Section I

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: 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, which aim to discover the mechanisms of injury and illness, and to develop, implement, and evaluate prevention strategies that measurably improve the health and safety of 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 – grassroots partnerships we can address local, regional and national issues. The Center research projects focus on injury, asthma, hearing loss, and sleep deprivation. Information is disseminated through events, courses, presentations, articles, and messages in electronic and printed media.

Key Personnel

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<th>Name</th>
<th>Role</th>
<th>Phone</th>
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CS-CASH Website: www.unmc.edu/publichealth/cscash/
Section II– Program/Project Highlights

CS-CASH Annual Report

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 the differences and similarities in information needs. The traditional farmers are separated into two income groups resulting in five groups. In the first year of the project three data collection methods were used:

- National Agricultural Statistics Service administered a survey to 1,038 farmers in seven Midwestern states asking questions about hazard recognition, information preferences, prevention strategies, communication channels, and child/youth injury prevention practices. The response rate was 20.7%; 223 farmers completed surveys.
- Face to face interviews were completed with 510 farm family members during agricultural shows, fairs and farmers markets in the CS-CASH 7-state region. Five questions about demographics and nine questions about safety and health issues were asked.
- Focus groups were conducted with three of the five demographic groups in ND, SD and MN. Each focus group addressed five questions about changes in farm safety and health, communication channels, and prevention techniques used within the family. Focus groups with organic and larger income traditional farmers are planned for Nebraska and Iowa.

Data collected from each method will be compiled and compared to identify the differences and similarities among the various farm groups. This information will be used to develop relevant resources for each group, pilot tested with each farmer group, and adapted upon results.

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

Modern industrialized farming practices have led to working conditions that include high levels of airborne dust. Agricultural workers inhale these complex organic dusts daily, leading to airway inflammation and a higher risk for developing chronic obstructive pulmonary disease. The mechanisms regulating the organic dust-induced airway inflammatory response in the lung are not well defined. Lung inflammation is associated with changes in airway nitric oxide levels and increased protein kinase C activation. We investigated whether overexpression of a nitric-oxide protective enzyme (DDAH) would lead to decreased pulmonary inflammation in an animal model of organic dust exposure. We instilled wild-type (WT) and DDAH overexpressing mice with an aqueous organic dust extract (ODE) collected from a swine confinement building. Findings:

- Inflammatory cells and cytokines were lower in the DDAH overexpressing mice compared to WT after ODE instillation.
- Dust-stimulated increases in protein kinase C were diminished in the DDAH overexpressing mice.
- We also tested an important component of the ODE, peptidoglycan (PGN). We noted a similar decrease in neutrophils and inflammatory cytokines in the DDAH overexpressing animals instilled with PGN compared to WT.

Publications:
- KL Bailey, Wyatt TA, Wells SM, Klein E, Robinson JE, Romberger DJ, Poole JA. Dimethylarginine dimethylaminohydrolase (DDAH) overexpression attenuates agricultural organic dust induced inflammation. Journal of Environmental Immunology and Toxicology, in press
**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.

The first round of data collection was conducted in the spring of 2012; 2299 out of 7000 farms responded (33% response rate). These farms had 2837 operators. The majority of them were male (82%), and the majority spent more than 50% of their time working on a farm or ranch (56%). The average sales were $180,400. The incidence of injuries among operators was 6.1% (172 injuries in 2011). The average direct cost of injury involved out-of-pocket expense of $1712 and insurance pay of $7723. Nearly 58% (99) of injuries required professional medical care, 12% (21) resulted in hospitalization, and 117 injured operators lost work time ranging from less than half a day to 30 days or more. The injury surveillance also involves tracking injury cases through a press clipping service. In 2012, this system found 92 fatal and 102 non-fatal 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.

Publications:

**Outreach Program**  
*Debra Romberger Program Director*

The CS-CASH Outreach program has focused its work in year one on creating and distributing educational materials related to increasing the understanding of lung problems caused by agricultural dusts and promoting the use of personal protective equipment (masks and respiratory systems) in dusty work environments. Using social marketing strategies, we have designed flyers aimed particularly at corn and soybean growers that promote the use of masks and have distributed them electronically via e-mail to over 14,000 farmers and ranchers. Flyer example:

http://www.unmc.edu/publichealth/cscash/images/CS-CASH_Save_Your_Breath_Flyer.pdf

Flyers and respiratory storage bags for masks were distributed at 13 agricultural shows and exhibits in 8 states. In collaboration with AgriSafe Network we have also created four short videos now available on YouTube that give practical advice about selecting the right mask for the right job, getting the right fit and how to properly care for masks. These videos were distributed to producers via e-mail and via links on the CS-CASH website.

Video Links http://www.unmc.edu/publichealth/cscash/ (Safety Spotlight)

We have created the CS-CASH Community Contact Network (CCN) of public health, extension, agribusiness, producer and grass-roots organizations and individuals with an interest in promoting agricultural health and safety. The CCN serves as a portal for getting educational materials and updates on emerging issues into the community and currently has over 900 contacts. We utilized our CCN to address an important issue this fall harvest season when, in collaboration with AgriSafe Network, Iowa’s Center for Agricultural Safety and Health and the Great Plains Center for Agricultural Health we created and distributed information related to potential dangers with aflatoxin in harvest dusts.

The incidence of injuries among survey respondents was 6.1% resulting in an average out of pocket expense of $1712.

Press clippings from 2012 reported 92 fatal agricultural injury cases in the CS-CASH seven -states region.

“I wear a mask because after cleaning a bin I can be sick for up to a week. I can only imagine what the long term effects would be.”  
*(Interview with Iowa farmer)*
Pilot and Emerging Issues Projects
Eleanor Rogan Program Director

One essential program within CS-CASH is the Pilot/Feasibility Projects and Emerging Issues Program, which supports pilot and feasibility projects, with the goal of enabling 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.

Announcements of the availability of funding for pilot/feasibility projects were sent out in October 2011, with a due date for receipt of proposals of mid-November. Six proposals were submitted and reviewed by appropriate members of the CS-CASH Internal Advisory Committee. Three projects were funded. As a result of a $60,000 award from the UNMC Vice Chancellor of Research CS-CASH was able to fund two additional pilot projects, including an emerging issues study: Grain Dust Exposure in the Allergic Lung (Schuh, North Dakota State University).

A review of the funded pilot programs follows:

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

The goals of this project are to determine how sleep deprivation affects balance in farmers and influences stress and recovery based on heart rate variability. These goals will be accomplished by studying the performance among farmers longitudinally in repeated one-week observation periods before, during and after the busy spring planting and fall harvest seasons.

We have collected balance performance, sleep patterns and daily activity levels from four farmers during and after the fall harvest season, and will continue to collect data from them in the next planting season. We will identify and collect data from four additional farmers at the remaining season. We expect that this ongoing project will establish the exposure-response relationship of sleep patterns and physical and physiological performance. We aim to provide the scientific basis for new guidelines recommending how farmers should self-regulate their sleep and working hours, particularly during

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

The purpose of this intervention study is to prevent further hearing loss in farmers by increasing their access to hearing protection devices, by placing these devices near all major sources of noise on the farm. After obtaining Institutional Review Board (IRB) approval for the study, we began recruitment of farm families. Two researchers received training from the Council for the Accreditation of Occupational Hearing Conservationists on providing hearing tests, and are certified as Occupational Hearing Conservationists. These researchers will conduct farm visits and hearing tests.

We have recruited seven farms, of which four are in the intervention group and three are in the control group. Study participants had the study explained to them, and after obtaining their written consent, we tested their hearing; they have also filled out a medical history and a questionnaire related to their beliefs and opinions about wearing hearing protectors. In consultation with the IRB, we are increasing our recruitment effort by placing flyers in places frequented by farmers, as well as sending letters to farmers living approximately 50 miles from Omaha, NE.
AgHealth Nebraska: a novel preventive health services model for Nebraska Farm Families
Matthew Beacom PI

Agriculture is a vitally important part of Nebraska’s economy, yet farmers experience high rates of injury and illness and poor access to medical care. We have initiated a novel AgHealth Nebraska model that addresses the needs of farm families. We incorporate AgriSafe Network, Certified Safe Farm, and wellness concepts into modern rural clinical practice. With the AgHealth model we aim 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. We expect 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 central Nebraska have agreed to participate in this study. An occupational nurse has been trained to perform the farm visits. She will perform the health and farm safety assessments. Equipment is in place for the biometric data to be analyzed.

A business consultant on the project has created a customizable iPad application (BioCheck™) for this study. Working with this consultant we will develop a business model to guide future studies and assure long term sustainability. This model will provide a financial platform and identify industry business partners.

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

Current press clips related to agricultural injuries and fatalities are analyzed, coded, and entered into an accessible dataset that is distributed each month. These reports facilitate discovery of issues, including the newly-emergent ones, and encourage dialogue and information exchange. Quarterly summaries were prepared to help track the evolving, persistent experience of producers and to highlight targets for continuing prevention-intervention work. To date in CY2012, press clips have captured 73 fatal and 76 nonfatal events; 75% of fatal and 70% of nonfatal events involved mobile machinery. Overturns and run-overs are about two-thirds of the mobile machinery deaths; collisions between farm equipment and motor vehicles top the non-fatal injuries at 42%. Five media messages were created and disseminated about clashes between farm equipment and motor vehicles on roadways, safety in the pasture at calving time, using past CFOI and press clip information to guide prevention efforts for the harvest season ahead (MN and NE), and strategies for a safer end in production agriculture this year in our region. Sample testing is underway to evaluate hyperlinks from database records to source clip-pings on the internet to further attract and assist researchers. We are beginning to analyze relationships between nonfatal injury events in press clippings and injuries reported in survey work by CS-CASH with USDA NASS.

In collaboration with the Great Plains Center for Agricultural Health (GPCAH), a baseline dataset of 1607 records categorizing 766 fatal and 841 nonfatal farm and agricultural injury events reported in press clips across the 9-state region for the 5-year period 2007-11 was completed with CS-CASH data. Related work completed includes a poster and presentation for the 2012 Midwest Rural Agricultural Safety and Health Conference, and a meeting of (16) Midwest region advisors, including CS-CASH and MN-WI (UMASH) Ag Center representatives.

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 recognition that this complex mixture of particulates can trigger acute respiratory distress is not new, but the ways in which it may exacerbate both immediate and long-term outcomes of allergic asthma remain unclear. The objectives of this study are to investigate the impact of repeated grain dust inhalation on normal lungs and to compare/contrast that with the effect on allergic lungs. Using an inhalation model of fungus-induced asthma that was developed in our laboratory, we have exposed normal mice to corn dust (collected from the rafters of a commercial grain elevator). Few microbes were noted in the sample and consisted of Gram-positive spore-forming rods and 3 unique fungal species, which are currently being identified. Physiologically, our early data has revealed a prominent, but short-lived, airway neutrophilia that corresponds to increased airway hyperresponsiveness in naïve mice subjected to a series of 3, 20-min dust exposures. Continuing, we will compare airway responses and inflammation after multiple grain dust exposures in naïve and allergic lungs, as well as the chronic architectural changes that account for much of the morbidity of long-term asthma. 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.
Education/Translation Core
Susanna Von Essen Director

During the first year of the Education/Translation Core elements of agricultural health and safety were incorporated into various curricula used on the UNMC campus. This topic was integrated into a general discussion of rural health and the importance of understanding of occupational health problems caused by a variety of exposures common in the region. Experiential learning was used as a teaching tool whenever possible.

All UNMC medical students in the second year received a lecture on farm health and safety as part of the Integrated Clinical Experiences curriculum. A similar lecture was given to the physician assistant students. A summer class on rural health and safety was held for pre-health professions students, with an emphasis on occupational health for production agriculture. A highlight of that week was a visit to the University of Nebraska farm to learn first-hand about farm health and safety. A week long Agricultural Medicine Course was attended by 20 health care professionals from across the US. Continuing education credit was available to physicians, nurses and veterinarians who attended this course. In addition to having a class session devoted to farm health and safety as part of the Advanced Occupational Health Course for the MPH students, they also participated in Husker Harvest Days, a farm trade show held in September of 2012 near Grand Island, Nebraska. The show’s health fair gives farmers an opportunity to interact with medical professionals to receive health screening and information. MPH and nursing students helped with this event, giving them a unique experiential learning opportunity.

In summary, this educational program impacted many students on UNMC’s campus and throughout the US, including medical, physician assistant, nursing and MPH students. It introduced college undergraduates to agricultural health and safety. A wide range of farm health and safety topics were covered. It is robust and ready for dissemination to other medical schools and colleges of public health.

### FY01 CS-CASH Activity

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<th>States Involved</th>
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<tr>
<td>Course/ Curriculum (short course or training)</td>
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<td>Focus Groups</td>
<td>MN,ND,SD</td>
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<td>Interview (media/other)</td>
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<td>Material Distribution (Ag shows, fairs and exhibits)</td>
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<td>Meeting/Conference</td>
<td>IA,MN,NE,ND,SD,AK,IL</td>
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<td>Newsletter</td>
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<td>Peer Review (grant/paper)</td>
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<td>Educational Presentations (oral)</td>
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<td>Project Site Visits</td>
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The Evaluation Core placed high priority during year one on developing the infrastructure to monitor and track progress of our projects. We developed an on-line Access database that allows project directors to record their on-going activities so that we can measure benchmarks to outcome achievement. A second priority for Evaluation has been gaining baseline data on the organizational effectiveness of our Center. In June we administered the Internal Coalition Effectiveness (ICE©) instrument to 34 members and leaders of our project and results showed good levels of shared mission/vision, participation, use of resources, knowledge gained and overall satisfaction with the direction of the project. We will re-administer the ICE instrument next year to measure continued growth in our organizational effectiveness. In August 2012, the Evaluation Team conducted site visits to five pilot projects in three states for the purpose of assessing progress, training on evaluation methods/database use, determining needs and establishing communication links. Qualitative analysis showed that distance projects feel connected to our Center, are satisfied with the support they receive, and look forward to continued collaborations with our Center. Evaluation staff attended the WestON conference in Denver. We also attended a national gathering of NIOSH Evaluators held pre-conference to the American Evaluation Association in Minneapolis. Our project presented on the ICE instrument.

For year two, the Evaluation Core is focused on examining outcomes of programs and developing a database for impact. We have developed a mailed survey to a random sampling of farmers in the seven state regions to establish baseline data (i.e., knowledge, attitudes, practices, and morbidity measures) as regards the major foci of our outreach projects: a) mask protection for grain/livestock dust; b) hearing protection; and c) injury prevention. This survey will be re-administered annually to measure changes based on post-intervention (i.e., outreach and education activities).