workshops across geographic and ethnic populations and agricultural sectors. Research might also identify the parts of the workshops that best serve particular agricultural and rural people and whether the workshops can serve a purpose in clinical practice.

Prevention and Treatment of Agricultural Respiratory Disorders: A Pilot Educational Program of Rural Health Care NPs and PAs Kathy Morris PI

Agricultural workers are exposed to an ever expanding number of potentially harmful agents that can affect the respiratory system. The prevention and treatment of acute and chronic illness related to agricultural respiratory disorders, is a necessary component in caring for the rural agricultural worker. In Nebraska, Nurse Practitioners (NPs) and Physician Assistants (PAs) provide care in rural areas of the state, however many have not had any formal education regarding agricultural-related respiratory diseases. This study evaluates the knowledge level of NPs and PAs regarding evaluation, diagnosis and treatment of agricultural respiratory diseases and pilots an innovative, evidence-based, continuing education program utilizing problem-based learning strategies.

Results from a survey sent to 631 NPs and PAs in Nebraska indicated that 71% were uncomfortable or somewhat uncomfortable recognizing and treating agricultural related illnesses. While 75% of the participants indicated that they would be interested in continuing education on respiratory-related disorders in agricultural workers. The knowledge portion of the survey indicated a need for education in a number of respiratory health topics. Educational programs and seminars for NPs and PAs were developed and continue to be presented in educational forums. The objectives for each session are for participants to be able to describe 5 common agricultural respiratory hazards, identify 4 respiratory conditions associated with agricultural dust and gas exposure and to determine when personal respirators are appropriate for use in the prevention of acute and chronic agricultural respiratory disease.

Data from this study were used in a grant application resulting in funding of a three year \$769,000 HRSA grant that offers advanced education and training for family nurse practitioners who work in rural and underserved areas.

Effects of Sleep Deprivation on Balance, Stress and Recovery among Farmers Ka-Chun (Joseph) Siu PI

Working hours in agriculture are highly seasonal and fluctuate by weather. Spring planting and fall harvest involve extremely long workdays and farmers often have less sleep during those busy times. Sleep deprivation might cause balance instability contributing to slip, trip, loss of balance and fall injuries, which are common and serious among ageing farmers. This project studied the performance among farmers longitudinally in repeated one-week observation periods before, during and after the busy spring planting and fall harvest seasons. Our pilot work has clearly indicated a strong relationship between sleep hours and instability in crop farmers. Increasing sleep loss can cause balance instability. We also found that our sample of six farmers were about seven times more likely to be unstable when they slept less than their average hours the night before the testing. These important data allow us to develop a larger scale of research and ultimately provide more scientific basis to form better recommendations for farmers to self-regulate their sleep and working hours in prevention of agricultural injuries.



AgHealth Nebraska: a novel preventive health services model for Nebraska Farm Families Matthew Beacom PI

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the health screening data are safely stored and can be readily accessed by the clinic physician. Working in collaboration with a business consultant and the AgriSafe Network, a business model is being developed that will guide future studies and assure long term sustainability. This model will provide a financial platform to identify insurance and industry business partners.

The 10 farms participating in the study have all completed the farm and wellness audit. Excellent feedback has been received on the safety inspection as well as the health screening. Neighboring farmers have inquired about being a part of the study group. Study investigators are looking at the feasibility of continuing this work as another study or working with other agencies to ensure that this project can continue. It is clear to that the work is necessary and with time could become self-sustainable.

Emergent, Re-emergent, and Persistent Issues in Agricultural Safety and Health in the CS-CASH Region Murray Madsen PI

Quarterly summaries of current press clips related to agricultural injuries and fatalities are analyzed, coded, and entered into an accessible dataset. These help track the evolving, persistent experience of producers and highlight targets for continuing prevention-intervention work. These data were used to create media messages that were disseminated to newspapers and used in email blasts to 27,000 farmers and ranchers in the CS-CASH 7-states region. Work is underway analyzing relationships between nonfatal injury events in press clippings and injuries reported in survey work by CS-CASH with USDA NASS.” These data were shared throughout the year with researchers, agricultural reporters and others who require statistics on injury and fatality rates.

Examples of outputs from the press clipping database are shown below:

Data sheets created for each of the 7 CS-CASH Regional States

Data used to survey emerging issues and develop educational materials



Missouri Agricultural Worker Fatalities 2012 - 2015

Missouri Tractor Related Fatalities*

March 28, 2012 Holden, 71 year old male lost control of his tractor, he fell off and the tractor rolled on him.
 July 17, 2012 Coater, 22 year old male employee was pinned between the ditch and a tractor while moving.
 August 18, 2012 Rolla, 16 year old female fell from and was pinned under a tractor.
 September 24, 2012 Garden City, 52 year old male was pinned underneath a tractor that overturned.
 September 30, 2012 Bowling Green, 80 year old male was pinned under a tractor that overturned.
 February 23, 2013 Maysville, 73 year old male was pinned under a tractor while blading snow.
 June 13, 2013 Cuba, 70 year old male operator of a tractor was using a rotary cutter when he overturned.
 July 13, 2013 Frankford, 15 year old male fell from the cab of a tractor and was run over by the trailer.
 September 22, 2013 St. Genevieve, 17 year old male was killed while operating a tractor with a rotary cutter.
 October 1, 2013 Odessa, 53 year old male was pinned underneath a tractor when it overturned on an embankment.
 November 9, 2013 Fordland, 68 year old male was ejected from a tractor when it jackknifed and overturned.
 November 13, 2013 Fordland, 72 year old man was partially ejected when the tractor he was driving overturned.
 November 26, 2013, 43 year old male was pinned under a tractor that slid sideways then overturned.
 January 9, 2014 Rocky Mount, 87 year old male was ejected when his tractor overturned.
 February 14, 2014 Cora, a male was pinned (run-over or rollover unspecified) by a tractor while feeding livestock.
 July 4, 2014 Olympian Village, 84 year old male pinned under mower that overturned on steep slope.
 July 25, 2014, Hermitage, 45 year old male was pinned under his tractor when he failed to negotiate a curve.
 July 28, 2014, St. Joseph, 84 year old male ejected from tractor when a truck rear-ended his tractor on a roadway.
 August 3, 2014, Pineville, 74 year old male was run-over by a tractor when the tractor moved.
 August 9, 2014, Athambara, 75 year old male fell from the bucket on his tractor while trimming trees.
 September 6, 2014, Marshall, 74 year old male backed a tractor over 15 foot embankment.
 November 15, 2014 Mound City, 45 year old male driving a tractor was pinned when the tractor went off a bridge.
 January 23, 2015 Belleville, 77 year old male driving a tractor was rear-ended by an automobile.
 March 28, 2015 Mount Vernon, 59 year old male in an unspecified tractor incident.
 April 28, 2015 Wellington, 62 year old male driving tractor collided with automobile attempting to pass.
 June 7, 2015 Elsberry, 55 year old male run over by mower when ejected from his tractor.
 July 8, 2015 Harrisburg, 34 year old male struck by rotary cutter when he fell from his tractor.
 August 4, 2015 East Prairie, 58 year old male pinned underneath tractor that overturned driving up a levee.
 August 10, 2015 Memphis, 62 year old male ejected from tractor that overturned while being loaded onto trailer.
 September 3, 2015 Bethany, 51 year old male ejected from overturned tractor while towing drill.
 September 3, 2015 Seymour, 60 year old male struck by tree limb and knocked off tractor.
 September 5, 2015 Florence, 11 year old male ejected and run-over after losing control on a steep roadway.
 October 10, 2015 Defiance, 47 year old male ejected when applicator overturned backwards.
 November 15, 2015 Peculiar, 52 year old driver of an automobile killed after colliding with a combine.

**Tractor rollovers are the single deadliest type of farm incident.*

CY2015 Production Agriculture Injury EVENTS Reported in Press Clippings (N = 164) (Includes 4-mon Internet Monitoring Trial)								
7-State Central States - Center for Agricultural Safety and Health (CS-CASH) Region				M D Madsen, 08 Feb 2016				
FATAL EVENTS (n = 70)		%	#	NONFATAL EVENTS (n = 94)				
Tractors and Mobile Machinery (Includes ATV's and Utility Haulers WORKING)	67.1%	47	Tractors and Mobile Machinery (Includes ATV's and Utility Haulers WORKING)	70.2%	66			
Overturn	38.3%	18	Overturn	12.1%	8			
Runover	14.9%	7	Runover	9.1%	6			
Crushed	12.8%	6	Crushed	7.6%	5			
Collision	12.8%	6	Collision	42.2%	28			
Entangled	2.1%	1	Entangled	10.6%	7			
Other & Unknown	19.1%	9	Other & Unknown	18.2%	12			
	100.0%			99.8%				
Grain / Feed Stuffs Storage & Handling (Includes entanglements but not trucks)	8.6%	6	Grain / Feed Stuffs Storage & Handling (Includes entanglements but not trucks)	9.6%	9			
Livestock Handling	2.8%	2	Livestock Handling	1.1%	1			
Other (Includes farmer-operated trucks)	21.4%	15	Other (Includes farmer-operated trucks)	19.1%	18			
	99.9%			100.0%				
Number of Injury or Death EVENTS in Press Clips by State in the 7-State Region (Includes 4-mon Internet Monitoring Trial)								
Fatal Events Recorded	MN	ND	SD	IA	MO	KS	NE	Region
	12	5	7	14	17	4	11	70
Nonfatal Events Recorded	23	4	3	19	22	9	14	94

*Collisions Between Motor Vehicles (MV) and Farm Equipment (FE) (other than trucks)

CS-CASH 2014 FE-MV COLLISIONS on Roadways

	COLLISIONS				INJURIES			FATALITIES		
	PDO	INJURY	FATAL	TOTAL	FE	MV	TOTAL	FE	MV	TOTAL
IA	92	61	6	159	29	62	91	4	3	7
KS	42	21	1	64	11	23	34	0	1	1
MN	93	38	2	93	10	40	50	2	0	2
MO	106	46	4	156	11	46	57	4	0	4
NE	48	14	3	65	4	13	17	2	1	3
ND	29	13	1	43	1	12	13	1	0	1
SD	19	8	0	27	1	8	9	0	0	0
CS-CASH	429	201	17	607	67	204	271	13	5	18

CS-CASH Core and Program Activities Database FY05

September 01, 2015– August 31, 2016 No. of Activities

Course/Curriculum (short course or training)	4
Material Distribution	14
Meeting/Conference	21
Training/Demonstration	29
Workshop	5

Total **73**

Article (peer reviewed)	23
Peer Review (grant/paper)	16
Presentation (oral)	37
Presentation (poster)	11
Annual Report	3
Article/Report (non-peer reviewed)	8
Booklet/Brochure/Factsheet	15
Interview (media/other)	6
Newsletter	17
Video/Multimedia Material/Website	3

Total **139**

Evaluation Instrument/Tool	3
Focus Group	8
Questionnaire/Survey/Checklist	3
Site Visit	2
Farm Safety Audit	3

Total **19**

Total CS-CASH Member Activities **231**

CS-CASH Peer Reviewed Articles September 1, 2015- August 31, 2016

- Burgus S, Duysen, E, Wendl, M. What Influences Farmers to Use Farm Safety and Health Information? *Journal of Extension*. June, 2015 16 In Press
- Burgus, S., Duysen, E., Rautiainen, R. Farmers' Age Influence on Farm Safety and Health Resources: A Research Note. Submitted for review *Journal of Rural Social Sciences*. 01-Oct-15.
- Burgus, S, Duysen, E., Reaching Farmers with Safety and Health Messages. *Safety*. In Review.
- Cramer M., Wendl M., Sayles H., Achutan C., Duysen E. Tracking knowledge, attitudes, and practices on respiratory and hearing health among the mid-western agricultural population *Public Health Nurs* 9/13/16- Awaiting Decision.
- Cramer, M., Araz, O., and Wendl, M. Social networking in an agricultural research center: Using data to enhance outcomes. *J Agromedicine*. 9/12/16 In Press
- Hawley,B.; Schaeffer,J.; Poole,J.A.; Dooley,G.P.; Reynolds,S.; Volckens,J.Differential response of human nasal and bronchial epithelial cells upon exposure to size-fractionated dairy dust. *J.Toxicol.Environ.Health Part A Curr.Iss.*, 2015, 78, 9, 583-594.
- Hofmann,J.N.; Hoppin,J.A.; Lynch,C.F.; Poole,J.A.; Purdue,M.P.; Blair,A.; Alavanja,M.C.; Beane Freeman, L.E. Farm characteristics, allergy symptoms, and risk of non-Hodgkin lymphoid neoplasms in the agricultural health study.*Cancer Epidemiol.Biomarkers Prev.*, 2015, 24, 3, 587-594.
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- Kaustell, K, Mattila, T, Rautiainen, R., Occupational injuries and diseases among commercial fishers in Finland 1996–2015, *Int Marit Health* 2016; 67, 3: 163–170 DOI: 10.5603/IMH.2016.0031
- Nordgren, T; Bailey, K. Pulmonary health effects of agriculture. *Current opinion in Pulmonary Medicine* March 2016 - Volume 22 - Issue 2 - p 144–149. doi: 10.1097/MCP.0000000000000247.
- Poole,J.A.; Romberger,D.J.; Wyatt,T.A.; Staab,E.; Vandegraaff,J.; Thiele,G.M.; Dusad,A.; Klassen,L.W.;Duryee,M.J.; Mikuls,T.R.; West,W.W.; Wang,D.; Bailey,K.L. Age Impacts Pulmonary Inflammation and Systemic Bone Response to Inhaled Organic Dust Exposure. *J.Toxicol.Environ.Health Part A Curr.Iss.*, 2015, 78, 19, 1201-1216.
- Poole,J.A.; Wyatt,T.A.; Romberger,D.J.; Staab,E.; Simet,S.; Reynolds,S.J.; Sisson,J.H.; Kielian,T. MyD88 in lung resident cells governs airway inflammatory and pulmonary function responses to organic dust treatment. *Respir.*, 2015, 16, 1.
- Ramos, A, Carlo,G, Grant, K, Trinidad, N. Correa, A. Stress, Depression, and Occupational Injury Among Migrant Farmworkers in Nebraska. *Safety (journal)* 23-May-16, Submitted Manuscript
- Ramos, A, Fuentes, Trinidad, N. Perception of Occupational Risks, Personal Protective Equipment (PPE) Use, and Prevention Opportunities Among Latino Immigrant Hog CAFO Workers in Missouri. *Journal "Safety" special call on agricultural safety and health*. 30-Jun-16, Submitted Manuscript
- Ramos, A, Carlo, G,Grant, K,Trinidad, N,Antonia Correa, A. Stress, Depression, and Occupational Injury Among Migrant Farmworkers in Nebraska. *Journal of Agromedicine*. 19-Nov-15. Written Manuscript
- Ramos, A. Child Labor in Global Tobacco Production: A Human Rights Approach to an Enduring Dilemma. *Journal of Health & Human Rights* 2016 "In press".
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- Weissenburger-Moser, L, Meza,J, Yu, F, Shiyanbola, O, Romberger, DJ, Levan, T. A principal factor analysis to characterize agricultural exposures among Nebraska veterans. *Journal of Exposure Science and Environmental Epidemiology* · April 2016. doi: 10.1038/jes.2016.20
- Wunschel,J.; Poole,J.A. Occupational agriculture organic dust exposure and its relationship to asthma and airway inflammation in adults. *J.Asthma*, 2016, 1-7.

CS-CASH Social Media and Photo Sharing Site

The screenshot shows the homepage of the Central States Center for Agricultural Safety and Health (CS-CASH). At the top, it identifies the parent organization as the College of Public Health. A navigation menu includes links for About Us, Outreach, Education, Research, Prevention, and News & Events. The main content area features a large photo of a person in a field, with a caption for the 'Ag Safety & Health Photo Sharing Site'. To the right, there is a 'Resources' sidebar listing various topics like 'Poultry Workers - Avian Influenza' and 'US AgCenter Safety Videos'. A 'Contact Us' section provides the center's address in Omaha, NE, and contact information. A 'Pilot Program Grants Available' notice states that applications are now being accepted. Below that, a 'View the winning videos from CS-CASH 3rd Annual FFA Farm Safety Video Contest' is advertised, mentioning that 60 second videos promoting safe and smart work habits in agriculture were created by FFA chapters.

CS-CASH Website:

<https://www.unmc.edu/publichealth/cscash/>

The screenshot displays the Facebook page for the Central States Center for Agricultural Safety and Health (CS-CASH). The page header includes the UNMC logo and the full name of the center. The main content area shows a post featuring a large red combine harvester in a field. Below the post, there are engagement metrics: 418 Post Reach, 0 Website Clicks, and 0 Call Now. The page also shows a 'This Week' summary and a 'New to Facebook?' prompt.

CS-CASH Facebook:

<https://www.facebook.com/unmccscash/>

The screenshot shows the Twitter profile for UNMC CS-CASH (@UNMC_CSCASH). The profile picture is the UNMC logo. The header includes the name 'UNMC CS-CASH' and the bio: 'University of Nebraska Medical Center, Central States Center for Agricultural Safety and Health (UNMC CS-CASH)'. The page shows 12 tweets, 6 followers, and 2 following. A recent tweet from AgAbility is visible, discussing pipeline safety. A 'New to Twitter?' prompt is also present.

CS-CASH Twitter:

[@UNMC_CSCASH](https://twitter.com/UNMC_CSCASH)

The screenshot displays the Flickr photo sharing site for CS-CASH. The header features the UNMC logo and the center's name. Below the header, there is a grid of photos showing various agricultural scenes, including people working in fields and a combine harvester. The interface includes navigation options like 'Camera Roll', 'Photostream', and 'Albums', and a search bar.

CS-CASH Photo Sharing Site

<https://www.flickr.com/photos/cscash/>