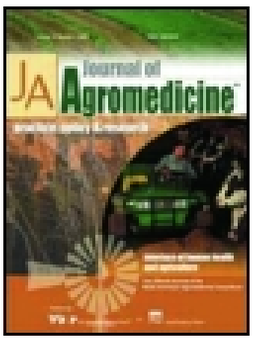

Journal of Agromedicine

ISSN: 1059-924X (Print) 1545-0813 (Online) Journal homepage: https://www.tandfonline.com/loi/wagr20

Aging and Disabled Workers Education and Outreach Heat Related Illness Language, Literacy and Cultural Barriers Livestock Handling Musculoskeletal Disorders Pesticide Exposure Respiratory Issues Safe Tractor Operation Zoonotic Influenza Other

To cite this article: (2010) Aging and Disabled Workers Education and Outreach Heat Related Illness Language, Literacy and Cultural Barriers Livestock Handling Musculoskeletal Disorders Pesticide Exposure Respiratory Issues Safe Tractor Operation Zoonotic Influenza Other , Journal of Agromedicine, 15:3, 307-327, DOI: 10.1080/1059924X.2010.504470

To link to this article: https://doi.org/10.1080/1059924X.2010.504470

Published online: 27 Jul 2010.

Journal of Agromedicine, 15:307–327, 2010

ISSN: 1059-924X print/1545-0813 online
DOI: 10.1080/1059924X.2010.504470

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ASHCA/NIOSH CONFERENCE: SELECTED ABSTRACTS

AGING AND DISABLED WORKERS

Obstructive Sleep Apnea Indicators and Injury in Older Farmers

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The purpose of this study was to explore the relationship between sleep apnea indicators and injury in older farmers from Kentucky and South Carolina. The cross-sectional study focused on survey data collected during the fourth wave of data collected for the study entitled Sustained Work Indicators of Older Farmers (Reed, R01 OH07534-01). Subjects included in the current study reported at least one day of farm work during the preceding year (n = 756). The primary outcome variable was the reported occurrence of injuries because of farm work in the past year. The main explanatory variables of interest included the following sleep characteristics: reported snoring, gasping, snorting, or breathing while asleep; trouble sleeping; consumption of sleep medications; trouble staying awake during daytime; and self-rated overall sleep quality. Descriptive statistics were calculated for the outcome and explanatory variables. Bivariate association tests between the outcome and explanatory variables were conducted using simple logistic regressions. Explanatory variables that showed significant association with the outcome in the bivariate analyses were then used to fit an initial multivariable logistic regression model. Just over 10% of respondents reported an injury related to farming in the previous year. Significant bivariate associations were detected between the occurrence of injuries and number of days of farm work; number of hours of farm work during the last week; male gender; arthritis or rheumatism conditions; stopped breathing while sleeping; and problems staying awake during the past month. In the final multivariable model, "apneic periods during sleep" (p = <.05) and "problems staying awake last month" (p = < .01) were retained. Sleep problems were associated with injury in this sample of older farmers. Future studies are necessary to screen and diagnose older farmers with OSA to empirically determine the effect of this sleep disorder on injury.

Disclaimer: This poster presentation was presented at the Center for Aging Annual Meeting, University of Alabama at Birmingham, August 28, 2009.

Support: Agrinursing Fellowship, University of Kentucky College of Nursing (Heaton) via *Sustained Work Indicators of Older Farmers* (Reed, R01 OH07534-01).

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An Assessment Process to Estimate the Secondary Potential of Assistive Technology Adopted by Farmers with Disabilities

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Farmers with disabilities frequently fabricate or modify devices and worksites – referred to collectively as assistive technology (AT) in order to continue performing required tasks on their farms. In some cases these AT have been documented to cause secondary injury. Further, some farmers with disabilities are not able to fully benefit from traditional funding sources, such as vocational rehabilitation agencies, because such one-of-a-kind or personally fabricated technologies fall outside *"normally"* funded-services whose primary concerns include the reliability of the AT and/or the potential liability issues if injuries occur. It is believed that an assessment process with the appropriate empirical support to indicate the potential for secondary injuries with a reasonable degree of reliability may decrease the frequency and severity of injuries as well as reduce barriers to achieving employment and independence. Also, the validated assessment process can be a resource to train rehabilitation professionals in identifying potential injury hazards on both commercially available and locally fabricated AT used in the farm workplace. Hence the research goal was 'to develop a strategy supported by empirical data to identify potential AT-related hazards and the potential for work-related secondary injuries for farmers who adopt personally or locally fabricated AT to compensate for disabling conditions, through a consistent assessment process'. On-site case studies of 19 farmers with disabilities who fabricated AT for personal use were completed, and potential causative factors for secondary injuries were identified. A survey of 43 rehabilitation professionals, experienced in working with farmers

having disabilities, was conducted to identify their perception of the significance of injury causative factors identified from the case studies. Relevant ASABE and SAE standards, OSHA workplace safety regulations and current agricultural workplace safe work practices were referenced to assess compliance with applicable safety standards and as a source of the state-of-the-art design practices. A prototype of the assessment process was developed and the same was validated using an expert panel consisting of six rehabilitation professionals evaluating nine different ATs. The desired outcomes included steps to (a) minimize secondary injuries caused by ATs, (b) help framers with disabilities obtain funding for the purchase or fabrication of ATs, and (c) train rehabilitation professionals who work with farmers to identify potential disability-related hazards. Dissemination of the assessment process has been started with presentations to AgrAbility professionals involved in rehabilitation of farmers with disabilities, and at workshops and conferences.

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Safeguarding Older Farmers

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The objective of the study is to present the state of health and injury of farmers age 50 and over with suggestions for maximizing their health. As with the rest of the United States workforce, America's farmers are aging. The average age of principal farm operators was over 50 in all states in 2002; the 2007 Agricultural Census reported an average age of 57.1 (NASS, 2009). In addition, farmers over age 55 now comprise over 30% percent of all farm workers (Myer, 2005) Complex and multidimensional physiological and psychological changes conspire to place older farmers at a higher risk for injury and poorer outcomes than their younger counterparts. Myers and colleagues (2007) noted that farmers over age 55 had a death rate nearly 2.5 times that of the younger group. Fatalities to older farmers made up over half of all adult farm fatalities between 1992 and 2004. A five year survey based study of 1,423 farmers age 50 and over in KY and SC revealed the leading self-reported health conditions were hypertension (55%), arthritis (54%), and problems with their backs (32%), hearing (27%), and vision (26%). In addition, 3,028 observations of only six injury types revealed 620 injuries (20.5% of the observations); 44% of those were farm work related. Persons working greater than 20 hours per week had twice the risk of injury compared to those working 1–10 hours per week; better perceived health status also was associated with greater risk for injury. Despite the effects of aging, co-morbid chronic health conditions, and the high injury rate, very little attention has been focused on safeguarding older farm workers. Work to date on this topic and potential strategies for decreasing injuries to older farm workers will be presented.

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EDUCATION AND OUTREACH

The High Plains and Mountain Region Dairy Health and Safety Workshop: A Participatory Approach to Identify Research and Outreach Needs in the Dairy Industry

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US dairy production has steadily moved to industrialized operations because of associated economies of scale. These "mega-herd" dairy operations present new occupational health and safety challenges to both dairy owners and workers. There is limited research addressing worker health and safety on these large-herd operations. The High Plains Intermountain Center for Agricultural Health and Safety (HICAHS) partnered with the Southwest Center for Agricultural Health, Injury Prevention, and Education (SWAG) to host the High Plains and Mountain Region Dairy Health and Safety Workshop October 15 - 16, 2009 in Denver, CO. The objectives of the workshop included the following: 1) to provide an interactive forum to exchange ideas and strategies to effectively address dairy worker health and safety; 2) to identify and prioritize dairy worker health and safety issues; 3) to identify process management strategies that address worker health and safety; and 4) to identify future research and outreach priorities. In addition to Center personnel workshop attendees included faculty from a US university and one Swedish university, dairy extension specialists (representing CO, TX, NM, SD, ND, IA, and UT); six dairy owners and managers (representing CO, TX, NM, and SD); one dairy equipment manufacturer, one workers' compensation provider, and dairy producer organizations (CO, TX, and NM). The workshop sought to bring together the attendees' multiple perspectives to facilitate a dialogue on worker health and safety issues in the dairy industry. Through presentations, group and panel discussions the workshop organizers sought to identify and then prioritize pressing dairy worker health and safety issues, and generate recommendations and strategies for dealing with the challenges of addressing health and safety among dairy workers. A pre-post workshop evaluation is currently underway and the results will be included in the presentation. The dairy workshop appeared to be a successful means to identify and prioritize future research, and outreach efforts to address the health and safety of workers on industrialized dairy operations.

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Health Hazard Educational Products for Workers in Agriculture

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Workers in agriculture are exposed to many outdoor health hazards that depend on their type of work, geographic region, season, and duration of time they are outside. The Education and Information Division (EID) of NIOSH is developing educational materials for employers and workers about these health hazards in collaboration with scientists internal and external to NIOSH. The goal of these educational products is to provide materials for agricultural workers on hazards they may be exposed to while on the job. These products describe each physical, biological, or chemical hazard and provide steps for prevention and basic first aid recommendations. In addition, these products provide portable, accessible, and easy-to-use information about individual worker hazards. Current and future NIOSH electronic and print products for workers in agriculture include Workplace Solutions, web topic pages, and NIOSH Fast Facts cards. Product topics currently in development include: tick-borne diseases, mosquito-borne diseases, poisonous plants, venomous snakes, venomous spiders, stinging insects, heat stress, cold stress, and sun exposure (ultraviolet radiation). NIOSH/EID is interested in partnering with other researchers to develop additional educational products about health hazards to workers in agriculture.

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Community Collaborations for Agricultural Health - Applications in the Northeast

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The Northeast Center for Agricultural Health's (NEC) community-based partnerships are addressing important health and safety issues in diverse agricultural populations at several sites across the northeast. A project with Maine blueberry harvesters led to widespread use of a more efficient, ergonomically superior harvesting rake. A project in New York addressed eye irritation and is currently focusing upon musculoskeletal injuries. Another NY project aims to reduce child injuries in a Mennonite population. Through the evaluation process of these NEC community-based projects, similar themes appeared, strengths and weaknesses were identified and important lessons learned for better project development. This presentation will emphasize the lessons learned in the partnership with the University of Connecticut's Migrant Farmworkers Clinic seeking to reduce skin and eye irritation among shade tobacco workers. Input from the community (farmworkers, employers, and farmworker advocates) guided the selection of the target health problem, the modes of intervention and the evaluation measures. Two interventions were implemented to improve access to water/hand washing and hygiene: the workers were invited to attend hygiene trainings and the growers were encouraged to place more hand washing facilities with soap and towels in the fields. Evaluation results demonstrate high acceptance of the intervention by the workers and modifications by employers to assure high rates of compliance. The community-based approach presents a number of challenges but assures projects relevant to the community and ultimately feasible for dissemination.

Disclaimer: This poster has not been presented previously. Some of these data have been presented orally at the recent American Public Health Association Annual Meeting.

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Economics of Preventing Agricultural Injuries to Adolescent and Adult Farm Workers: Surveillance, Exposure and Intervention Effectiveness Data that Supports an Intervention Model for Teachers as Safety Advocates in Rural Schools

Joan M. Mazur, PhD; Henry P. Cole, EdD; Melvin L. Myers, MPA; Gerry M. Swan, PhD; Kathy O. Swan, PhD; Susan C. Westneat, MA; Andrew J. Ashford

University of Kentucky, Southeast Center for Agricultural Health and Injury Prevention

This poster will display results from three years of demographic and pre-post data on attitudinal, knowledge and behavioral intention measures obtained from pre-career professionals trained (i.e. student teachers) in the use of narrative simulations and cost tools (N = 418 intervention group/387 control group). These educational interventions are designed for use with high school students aged 15–19 who are at the highest risk for farm injury and fatalities in four injury categories: crush injuries from tractor overturns, closed head injuries from ATV and horseback riding incidents, motor vehicle/equipment collision and noise-induced hearing loss. Demographic data show that many pre-career professionals have experiences with such injuries regardless of whether or not they have lived or worked on farms. These experiences prove to be motivating factors in engaging teachers as agricultural safety advocates. Also pre-post data show that there is a significant improvement in knowledge about these injuries, how to prevent them and the individual and social costs of these incidents. Thus informed, these teachers' increased awareness informs a sense of responsibility as change agents in the rural communities in which they work. In follow up interviews, program participants are using these materials and acting as agricultural safety advocates in the rural schools in which they have obtained teaching positions. In addition, the research poster presentation will include an R2P transdisciplinary model for educational intervention to

promote safety advocacy by public school teachers in rural schools.

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Preparing Rural High School Teachers and Extension Agents to Become Advocates for Preventing Injuries to Adolescent and Adult Farm Community Members

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This poster describes a transdisciplinary R2P educational intervention project that prepares pre-career public high school teachers and extension agents to become farm and rural-life safety advocates in the communities in which they live and work. Pre-career professionals in three states (KY, MS, FL) were trained in the use of narrative simulations and economic cost tools that depict four categories of severe injuries for which rural high school students, age 15–19 years are at high risk. These include crush injuries from tractor overturns, motor vehicle/farm equipment roadway collisions, closed head injuries from ATV and horseback riding, and noise-induced hearing loss. After completing a simulation the college students use interactive Excel spreadsheets to calculate the prevalence, severity, and cost of the injuries and cost effectiveness of their prevention. They then gather additional case materials and prepare short media digital documentaries about similar cases. The study design included an intervention (n = 418) and a control (n = 387) group. Farm and rural life experience demographic data were collected for both groups. Other pre and post intervention measures assessed the participants' knowledge about the injury hazards depicted in the simulations as well as their attitudes and behavioral intentions regarding preventing the injuries studied. The demographic data revealed that many of these pre-career professionals had experience with such injuries regardless of whether or not they have lived or worked on farms. The pre and post measures found a significant treatment group improvement in knowledge about these injury events, their individual and social costs, and prevention. Sharing their own experiences and analyzing the case materials increased intervention group participants' sense of responsibility as safety advocates in communities where they live and work. Follow-up interviews revealed that program graduates use the simulations and cost tools in the rural schools in which they work.

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Certified Safe Farm – Identifying and Removing Injury and Illness Hazards on the Farm

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The Certified Safe Farm (CSF) program aims to reduce farm-related injuries, illnesses and related costs. It includes a health screening, on-farm safety review, education, and incentives. In this presentation we describe the development of the on-farm safety review tools and characterize the hazards and safety improvements documented in the CSF study. The on-farm safety review checklist was developed based on a review of over 40 existing safety checklists. An expert panel selected the most important questions and rated their importance (weight factors) based on frequency and severity of related injury and time, cost, acceptability, and effectiveness of the typical available correction. The review produces a safety score (scale: 0–100, 100 safest) for the farm. On-farm safety reviews were conducted annually (1998–2003) on 185 farms in Iowa by four trained local reviewers. Hazards and safety improvements were documented and their monetary costs were estimated by an expert panel. Average farm review scores improved from 90 to 95 during the five year study period. A large number of hazards were identified, particularly in machinery during the first years of the study. A total of 1292 safety improvements were reported at estimated cost of $650 per farm. A wide range of improvements were made including adding 9 ROPS, 59 Power Take-Off (PTO) master shields and 207 Slow Moving Vehicle (SMV) signs, improving lighting on 72 machines, placing 171 warning decals on machinery, shielding 77 moving parts, locking up 17 chemical storage areas, making 83 lockout/tagout improvements, and making general housekeeping upgrades in 62 farm buildings. The CSF on-farm safety review process appeared effective in identifying hazards and encouraging safety improvements. Local trained reviewers with farm background were well received among farmers. Questions for future research includes if adjustments should be made to scoring (currently too easy to pass?), if self-administered check would be a better alternative for reviewing animal confinements, and if reviews could be conducted less often than every year to improve cost-effectiveness.

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AgriSafe Health Services: An Innovative Occupational Health Model

Natalie Roy, MPH

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The AgriSafe Network, a non-profit national membership organization, represents health professionals who are concerned about the health and safety of those who work in agriculture. Many agricultural injuries, diseases, and fatalities can be prevented through the delivery of agricultural occupational health services. Farmers, Ranchers and the Agribusiness Workers, Who Feed Our Nation experience an increased incidence of: respiratory diseases, zoonotic infections, skin cancer, musculoskeletal disorders, hearing loss, depression, disabling injuries and occupational fatalities. We believe that providing occupational health services to farmers, ranchers and agribusiness workers will improve the quality of their lives and those of future

generations. Our core strength is based upon the professional standards required to deliver AgriSafe services. Only health professionals who have received extensive training in the field of agricultural health and safety earn the right to be named "AgriSafe Providers". This is where our commitment to uphold the quality of AgriSafe services will never waiver. We envision a day when farmers, ranchers and agribusiness employees across the country have access to highly trained AgriSafe professionals. That local AgriSafe clinician will provide superior disease management and prevention services to match their specific agricultural exposures. AgriSafe encourages partnerships to integrate AgriSafe occupational health services into agribusiness wellness practices. Partnership benefits include training, educational materials, clinical resources, and updates on the most cutting-edge developments in agricultural health and safety.

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Putting Research into Practice: Adapting and Implementing the Agrisafe and Certified Safe Farm Programs to the Diverse Agriculture of North Carolina

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The goal of the AgriSafe Network of North Carolina (AgriSafe-NC) and Certified Safe Farm of North Carolina (CSF-NC) coordinated programs is to improve the safety and health of North Carolina's farm families and employees. Expected results include saving lives, reducing injury, improving health, and saving lost work days and costs. The AgriSafe-NC program offers: 1) occupational health screenings conducted by specially-trained AgriSafe health professionals; 2) farm-specific occupational health and wellness education; 3) assistance in the selection, fit, and use of personal protective equipment; and 4) family services in both clinic and community settings. The CSF-NC program features an on-farm safety review of 15 worksite areas conducted by specially-trained county Cooperative Extension agents with the farm operator. AgriSafe-NC and CSF-NC staff collaborate on outreach/education events and coordinate services. AgriSafe-NC and CSF-NC are based on proven programs developed (1987) and implemented (1996–2005) by Iowa's Center for Agricultural Safety and Health. In 2003, AgriSafe health providers participating in Iowa's research program established the AgriSafe Network, a non-profit, national network of AgriSafe providers, now with individual members in 16 states including Iowa. AgriSafe of North Carolina is the first state affiliate (state-wide network) within the national AgriSafe Network. Certified Safe Farm of North Carolina is the first state program to launch a full-scale pilot outside of Iowa. AgriSafe-NC and CSF-NC are being piloted in three agriculture-intensive eastern North Carolina counties to address the diverse characteristics of NC agriculture and needs of NC farmers. NC's agriculture differs and is more diverse than that of Iowa. It is labor-intensive and involves a variety of specialized equipment. NC farms range widely in size, commodity mix and income. Additionally, 29% of NC farmers have no health insurance. Long-term goals are to develop insurance incentives and to expand AgriSafe-NC and Certified Safe Farm-NC to the entire state.

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HEAT RELATED ILLNESS

Interactive Heat Related Illness Training Tools for Less Literate Populations

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Heat-related illnesses (HRI) hit the Washington state agriculture health and safety agenda in response to the preventable death of a hops worker in 2005. Legislative rule making followed for outdoor workers. In response to this need, the Pacific Northwest Agricultural Safety and Health Center (PNASH) developed a number of interactive training tools for workers with literacy limitations. They include an icon based self assessment tool that workers can use to understand their own personal risk factors for heat-related illnesses. Another is a series of skits which demonstrate the forms of heat illnesses, their causes, risk factors, signs and symptoms and emergency treatment. Finally, is a heat jeopardy game which highlights the key points workers should understand coupled with an icon based quick reference handout for the game participants. These materials have been field-tested and successfully used for a variety of purposes. The skits and jeopardy game have been used to raise public awareness of HRI, the former on a rural Spanish language radio program and the latter as an annual feature of the health fair at the Washington State Ag Safety Day. The risk factor self assessment tool has been used in the classroom before HRI training as reinforcement for those workers who need to be extra vigilant during heat events. The skits have been used as an alternative to the traditional lecture. Heat jeopardy in the classroom has had a dual function. First, it reinforces the lesson for the participants and secondly provides the instructor an instant evaluation on how much the students learned. These innovative tools have been adopted enthusiastically by industry as well as health and safety professionals because they promote interactive non-formal education preferred by workers and can

be adapted to overcome language and literacy barriers in heat-related illness training.

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The Effectiveness of a Sun Safety Intervention Program for Agricultural Workers

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A team of outreach educators at OSU collaborated to address the problem of skin cancer among farmers. The specific objectives were to 1) encourage sun safe practices among agricultural workers, 2) evaluate the impact of sun safety educational programs, and 3) evaluate the capabilities of the Dermascan sun screening analyzer as an effective method to change sun safety practices. Agricultural workers (n = 451) attending mandated pesticide certification programs, in 11 different sites around Ohio, had the opportunity to participate in the study. Two different educational approaches were taken. Group A received a 20-minute program with information on skin cancer awareness and detection; participants also learned sun safe prevention practices. Group B participants received the same program; in addition, they were able to view their face in the Dermascan skin analyzer. Group C was a control group; these participants did not receive any program on sun safety or skin cancer. Farmers participating in the intervention program completed an initial questionnaire during the time of certification. This information provided baseline data on sun exposure and sun safe practices. A mail survey was administered 10 months after the initial survey with a 78% response rate. The follow-up survey determined changes in sun safe practices, adoption of the sun safe hat (incentive to Groups A & B), and peer perceptions and influences on behavior change. The educational intervention was effective by increasing the use of sun safe hats during the study period. Both treatment groups reported an increased use of sunscreen and increased use of either a sun canopy or cab tractor. The Dermascan analyzer is a novel educational tool, but is not a critical asset to changing behaviors. The common historical perspective is that farmers do not have complete control of their work environment and thereby cannot make changes to impact their risk for skin cancer. Project results indicate an openness and interest in sun safety education in the agricultural community. Workers will try new practices when awareness is created and barriers for implementation are removed.

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Heat Relief Solutions: An Innovative Approach to Protecting Workers

Garth Patterson

Heat Relief Solutions, Napa, CA

Heat stress injuries and deaths are occurring at ever increasing rates. According to the Heat Related Deaths Among Crop Workers report released by the Centers for Disease Control in 2008, during a 15 year period (1992–2006) over 420 workers in the nation died as a result of exposure to environmental heat in agriculture. The majority of these deaths occurred in crop production. Estimates suggest that many more workers suffer heat-related illness each year while working in the nation's agricultural industry. An innovative, engineering approach to minimizing the risk of heat-related illness is to bring a cooling option directly to workers in the agricultural work setting. The Heat Relief Solutions safety trailer is designed to address most heat-related emergencies that occur in the nation's agricultural fields and worksites. The self-contained mobile heat-relief facility helps prevent heat illness among farm workers. The 16-foot, all-steel tandem axle trailer is highway legal and can carry a total of 300 gallons of potable water. Features include an aluminum shade canopy; a commercial two-stage oscillating fogging fan plus an optional satellite fan that can be used with a water misting pump up to 200 feet from the trailer; and two 10-gallon food-grade drinking water tanks with dispensers for large cups. The cooling fan plays a big role in reducing the body core temperature which is the cause of heat stroke. Workers on the trailer seating area will experience temperatures much lower than the ambient air and can be as much as 30 degrees lower. The benefits to utilizing the cooling station trailer include: 1) Improved employee safety, 2) Limit exposure to civil law and substantial state and federal fines, 3) Increased productivity of workers, 4) Potential insurance cost reduction, 5) Reduce cost of safety compliance. Chemical exposure is another health related issue in agriculture. The Cooling Station has as part of its components includes an emergency eye wash station and emergency shower for those accidents in remote fields. The Cooling Station also has a sanitary hand washing station with soap and towel dispensers for workers health protection. This relatively new approach to protecting field workers is now being tested in several west coast agricultural field settings.

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LANGUAGE, LITERACY AND CULTURAL BARRIERS

Migrant Clinician's Manual for Occupational Health and Safety – Occupational Medicine Manual for Migrant Clinicians – NIOSH/NEC

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Chart reviews of migrant farmworker visits to clinics in seven northeastern states document that 10–15% of visits are related to occupational problems. Surveys by our group and by the Migrant Clinicians Network indicate that most clinic physicians have had minimal training in occupational medicine and most feel quite uncomfortable with these problems. To fill this gap, the Northeast Center has developed a manual aimed at assisting these health professionals with the types of problems seen most frequently

with various types of commodity work. The manual has been assembled with clinical technical assistance of several occupational physicians throughout the Northeast and Midwest. It is designed to assist with a number of aspects of farmworker medical care, ranging from cultural issues (cultural competency), understanding the agricultural workplace (organized by crop), taking an occupational health history, common diagnoses, patient education and Worker's Compensation. Throughout the text, citation and website references are provided so that the reader can access more detailed information as needed. Pages from the "Cultural competency resources," "Patient education," "Farmworker information flyers" and "Occupational health history pocket card" sections may be freely reproduced as needed for health care and educational purposes. Initially only in print, it has now been put on the web, and actively disseminated through a partnership with the Migrant Clinicians Network. Future plans include adapting the manual to other crops and regions of the country, and developing partnerships for dissemination and evaluation.

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Educating to Improve Hispanic Agricultural Workers Safety Communication and Professional Development

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Currently in the United States Hispanic workers have the highest rate of fatal accidents in comparison with other ethnic worker population. The Hispanic agricultural labor force is facing many difficulties in the United States but the language barrier is one of the most important factors affecting their job safety and professional development. The educational needs of this highly mobile worker community is diverse and varies according with their migration patterns, permanency in the country, work experience, and their English proficiency. The objective of the poster is to explain a methodology used to improve worker safety communication and job skills development based on an extension program that has delivered agricultural safety trainings to Hispanic agricultural workers in south Florida for more than 10 years. The poster will highlight the importance to incorporate the English language in certain trainings to increase safety and increase professional development opportunities. Main Points and Information displayed: 1) A conceptual framework used to design educational programs for Hispanic agricultural workers; 2) A description of the Hispanic agricultural workforce and their job educational needs; 3) Program design and teaching methodology; 4) Outreach strategies and program development; 5) Collecting data for program evaluation and results. In summary, for Hispanic agricultural workers the language barrier is one of the most critical issues for job development and safety. Regardless of the type of agricultural work Hispanic agricultural workers are hired to do, they will have the need to communicate with non-Spanish speaking supervisors. Failure to understand safety instructions can put Hispanic workers at high risk or death. In addition of increasing worker safety, the teaching methodology presented on the poster had helped many Hispanic agricultural workers to become certified pesticide applicators. The total economic impact of it resulted in millions of dollars.

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Pedro's Problems: A Bilingual Interactive Story that Teaches Injury Risk and Hazard Reduction to Hispanic Tobacco Workers

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Stories are one of the most powerful influences on human behavior. Parables remain the primary method for teaching beliefs, attitudes, and values which in turn direct behavior. Workers' lives are embedded in collections of stories, often referred to as culture tales. Stories can be told through oral or printed narrative or combinations of both. When accompanied by simple graphic images, story content and meaning are more rapidly and fully processed by the brain's dual coding system, one for language, the other for images. Good stories have plots and characters, each with personal goals and predicaments that require the characters to choose from among alternative actions and to experience the consequences of those choices. Pedro's story is about an occupational injury event that progress along the Haddon injury matrix phases (pre-event, event, post event consequences). As the story unfolds workers vicariously interact with and adopt the roles of Pedro and the other characters. Predicaments emerge that involve human, physical, and social environmental variables like those addressed in the Haddon matrix, and that in this case, contributed to the injury event. At multiple critical points in the story, embedded questions ask the participants to select from decision alternatives without knowing the consequences of their actions until *after* their decision. Because of its logical progression, simple language, and extensive use of graphics the simulation can be administered in multiple ways. It can be told as a story supported by the graphics with the story teller stopping and asking the embedded questions. It can be presented in interactive paper and pencil form or online formats. Participants' answers to and discussions of the embedded questions provide information about both the prevalence of worker misconceptions and work-site physical and social environmental factors that when combined increase risk of injury.

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Development of Visual and Interactive Materials for Educating Latino Farmworkers about Pesticide Risks

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The *Pesticides and Farmworker Health Toolkit* project, based on the successful *Pesticides and Human Health* series of educational materials for workers in eight hand-labor intensive crops that was first published in North Carolina in 1998, seeks to enhance farmworker pesticide safety training by addressing current educational needs of the target population. The toolkit includes updated and improved crop-specific pesticide information sheets, training flipcharts containing discussion guides for trainers, and performance-based assessments of farmworker knowledge and skills. All materials are available in Spanish and in English. The lessons provided in the toolkit present information in a highly visual and engaging way to meet the specific demands of the migrant farmworker population, generally characterized by low literacy and limited formal education. The use of this toolkit is expected to improve the understanding of pesticide hazards and to reduce pesticide exposure among Latino farmworkers. Feedback from Extension and outreach trainers, farmworkers, agricultural professionals, and other agricultural health and safety stakeholders guided revisions of the toolkit. Field testing with North Carolina farmworkers involved in tobacco production in 2008 and Florida farmworkers involved in tomato production in 2009 provided insight into farmworkers' layout preferences for the crop-specific sheets and their understanding of central learning messages associated with the toolkit. The entire learning packages for both sweetpotatoes and tobacco, including flip charts and crop-specific sheets, underwent testing with farmworkers and pesticide educators in 2009. Preliminary results of field testing of the toolkit include enthusiastic endorsement of the toolkit by clinic outreach workers and agency safety trainers, observations noting farmworker active engagement throughout trainings, and demonstrated increase in knowledge among farmworkers participating in the training. The toolkit and all associated educational materials for eleven crops are expected to be complete and available for the 2011 growing season.

Disclaimer: This poster was presented in August 2009 at the EPA-sponsored North American Pesticide Applicator Certification & Safety Education Workshop in Charleston, SC.

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Signaling and Mayday Simulation in Vietnamese Shrimp Fishermen on the Gulf Coast

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Preparation of commercial fishermen for emergencies aboard vessel can enhance crew survival. Receptiveness to safety training may be influenced by cultural factors. In the US, Coast Guard District 8 has the second highest level of vessel loss and crew fatalities in commercial fishermen. A cross-sectional survey of this group near the Port of Galveston, Texas in 2004 revealed a majority of the commercial fishermen and 95% of the shrimp fishermen to be Asian, predominantly Vietnamese. Many claimed to speak little or no English. The US Coast Guard (USCG) has reported multiple navigational situations in high traffic areas involving these vessels, resulting from failure to properly signal or communicate ship-to-ship. Two key skills identified by the USCG are use of the signaling horn and executing a mayday call. Reported obstacles have been lack of understanding and language barriers. A model was built replicating a vessel's steering wheel, speed control, horn blast, and radio, in order to simulate the bridge of a fishing vessel. Professional video/audio footage of approaching freighters was produced. Using this footage, vessel captains are instructed by an experienced mariner in Vietnamese how to listen to and signal approaching vessels with the horn. Using a double-sided tip card with English and Vietnamese instructions, they are also able to practice the mayday call. This "three-dimensional" poster will illustrate how the training is conducted. This training has been well received by Vietnamese shrimp fishermen along the Texas and Louisiana Gulf Coast and has served as an important survey recruitment tool during the second phase of the project. From 2004–2008, 387 have been trained (including repeats). This training module serves as an example of research to practice (r2p). This hands-on experience provided in Vietnamese by experienced instructors is responsive to findings of the early project survey and focus groups. It illustrates the importance of securing stakeholder input and considering cultural factors in the design of workplace safety training interventions in this group.

Support: NIOSH Cooperative Agreement 2 U50 OH07541

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Assessment of Exposure to Agricultural Workers from Drug-resistant Bacteria in a Mexican Agricultural Community

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The crowding of swine and poultry in industrial food animal production (IFAP) increases risk for transmission of bacteria. Furthermore, use of antimicrobials at non-therapeutic levels in animal feed to promote growth may contribute to development of resistance in both pathogens and commensal organisms like *Enterococcus*. Transfer of resistance in this environmental microbial community may increase risk to workers for exposure to drug-resistant bacteria. Furthermore, IFAP workers could carry disease between animals in IFAP settings and local human communities. The objective of this work was to evaluate drug-resistant bacterial reservoirs in farm environments in Mexico. Five environmental samples each from two farms and one clinic were taken from dry surfaces using a sterilized dry electrostatic cloth (Swiffer™, Proctor and Gamble). Microbiologic analysis was conducted using a double-enrichment protocol, followed by overnight culture on a chromagenic selective agar for MRSA and other resistant *Staphylococcus* and *Enterococcus* species (MRSA Select™, Biorad, CA). Colonies were sent to Johns Hopkins Hospital microbiology laboratory for subcultivation, identification using a Phoenix system, and antibiotic resistance testing. Further antimicrobial resistance testing was performed using Kirby-Bauer methods. Eleven of fifteen swiffers (73%) yielded growth of *Staphylococcus* and *Enterococcus* species. Eight isolates were multi-drug resistant, 2/3 from the clinic, 3/6 from Farm A, and 4/5 from Farm B. Only 1/3 of isolates from the clinic were tetracycline-resistant, while 6/6 and 3/5 were tetracycline-resistant on Farms A and B respectively. In conclusion, drug-resistant and multi-drug resistant bacteria were cultured from farm environments and showed different resistance patterns than those bacteria cultured from the community clinic. The farms added antibiotics to feed, suggesting that antibiotic use in farm environments may support emergence of drug-resistant organisms.

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Innovative Partnership Approaches to Reach Vulnerable Agricultural Workers

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As demographics and organization of the agricultural workforce continue to change it is challenging to reach hired workers with occupational safety and health (OSH) information. Some obstacles include cultural and language barriers, fears related to immigration status, and concerns surrounding compliance and regulation. Specialization and industrial growth have expanded the employer role in agriculture. The Southwest Center for Agricultural Health, Injury Prevention and Education (SW Ag Center) and the National Center for Farmworker Health (NCFH) have developed OSH training and intervention tools (e.g., heat-related illness) for migrant and seasonal farmworkers (MSFWs). Additional partnerships, utilizing the network of regional Monitor Advocates and other agricultural organizations are being fostered with employers who are instrumental in reaching agricultural workers and assuring a safe work environment. States are required to ensure that MSFWs are provided with services that are "qualitatively equivalent and quantitatively proportionate" to the services offered to others seeking employment. State and regional Monitor Advocates carry out this function in accordance with federal regulations. They support the needs of MSFWs, in part by developing linkages with a broad range of stakeholders, including community- and employer-based organizations. Through a newly formed partnership, the state Monitor Advocate in Texas, the SW Ag Center, and NCFH have been able to participate in a range of shared workshop and conference venues important to agricultural employers for information related to workforce needs, labor rules, wage issues, etc. In doing so, each has been able to establish employer relationships with potential opportunities to implement effective OSH solutions. Examples include the annual conference held by the Midwest Association of Farmworker Organizations (MAFO) and the annual Midwest Stream Farmworker Health Forum produced by NCFH. These partnerships constitute the first steps for fostering relationships with agricultural employers in an effort to inform training and disseminate intervention tools related to OSH for hired workers.

Support: NIOSH Cooperative Agreement 2 U50 OH07541

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Promoviendo Farmworker Safety: An Intervention Designed to Increase Farm Safety Practices among Migrant and Seasonal Farmworkers

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Promoviendo Farmworker Safety is a five year project with objectives covering the design and field testing of an intervention to increase farm safety practices related to heat and sun safety among migrant and seasonal farmworkers using the Promotora (lay health worker) model as the mode of dissemination. Intervention Mapping (IM) is being used as the framework to guide the development of the program intervention. IM provides a step-by-step process for using theory, empirical findings, and participant involvement to specify program objectives, select theory-based methods, translate the methods into practical strategies and programs, prepare for program adoption and

implementation, and design the program evaluation instruments. This process allows for the careful design and development of both the intervention materials and the implementation and dissemination plan. This poster will illustrate and describe the results of a needs assessment; creation of matrices of change objectives based on the determinants of behavior and environmental conditions; selection of theory-based intervention methods and practical strategies; and translation of the methods and strategies into an organized program. The program matrices that were created focus on performance objectives and change objectives along with the key messages that need to be delivered to farmworkers to influence behavior change. These matrices are being used to inform and guide material development. The key behaviors identified and that will be addressed in the program include: use of sunscreen, proper clothing, hydration, avoidance of caffeine and alcohol and periodic rest breaks. Educational materials in development include a flip chart (with an emphasis on sun safety behaviors) that will be used by the lay health workers to disseminate safety information to farmworkers, and a fotonovela/photo novel (with an emphasis on proper hydration practices).

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Development of Safety Guidelines for Hired Adolescent Farm Workers

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The North American Guidelines for Children's Agricultural Tasks (NAGCAT) were released in 1999 as a resource to assist parents in assigning farm jobs to their children 7 - 16 years of age, on family farms. Since that time, these guidelines have been proven to reduce the risk of agricultural injuries among family farm children by 50%. The NAGCAT were not intended for use in employment situations because they do not incorporate child labor regulations or reference the Hazardous Occupations Orders in Agriculture which restrict specific tasks in youth employment. This project addressed the gap in resources for employers who hire adolescents for agricultural work. Over a 10 month period, the project team reviewed NAGCAT for tasks pertaining to youth hired to work in agriculture. Only jobs for which adolescents are legally eligible for hire were included. Stakeholder imput was gathered to identify the most common agricultural tasks and NIOSH Child Agricultural Injury Surveillance data were reviewed to identify relevant tasks and major hazards. Guidelines were drafted based on the orginal NAGCAT child development principles. Content from NAGCAT resources was updated to reflect prevailing working conditions. During 2008 content and format was reviewed by peers, employers/supervisors, and growers with labor-intensive crops. Seven guidelines are now available in English and Spanish. Each poster addresses supervisor responsibilities for ensuring work conditions are appropriate and adequate and for assessing their teen workers. Training and supervision tips, specific to teens are provided. Each poster includes illustrations of main hazards and points to remember for quick reference. Finally, each poster includes pertinent federal regulations and referrals to obtain state-specific child labor regulations. This project is funded by NIOSH through the National Children's Center for Rural and Agricultural Health and Safety cooperative agreement. An intervention to test the usability of these guidelines among field supervisors is now underway.

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Hearing Loss among Farmworkers: Perspectives and Prospects

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Occupational hearing loss is the most common occupational disease in the United States. It affects all workers regardless of age, gender, or industrial sector. Agriculture work has been associated with a high prevalence of hearing loss, both in adults and youth. Farmworkers directly associated with intense field work and transport activities, are potentially at risk for the development of hearing loss. Farmworkers in south Texas shared their perceptions about noise exposure and agricultural work. Hearing levels were measured using audiometric pure tone and calculating the sensitivity and specificity of the Hearing Ability Survey in Spanish. Farmworkers reported exposure to noise (e.g., machinery) and potentially toxic chemical exposures (e.g. pesticides) and lacking training about hearing conservation. Most farmworkers reported working in a noisy environment, and reported working in a noisy environment for over 6 years. Hearing loss (≥ 25dB average 500, 1000, 2000 Hz) was found in more than 25% of farmowrkers. This percentage of hearing loss increased when hearing loss was evaluated at higher frequencies (≥ 25dB average 4000, 8000 Hz). The average of the proportion of survey responses classified correctly was 70%, sensitivity was 46%, and specificity was 90%. Addressing occupational health outcomes that permanently impair a socio-economic disadvantaged population is urgent. Hearing loss among underserved populations, particularly Spanish speaking farmworkers needs to be prevented rather than only documenting such health disparity.

Disclaimer: Abstract accepted for the 137th Annual Meeting & Exposition, Philadelphia, PA, November 8, 2009.

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LIVESTOCK HANDLING

Transport Quality Assurance:™ an Industry Program to Assure the Well-being of Pigs During Handling, Movement, and Transport

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Transport Quality Assurance™ (TQA™) is a program that helps swine transporters, producers, and handlers understand how to handle, move, and transport pigs and the potential impacts of those actions on pig well-being and pork quality. The program mission is to make a positive impact on pork industry animal movement practices through education and continued training of animal handlers by demonstrating industry-leading techniques, which lead to enhanced animal well-being and quality pork products. The TQA program addresses key areas that help swine handlers and transporters improve their interactions with pigs. These topics include: animal handling, loading and unloading, transportation (including attitude and responsibilities of transporters), fitness of the pig, biosecurity, emergency response plans, and laws and regulations. There are two types of individuals certified through the TQA program: a handler is an individual who receives TQA certification to move, handle, and transport pigs. An advisor is an individual who is trained by the Pork Checkoff and who can offer certification training and administer exams to handlers. Individuals interested in receiving TQA certification to become handlers can find a TQA advisor at the website http://www.pork.org/Producers/TQA/ TQA.aspx. To become a Certified TQA Advisor you must participate in a one-day training session offered by the National Pork Board and successfully complete and pass a comprehensive TQA examination. Training on proper animal handling techniques provides a proactive position regarding animal well-being. In addition, incorporating the techniques learned in this program can help to decrease revenue losses in the pork industry in part by reducing injuries to pigs or to the people handling them.

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MUSCULOSKELETAL DISORDERS

Chronic Low Back Pain among Adolescents: Examining Farm Work Exposures

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Agricultural tasks often require postures, repetitive actions, and heavy lifting that could substantially increase the risk of musculoskeletal injury, namely to the lower back. Although adult and adolescent farmworkers play a major role in the agricultural economy, very little is known about prevention of musculoskeletal symptoms among these workers. This is a major adolescent health concern for many reasons. For example, the musculoskeletal system does not fully develop until adulthood. Consequently, adolescents could be more vulnerable to injury and more likely to experience physiologic changes with long-term consequences including chronic pain. A variety of work factors are associated with back pain in adults in several industries, but similar population-based research in youth is needed specifically in agriculture. The Migrant Adolescent Health Research Study (a.k.a., The Work-Life Study) is a combined cross-sectional/cohort project designed to examine chronic disease risk factors, including back pain, among high school students from Weslaco, TX. From 2007–2008, 256 migrant education students and 252 of their non-migrant peers enrolled in the study (n = 508; 50.0% female; 97.1% Hispanic/Latino; median age of 15.3 years). These participants will be followed through 2010. Data are self-reported and collected via self and interviewer administered questionnaires. Currently, baseline data analyses are underway and preliminary findings are available. During the prior twelve months 11.1% of those who did farm work during the same time period reported chronic low back pain (lasting three or more consecutive months) compared to 6.6% of non-workers. Based on bivariate analyses, the following independent farm work variables were associated with the outcome ($p \leq 0.05$): lifting heavy loads repeatedly (OR = 2.6), twisting repeatedly from the waist (OR = 4.3), working harder and faster than preferred (OR = 3.2), and repeatedly bending/stooping (OR = 2.3). Additional and more extensive analyses will also be presented.

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PESTICIDE EXPOSURE

Poison Center Surveillance of Agricultural Poisonings

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Agricultural workers and farm residents have an elevated risk for pesticide exposures compared to the general population. However, surveillance linking pesticide exposures to agricultural activities is challenging. Data routinely collected by Poison Control Centers (PCCs) and maintained in the American Association of Poison Control Centers' (AAPCC) Toxic Exposure Surveillance System (TESS) database often lack comprehensive details about pesticide exposure etiology. The goal of this three-year project was to develop and evaluate a systematic approach to obtain information on agricultural-related pesticide exposures by collaborating with PCC specialists to modify the standardized

surveillance protocol they routinely use. During a 24-month period beginning September 2007, three pre-formatted questions were incorporated into PCC screen-based data-entry forms used during telephone consultations. These questions systematically solicited documentation of links between reported exposures and production agriculture. Six PCCs serving four southeastern states (Alabama, Kentucky, Virginia, and West Virginia) modified their Toxicall® data collection software to include three new questions to ask during a pesticide exposure's initial report. The modified software recognized 39 predetermined agriculture-related TESS database pesticide codes. Entry of these codes triggered a text box prompting specialists to ask additional study questions. Questions and corresponding answers became part of the permanent medical record. Preliminary results for the first 19 months (Sept. 1, 2007 – April 31, 2009) indicate that the software modification increased pesticide exposure documentation precision and detail. Of 5,414 calls received involving study pesticides, the enhanced protocol solicited additional information for 185 cases (3.4%). Of cases that asked the study questions, 12.97 % (n = 24) had exposures linked to agricultural activities. In conclusion, the software modification developed for this study enhanced information routinely collected by PCCs and identified pesticide exposures that occurred during agricultural work. Prevention strategies to protect agricultural populations from pesticide exposures can be developed with improved information about exposure circumstances.

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Reducing Pesticide Exposures: The Oregon OSHA Experience

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In a concerted effort to reduce pesticide exposures in Oregon, Oregon OSHA launched the Pesticide Emphasis Program (PEP) in FY 2000. Oregon OSHA is a state-plan state and has promulgated its own regulations for Agriculture under Oregon Administrative Rules 437, Division 4. Oregon OSHA is unique as an OSHA state plan in that it also has full enforcement authority of the EPA's Worker Protection Standard and enforces pesticide issues in the agricultural setting. This enforcement authority was coordinated through Memorandums of Understanding with the Oregon Department of Agriculture. EPA Region 10, Pesticides Division has oversight authority over the pesticide program through an unfunded agreement with Oregon OSHA. Oregon OSHA's PEP applies the following regulations which encompass the various ways in which pesticide exposures can occur: the Worker Protection Standard, Hazard Communication, Respiratory Protection, personal protective equipment, pesticide storage, emergency eyewash, fumigation requirements, Thiram requirements, and supervision. From enforcement activities to consultation interventions, to stopping by Oregon OSHA's booth at the various trade shows, agricultural employers receive the necessary information to protect not only their workers, but the farm owner as well. The PEP includes an annual report which summarizes not only the enforcement activities, but the agency wide efforts to provide education, training, outreach through consultations, speaking engagements, conference booths, publications and AV distribution. This report allows the agency to develop publications to address frequently cited areas, and to devote focused training in those areas. As a result, the allocation of resources is effectively targeted.

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Provider Survey of Reporting Laws for Pesticide Exposure in Texas

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Since 1987, DSHS Pesticide Exposure Surveillance in Texas program (PEST) has received funding from the National Institute for Occupational Safety and Health (NIOSH) under SENSOR cooperative agreements to conduct surveillance of occupational pesticide exposures. In 2004, PEST started including disinfectant exposures in its surveillance and acquires most of these data from reports to Texas Poison Centers. While reports of disinfectant exposures have risen dramatically, reports of agricultural exposures have diminished. Underreporting is likely the case, so PEST decided to conduct a pilot survey of providers to gauge their knowledge of reporting laws in Texas. DSHS PEST acquired mailing addresses for 2,500 emergency room and occupational health providers from the Texas Center for Health Statistics and mailed letters asking if they would take a short informational survey about their knowledge of pesticide poisoning and the reporting laws for occupational pesticide exposures. They were asked to take the survey online; however, for their convenience, a copy of the survey also was included in the letter so that the survey could be faxed back to DSHS PEST. The survey included five questions that required either or a yes or no answer: 1) Do you and your staff know that Texas law requires you to report a suspected pesticide exposure to the state health department (800-458-7269)? 2) Do you and your staff know that you can also report that exposure to the Texas Poison Center Network (800-222-1222)? 3) Do you and your staff know that a disinfectant (including chlorine) is legally considered a pesticide? 4) Do you and your staff know how to identify a possible pesticide exposure? 5) Do you or your staff ever run tests on patients with possible pesticide exposures (e.g., cholinesterase or urinary metabolite tests)? Only 78 (3 people) percent responded to the survey. Eighteen percent of the surveys were completed online, 10 percent were mailed to DSHS PEST, and 72 percent were returned by fax. Of those providers who responded, 28 percent were aware that they were required by law to report occupational pesticide exposures; 54 percent were aware that they could use the Texas Poison Centers for reporting a pesticide exposure; 15 percent knew that disinfectants were considered a

pesticide; 77 percent felt confident that they knew how to identify a pesticide exposure; and 38 percent had run diagnostic tests to identify type of exposure. These data, while limited, indicate that providers in Texas are not aware that disinfectants are considered pesticides or that pesticide exposure is a reportable condition. DSHS PEST conducts educational campaigns in at hospitals and in the community, but these data suggest that alternative forms of interaction and education may be necessary to inform providers of pesticide exposure reporting requirements in Texas.

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Violations of Federal and State Pesticide & Pesticide-Related Personal Protective Equipment Standards among Agricultural Employers in Oregon

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The objectives of this study are to quantify and characterize violations of federal and state pesticide-related personal protective equipment (PPE) standards among randomly selected Agricultural workplaces in Oregon from 1999 to 2008. We analyzed data from the Oregon OSHA Pesticide Emphasis Program in over 500 pesticide-related inspections in Oregon from 1999–2008. All inspections were conducted randomly within major groups of the industry as targeted by the Pesticide Emphasis Program. Violations included non-compliance with specific standards of both the EPA Worker Protection Standard (WPS), including respiratory and non-respiratory PPE requirements, and the Oregon OSHA PPE standards. The following items will be analyzed and reported: 1) trends in the number and rate of EPA WPS violations and separately in Oregon OSHA PPE violations over time, controlling for the types of Agricultural Industry included which varies from year to year-violation rates will be calculated as the number of violations divided by the number of inspections; 2) a description of the types of violations and their seriousness and any changes in their prevalence over time; and 3) rates of violation recurrence within a workplace. All analyses will be presented in the poster. By addressing the study objectives, we will better understand the extent to which Agricultural workplaces in Oregon comply with state and federal pesticide-related PPE standards and the types of non-compliance that occur. The study addresses the Personal Protective Technology Program's PPE Surveillance in Agriculture effort to characterize PPE use among agricultural workers in order to better address their occupational safety and health needs.

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Practical Solutions for Minimizing Agricultural Worker and Family Exposure to Pesticides

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The purpose of this study is to promote practical and proven solutions for minimizing pesticide exposure in agriculture. The objectives are to identify, document, and evaluate unique solutions for pesticide safety measures developed and used in Washington tree fruit orchards. These orchard-developed interventions are relevant to the user and encourage adoption by other orchards. This project is part of a larger investigation that is developing, evaluating, and distributing pesticide safety measures that will minimize agricultural worker and family exposure to pesticides. Key to the overall project is collaboration of the research team with the Expert Working Group (EWG). This group, comprised of orchard managers, pesticide handlers, and specialists in agricultural safety, brings the knowledge of orchard practices and production to the project. Potential practical solutions were identified by contacting: orchards recommended by the EWG and colleagues in the agricultural community; as well as recipients of agricultural safety awards. The solutions were documented by observation, photographs, and interviews with managers and pesticide handlers. The solutions are being evaluated for uniqueness (not in common use); practicality (compatible with work practices, affordable, and convenient); and safety (does not create another hazard or increase pesticide exposure). Summaries of each solution are being evaluated by pesticide handlers and crew foreman, the EWG, orchard managers, and agricultural safety professionals. The pesticide handler and crew foremen evaluation takes place through an interactive presentation/survey in Spanish language sections of agricultural conferences. Proposed solutions are presented in Power Point and participants respond to the questions using a direct audience response system. The other target groups are completing an evaluation survey. Twenty-two practical solutions have been documented. Results from crew manager and pesticide handler evaluation are presented. Evaluation results are used to inform the selection of practical solutions and safety measures to be included in a manual and website.

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Pesticide Interactions and Risk to Agricultural Workers

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Human health risk assessment and the subsequent risk communication to end users are based largely on studies on surrogate animals. With regard to worker protection in agriculture such studies are deficient in several respects.

First, since surrogate experimental animals are highly inbred whereas human populations are genetically diverse, they do not reflect population variation. Second, they are based on single chemicals and provide no information on mixtures, the most common use scenario in agriculture. Finally, surrogate animals cannot reveal human specific health risks. Recently we have studied human metabolism and hepatotoxicity through the use of recombinant human enzymes, human hepatocytes and genotyping. Our studies indicate the variations in agrochemical metabolism in humans, important interactions between different agrochemicals and between agrochemicals and normal metabolites as well as hepatotoxicity from these chemicals. Among many examples, we may note that chlorpyrifos and other organophosphorus chemicals are potent inhibitors of the human metabolism of steroid hormones (both testosterone and estradiol), while fipronil, endosulfan and other insecticides are inducers of xenobiotic metabolizing enzymes (XMEs) in human hepatocytes. A number of insecticides cause cytotoxicity in human hepatocytes, including those that induce XMEs, although the concentrations required for hepatotoxicity are generally higher than those required for cytotoxicity. We are currently developing, and will discuss, the means of disseminating information concerning interactions in humans based on these effects to end users and to health professionals.

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Workplace Factors that Influence Serum Cholinesterase Inhibition among Organophosphate Exposed Pesticide Handlers in Washington State

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This study seeks to identify occupational risk factors that influence the likelihood of a worker showing serum ChE inhibition while participating in the Washington State Cholinesterase Monitoring Program. From 2006–2011, exposure information will be collected from agricultural pesticide handlers enrolled in the WA State ChE Monitoring Program during clinic visits for cholinesterase monitoring. Data are collected with a literacy friendly, bilingual, picture based computer driven questionnaire. This exposure information is compared to handler's serum ChE results. To date, we have enrolled a total of 274 agricultural pesticide handlers in this study. Factors found to be significantly associated with serum ChE inhibition include: mixing/loading pesticides; cleaning spray equipment; the lack of use of a full-face respirator, chemical resistant footwear, chemical resistant apron, and a storage locker for personal protective equipment. We will continue to enroll participants in this study for one more season and will conduct a comprehensive analysis of study data in late 2010. By improving our understanding of the risk factors for ChE depression, we can identify practices that may reduce the burden of acute and chronic pesticide-related overexposure among handlers. It is already clear, however, that pesticide handlers would likely reduce exposure by following certain practices when handling pesticides.

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Saving Lives by Changing Practices: Protecting Workers by Integrating Occupational and Environmental Medicine into the Primary Care Setting

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The objectives are to 1) design and evaluate a model program to integrate environmental and occupational medicine (OEM) into the primary care setting, 2) provide environmental and occupational health resources to practicing clinicians and 3) link primary care providers with OEM specialists. Through a five-year cooperative agreement with EPA Office of Pesticide Programs, Migrant Clinicians Network (MCN) established a series of in-depth relationships with select migrant health centers around the country. The centers received on-site OEM and pesticide trainings designed for the primary care provider as well as training for outreach staff. At each center the clinician champion and MCN developed a flexible program tailored to the unique needs of the center and incorporated key elements of the *National Pesticide Practice Skills Guidelines for Medical & Nursing Practice*. Centers were introduced to OEM specialists who served as faculty and offered consults. Centers also received patient education materials and clinical tools such as screening questions and reference books. MCN established environmental and occupational health programs in seven migrant health centers that have resulted in changes in clinical systems. The partner clinics have integrated screening processes to better recognize work related injuries and exposures and have incorporated into their practice patient education regarding the prevention of work related injuries and exposures. The project trained more than 2,000 clinicians and distributed more than 60,000 environmental and occupational health resources to assist clinicians. The project succeeded in offering health centers a simple model to assist them in modifying their clinical system to integrate OEM into their practice. Primary care clinicians are interested in OEM and welcomed the training and program. Some projects fostered new relationships between local growers and health centers. This model offers potential entrée to further involve health centers and primary care clinicians in worker health and safety training programs, surveillance and cholinesterase monitoring.

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RESPIRATORY ISSUES

Dust and Endotoxin Exposure in Cattle Feedlot and Grain Elevator/Feed Mill Workers

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Grain elevator workers are at risk for having respiratory symptoms and airway obstruction. Concern has been raised recently regarding health effects from dust levels near cattle feedlots. Subjects were recruited at Nebraska cattle feedlots and grain elevators/ feed mills. Pre- and post-exposure spirometry was performed. Dust levels were measured during the work shift using IOM inhalable samplers. Endotoxin values in dust sample extracts were determined using a Recombinant Factor C assay along with GC/MS. A total of 33 feedlot workers and 48 grain elevator/feedmill workers were enrolled in the study (78 men, 3 women) in the summer of 2006. There was no significant difference between mean total dust exposure for feedlot workers (2.36 mg/m3, 95% CI 1.36–4.01) and for grain elevator/feed mill workers (3.46 mg/m^3, 95% CI 2.03–5.89). Mean endotoxin concentration for feedlot workers was 448 EU/ m^3 (95% CI 142–1420) and for grain elevator/feed mill workers was 226 EU/ m^3 (95% CI 79–899), with no significant difference between groups. There was an association between pre-work shift $FEF_{25–75}$ ($p = .034$) and total dust levels but not endotoxin levels. No association was found between total dust levels or endotoxin and other lung function test measures, including cross-shift lung drop in FVC, FEV_1 or FEV_1/FVC. Airway obstruction defined by GOLD criteria was noted in 12% of feedlot workers and 8% of grain elevator/feed mill workers ($p = .71$). In conclusion, dust and endotoxin exposure in cattle feedlots was not significantly different from that in grain elevators/feed mills, a setting where airway obstruction from occupational exposure occurs. Cattle feedlot workers may also be at risk for developing occupational airways disease.

Support: Funded by NIOSH Award 5 U50O8085-03

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ASABE Proposed Standard X607: Fan Ventilation of Confined-Space Manure Storages for Safe Entry

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The ASABE proposed standard X607 contains supporting documents and ventilation time calculations for fan ventilation of on-farm, confined space manure pits prior to entry. The draft safety standard specifies minimum fan-ventilation times and ventilation rates to reduce dangerous gas concentrations to less than OSHA defined PELs or LVLs and to replenish oxygen concentration to greater than 20% by volume. A wide variety of confined-space manure pit sizes and shapes have been used to calculate ventilation scenarios. The draft standard specifies minimum ventilation times prior to entry for manure pits with solid, partially slotted, and totally slotted covers. Ventilation times are conservatively calculated from worst case conditions. The draft standard provides adjustments for situations where the initial gas concentrations are identified. Adjustments to ventilation times are also available for a range of ventilation fan air exchange rates and systems where ventilation air is drawn from directly above the manure pit or is ducted to the manure pit from a fresh air source with zero contaminant gas concentration and 20.4% by volume oxygen. Draft standard X607 also includes ventilation recommendations for free standing manure pits or for manure pits located directly beneath animal living quarters.

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SAFE TRACTOR OPERATION

Tractor Safety Education

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Safety education for tractor operators is an essential element in the pursuit for reduced injuries and fatalities associated with tractor use. Tractor safety education is aimed at two primary audiences, youth and adult operators. Youth training centers focus on the need to assign appropriate tasks based on age, physical abilities and emotional and intellectual maturity of the person. Since 1968, under the auspices of the US Dept. of Labor, operation of tractors by minors for persons other than their parents or guardians has been limited to individuals 16 years old or older. Youth ages 14 & 15 years old are permitted to operate tractors for non-family employers if they have successfully completed safety training provided through either a 4-H or high school vocational agriculture program. Two successful programs currently in use are the *Gearing Up for Safety* program by Purdue University that uses a multimedia (CD or online) approach and the *National Safe Tractor and Machinery Operation Program* (NSTMOP) created by a group of universities and industry partners that uses a more traditional lecture and activity approach. The use of these programs is sporadic and is a function of local conditions; i.e. availability of resources and trainers, interest in receiving training by youth, and demand for trained youth by employers. Adult education programs are developed around the OSHA 29 CFR 1928 regulations. The regulations give 9 specific training topics and require annual training for tractor operators. Many adult training programs follow a Train-the-Trainer format. This format allows safety instructors to reach a larger number of operators through training their supervisors and managers on specific safety issues and providing information on how to

conduct effective training. A successfully used Train-the-Trainer program in California is one given by the Agricultural Safety Institute, Cal Poly, San Luis Obispo. Several thousand people have gone through the program and have subsequently trained thousands of tractor operators.

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An ATV Injury Simulation Exercise Based on Principles of Narrative Psychology and the Haddon Injury Phase by Factors Matrix

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Historically safety training focused on presenting safety rules through slogans, posters, brochures, slides, or videos that described serious and fatal injury events. Until recently two major conceptualizations that improved safety engineering had little impact on farm safety training. Heinrich's injury pyramid established that fatal and serious injuries are rare events while minor injuries and close calls are frequent events, any one of which could be fatal. Haddon's (1970) matrix of injury phase (pre-event, injury event, and post-event consequences) by factors (human, injury agent, physical environment, and social environment) conceptualization assisted safety engineering by (a) identifying pre-event contributors to injury events, (b) removing or controlling these pre-event contributors, (c) examining the post-event consequences and costs of injuries, and (d) demonstrating the cost-effectiveness of preventive interventions. A new approach to farm safety instruction involves placing trainees within stories about actual injury events. As the scenario progresses participants interact with the story characters and make critical safety decisions across the pre-event, event, and post-event phases while vicariously experiencing the human, injury agent, physical, and social environmental factors that contributed to the injury depicted. As a result the experience is perceived as relevant and memorable. The simulation also yields data about the prevalence of participants' misconceptions and decision errors as well as their close call and injury histories with respect to the hazard depicted. When administered to large samples of at-risk populations, data that otherwise are not available are provided for hazard exposure, close calls, minor, and non-fatal injuries. The poster graphics and text describe the story of a traumatic brain injury to an un-helmeted 14-year-old ATV rider and illustrates how the narrative follows the Haddon injury phase by factor matrix. The simulation is timely and relevant. About a third of the 8,000 ATV fatalities during1982 - 2006 were to youth ≤ age 16 years.

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Physical and Visual Limitations of Youth Farm Tractor Operators

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Farm tractors account for the majority of fatal injuries to youth working in agriculture and therefore remain a leading occupational priority. However, little is known about the potential mismatch between the physical and visual characteristics of children and tractor characteristics. The purpose of this study is to provide a comprehensive evaluation of the physical and visual limitations of youth farm tractor operators. Several tractor dealers and farmers in California and Wisconsin offered their tractors for study, representing 44 tractors commonly used in the US. A unique photographic technique provided 3-D digital mock-ups of the tractors, which facilitated the evaluation of reach and visual abilities of adolescents using existing anthropometric data. Tractor control activation forces were captured using a digital force gauge and compared to existing force requirements and youth strength databases. Findings indicate that hand-operated controls tend to be out of reach for both genders with the exception of steering wheels. The worst controls were hand throttle levers. On the other hand, foot-operated controls yielded higher reachable percentages for both genders, while steering wheels showed a medium range of reachable percentages. The results also showed that foot-operated controls require more strength than the recommended force levels. These physical limitations may require youth operators to make non-optimal and potentially unsafe postural adaptations to activate controls; possibly including not using a seatbelt in ROPS tractors. In general, youth operators showed relatively restricted fields of vision compared to an average adult, and their fields of vision decreased as obstacles were closer to the tractor. The findings raise serious questions about the ability of children to safely operate tractors in common use on US farms and call for a revision of existing work guidelines related to youth tractor operations.

Disclosure: These study findings have been published (Forces, Reach) or accepted for publication (Vision) in *Ergonomics*. The Forces and Reach papers were presented at the National Institute for Farm Safety Meeting in 2008.

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Increasing Adoption of CROPS by Farmers

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This project will identify barriers from and approaches for stimulating farmers to retrofit their tractors with Cost-Effective Roll-Over Protection Structures (CROPS) utilizing stakeholder input. The initial phase of the project will identify the study population—farmers in two selected

states who use tractors for which a CROPS prototype has been developed and tested by NIOSH. New York and Virginia were selected because of on-going ROPS retrofit programs within their states and because of their high number of tractor roll over fatalities, well established relationships with NIOSH and its partners, and their states' farm population. The project employs approaches from multiple disciplines and is aimed at different populations to identify the complex set of barriers to the adoption of CROPS. In Phase I - Demonstration, a subset of farmers from the study population will be selected to receive a CROPS at no charge. Each farmer will be asked to demonstrate how to install the CROPS and provide an initial assessment of their perception of the utility and value of the device along with any installation problems/issues. This aspect of the study will provide end-user (customer) feedback to NIOSH and partner researchers on assembly issues for a CROPS design in field conditions. Farmers, potential manufacturers, and local influential community leaders will be invited to observe installation in the field and queried for their perception of the utility and value of the design after the demonstration and one year later.

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National Safe Tractor and Machinery Operation Program

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The National Safe Tractor and Machinery Operation Program (NSTMOP) was developed with funding from a USDA-CSREES Youth Safety Grant. The objective of the NSTMOP project was to design an effective, efficient and accountable youth farm machinery operation certification program with national uniformity and a single set of economically reproducible instructional materials. The format for the NSTMOP material was guided by input from focus groups, a national steering committee and selected agricultural safety educators. Primary curriculum materials were developed in a task sheet format with student objectives and activities listed and new skill and driving evaluations. Student and instructor evaluations have documented content validity of instructional materials and the program plan. A second USDA-CSREES project developed a national data base to register NSTMOP instructors and students. The data base has been maintained at The Pennsylvania State University and shows 512 registered NSTMOP instructors in 40 US states and two Canadian Provinces. A third USDA-CSREES Youth Safety Grant focused on the development of an on-line training and registration program for new NSTMOP instructors. Registration involved completing a series of on-line training modules orienting instructors to the NSTMOP materials and testing procedures. While the original intent of the NSTMOP project was to provide materials on-line and in a CD, demand for printed material was extremely high. NSTMOP materials remain available on-line at http://www.nstmop.psu.edu. They are also available in color print from http://www.finneyhobar.com. Data base management records and publisher sales records indicate the use of NSTMOP materials in states and by instructors not represented in the PSU data base, which is an instructor option. This poster indicates the use of NSTMOP materials by registered instructors by state and province and also indicates areas which are underserved. Future efforts will be made to better serve these areas with NSTMOP materials and programs.

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Youth Risky Behavior Around Tractors – Influence of Significant Others (Father, Mother and Friends)

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Injury and death rates of youth in farms in the US are particularly high. Operating a tractor on the farm is one of the most basic, yet extremely risky practices. Machinery (tractors) is the leading cause of fatal farm injuries to youth less than 20 years of age. This study explores whether youth's adoption of on farm safety practices is related to perceived support for engaging in those behaviors from significant others including parents and friends. This paper presents preliminary data from a youth farm injury prevention research study funded by NIOSH. Sixty farm families participated. Youth ages ranged from 10 through 19 years. Regression analysis revealed youth who thought their friends would think less of them if they practiced certain safety behaviors related to tractors; were more likely to engage in unsafe (risky) behaviors while working around tractors on farms. Unsafe tractor behaviors included operating ROPS tractor without a seatbelt, dismounting a tractor with tractor running or with key in ignition, giving someone a ride on tractor, starting a tractor while not in an operator's seat and, doing work on tractor without doing a safety check. The results further revealed that for youth whose parents (fathers and mothers) placed a high premium on practicing safe tractor-related behaviors on the farm, the youth had lesser intentions, and were far less likely to indulge in risky behaviors around tractors. Regression was significant for the hypothesis that importance placed by parents on safety behaviors negatively affected youth risky behaviors related to tractors. The study reconfirms the role of parents as role models for youth. Results highlight the notion that parents need to give proper guidance to youth, model safe behaviors themselves and set family rules around safe practices related to tractor operations. Further implications of results will be discussed.

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Trends in Tractor Overturn Fatalities and the Prevalence of Roll-Over Protective Structures (ROPS) in the U.S.

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Tractor overturns remain the leading cause of occupational death on US farms. Roll-over Protective Structures (ROPS) have been recommended as an engineering control to prevent these deaths. This work examines trends in overturn fatality rates and ROPS prevalence rates on US farms since the early 1990's, and approaches for targeting ROPS promotion activities. Trends in tractor overturn fatalities were assessed with data from the Bureau of Labor Statistics Census of Fatal Occupational Injuries using Poisson regression. ROPS prevalence rate trends were assessed with data from national farm operator surveys using logistic regression. The farm operator surveys were collected for the National Institute for Occupational Safety and Health by the National Agricultural Statistics Service. Associations between state ROPS prevalence data and Census of Agriculture data were used to develop a model to predict counties with low ROPS prevalence rates. The rate of tractor overturn deaths decreased an estimated 28.5% between 1992 and 2007, with the largest deceases occurring since 2004. Between 1993 and 2006, the prevalence of ROPS-equipped tractors on farms increased from 38% to 59%. The regions of the US that had the largest decrease in tractor overturn fatality rates also had the largest increase in ROPS prevalence rates. States with the lowest prevalence of ROPS-equipped tractors had a 5-fold increased risk for tractor overturn deaths. Logistic regression models fitting state ROPS prevalence rates against Census of Agriculture data show promise in identifying counties with low ROPS prevalence rates. These results support the position that ROPS are effective in preventing tractor overturn deaths. In addition, results show how well the effort to increase the use of ROPS has progressed in the US and identify areas of the US where ROPS prevalence rates are not adequate. This information is useful for targeting ROPS promotion activities.

Disclaimer: The findings and conclusions in this abstract have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

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Cost Analysis of ATV-Related Head Injuries

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All-terrain vehicles (ATVs) were the energy agent associated with 555 fatalities and 146,600 hospitalized injuries in 2006, one-third of which were head injuries. This poster presents a cost analysis that was used in a high school economics curriculum regarding ATV riders wearing a safety helmet as an intervention to reduce the frequency and severity of head injuries. In this curriculum, an interactive narrative simulation exercise informed youth of the injury hazards of *not* wearing a helmet while riding on an ATV. A companion Excel™ cost tool was created to demonstrate for students the catastrophic costs associated with low-probability injury events (an expected value analysis). Metaphorically, these companion approaches linked the narrative's "pull at the heart strings" to the cost tool's "pull at the purse strings." The cost analysis included three steps regarding the use of helmets when riding ATVs: (1) a cost analysis of the case as expressed in the narrative; (2) a decision analysis to determine injuries averted among the population-at-risk by the intervention; (3) several cost analyses including a cost-effectiveness analysis of the intervention. The decision analysis showed a reduction of 240 head injuries per 100,000 riders per year with two of these injuries resulting in death, and for each injury averted (fatal and nonfatal), a saving of $364,306 to society with a 5% discount rate over a 50-year period. When adjusted to full-time use of an ATV (2000 hours per year), 3,276 injuries, including 240 deaths, per 100,000 riders would be averted at a savings to society of $509,172.

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And What About Tractors that Can't Be Retrofitted? Piloting a Tractor Trade-in Approach

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Tractor overturns are the most frequent cause of occupational death on U.S. farms. Rollover Protective Structures (ROPS) and seatbelts are 99% effective in protecting the tractor operator, however, many tractors manufactured before 1965 (approximately 806,000) cannot accommodate ROPS. Anecdotal evidence indicates these tractors are responsible for a large proportion of tractor deaths. Study objectives were to explore the potential for a tractor trade-in program with tractor dealers and individuals unable to retrofit and to review this data with agricultural stakeholders, to develop a framework for a tractor trade-in pilot program. Focus group participants were recruited via the NY State ROPS Rebate Program hotline. Farmers contacting the hotline who could not retrofit were invited to participate in focus group discussions. Tractor dealers were also invited to participate. Potential barriers and motivators to participating in a trade-in program were discussed. Transcripts were reviewed and major themes extracted. These were discussed at a workgroup session attended by safety experts and industry representatives. Major barriers include investments in and familiarity with the old tractor, lack of money for a newer tractor and frustrations regarding the fact that ROPS have not been built for older tractors. Potential motivators included adequate financial compensation, tax credits, zero-percent financing, insurance reductions, extras (such as power steering, air-conditioning, sun-shade) and an emphasis on the risks of overturn and safety of ROPS. Participant's demonstrated preference for installing fabricated ROPS on older tractors reveals a potentially widespread ignorance regarding the strength of axle-housings on these tractors. This information was reviewed by work-group attendees who outlined recommendations for a trade-in pilot program. A trade-in program designed for tractor owners who lack ROPS protection for their tractors would have to provide

adequate financial reimbursement, as well as other benefits to overcome the numerous barriers associated with scrapping older tractors that cannot be retrofitted.

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Case-Control Study of Risk Factors for All-Terrain Vehicle Injuries on Kentucky Farms

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The purpose of this study was to identify risk factors for ATV-related injury to members of farm households. The literature has previously identified injury risks for the general population of ATV riders, but there have been no studies specific to occupational use of ATVs. A mail survey was sent to a stratified random sample of farms in Kentucky. Data was collected from September 2008 to March 2009. Cases were respondents who owned ATVs on their farm and had been injured while operating an ATV. Controls were respondents who owned ATVs for use on their farm and had not had ATV-related injuries. Prevalence-based case/control study methods were used for the analysis. The response rate was 53% (N = 1031). The case control analysis was based on 118 cases and 913 controls with complete data. After adjustment for covariates, the significant ($p < .05$) injury risks were related to the following ATV rider characteristics: age, exposure, riding on public roads, and dangerous risk-taking attitude. The p- value for Hosmer and Lemeshow was 0.95 indicating goodness of fit. The results of this study suggest that ATV injury risks on farms are related to a number of rider characteristics, most of which are modifiable. Community-based educational interventions for ATV riders need to be tailored to meet the needs of farmers. There is evidence to support the need for state policy regarding the use of ATVs on public roadways.

Disclaimer: This poster has been presented for the Injury Control section of the American Public Health Association at the annual convention (November, 2009).

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Tractor Operator Roll Angle Assessment and Visual Slope Indicator Effectiveness

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According to a 2004 NIOSH report, approximately 250 to 350 fatalities occur each year due to incidents involving production agriculture workers and tractors. Tractor overturns account for about 150 to 200 of these deaths. Overturns are often the result of improper tractor operation by inexperienced or careless operators. The goals of this project were to: a) test a device to effectively deliver stability information to a tractor operator; and b) study operators' understanding of tractor roll angles. A previous research project designed and tested an electronic tractor stability monitoring device. When installed on a full size remote control tractor that was intentionally overturned, the electronic monitor accurately predicted potential and actual overturn events. This current project required the design and construction of a full scale tractor cab roll simulator. The simulator was used with volunteer participants to identify roll angles at which they felt uncomfortable, as well as roll angles at which they would no longer operate a tractor. In addition, the participants performed a series of tasks to assess the functionality of a visual slope indicator that was designed to help them estimate slope angles. This project tested 236 tractor operators' perceptions of safe operation on side slopes, and 130 participants' interactions with the visual slope indicator. Testing showed that the visual slope indicator could potentially influence novice tractor operators' perceptions of side hill slopes. This project was the initial step to design and test a visual stability monitor. If tractor operators were provided with effective stability information then safer tractor operation may result in fewer overturns.

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ZOONOTIC INFLUENZA

Protecting Pigs and Workers from H1N1 Influenza: Biosecurity Recommendations for Pork Producers

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The novel 2009 H1N1 virus has now been identified in pig herds in Asia, Europe, North and South America, and Australia. This includes positive confirmation in herds in the United States. With this in mind, U.S. pork producers need to be more vigilant than ever to protect themselves, their workers, and their pigs from further spread of this novel virus. The National Pork Board is urging producers and veterinarians to step up on-farm biosecurity practices to prevent the H1N1 virus from entering their swine herd and to remain vigilant, carefully monitoring the health of their pigs and taking steps to minimize the spread of novel H1N1 if it enters a production system. Producers also are asked to follow the recommendations of the U.S. Centers for Disease Control and Prevention (CDC) to prevent further person-to-person spread of the virus (see cdc.gov/h1n1flu).

The following precautionary measures should be in place at all U.S. pork production facilities: 1) limit the number of people you allow into your pork production operation, 2) develop and implement an enhanced biosecurity protocol for workers, service personnel, and all other people and equipment entering your facility, 3) establish, implement, and enforce strict sick leave policies

for workers who have developed influenza-like symptoms, such as a fever, cough, body aches, and sometimes vomiting and diarrhea and 4) follow industry-accepted biosecurity practices, including: require basic hygiene practices, properly adjust and maintain ventilation, provide workers with personal protective equipment and training, recommend that all workers are vaccinated against the seasonal influenza virus, review herd health programs with your veterinarian to ensure they are up to date and effective for conditions on your farm, perform daily observation of all of the animals in your care to assess the health of the animals on the farm and all of the animals transported to other sites or the market. If you suspect influenza in your pigs, contact a swine veterinarian immediately.

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OTHER

Surveillance of Fatalities and Injuries

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Fatality surveillance on NY farms has been an ongoing project in the Northeast Region. Because there is little or no OSHA reporting of injuries, data on fatalities is incomplete and data on significant injuries is virtually nonexistent. A new resource has been identified that may provide a wealth of data on both fatal and non-fatal farm injuries: the statewide database of ambulance pre-hospital care reports. The objectives are to: 1) develop a surveillance system for identifying agricultural injuries using Emergency Medical Services ambulance reports in a sample of 10 Upstate New York Counties; 2) examine the proportion of farm injury ambulance reports in which the "farm" location check box was indicated; 3) conduct parallel active community surveillance in these sample Counties; and 4) determine the most common injury mechanisms for farm injuries identified through combined surveillance methods. Ten counties in New York State were selected for ongoing farm injury surveillance. Counties were selected on the basis of having the combined largest number of farms, largest agricultural population size, greatest number of farm fatalities over a five-year period, and greatest number of state-reported EMS "farm" location ambulance runs in 2001. Preliminary results (these data will be update by the presentation date) are shown in the table. Data for 2007 in 10 high agricultural counties of New York State show that for each fatal injury, approximately 7 non-fatal serious injuries were identified. Tractor roll-overs and run-overs continue to lead, with animal encounters and falls also major contributors. The addition of non-fatal injuries now highlights the role of ponds, hills and other natural features in farm injury, as well as wagons and ATVs.

A comparison of the types of injury events by data sources illustrates that horse related injuries are more common in the ambulance data, as are falls. It is also notable that 53.5% of PCR farm cases (n = 23) were found searching free text, and did not have farm location circle checked. 82.6% of all surveillance calls that indicated ambulance transport occurred have not yet been matched with a PCR (2007). More matches will be likely as forms are received by the study team. By January, full analysis for 2007 will be complete. Final results and implications will be discussed.

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Fatal Injuries 2007	n (%)	%	Non Fatal Injuries 2007	n(%)	%
Tractor	3	30%	Tractor	15	22%
Roll over	2 (20 %)		Roll over	6 (9%)	
Run over	1 (10)		Run over	5 (8%)	
			Other	4	
Animal	3	30%	Animal	23	34%
Cow/Bull	1 (1%)		Cow/Bull	5 (8%)	
Horse	2 (20%)		Horse	15 (22%)	
			Other	3	
Farm Building	1	10%	Farm Building	9	13%
Fall	1 (10%)		Fall	8 (12%)	
			Burn	1	
			Ponds, hills, natural feature	3	4%
			wagon	3	4%
			Non-Powered	2	
			Powered	1	
			Motorized Vehicles	3	4%
			Vehicle, ATV, Cirt bike	3	
Other	3	30%	Other (categories with less than 3 cases)	11	16%
Total	10	100%	Total	67	100%

SUMMARY OF PRIOR GRAIN ENTRAPMENT RESCUE STRATEGIES

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Entrapment in flowable agricultural material continues to be a relevant problem facing both farmers and employees of commercial grain storage and handling operations. Considerable work has been done previously on the causes of entrapment in grain and possible preventative measures. There has been, however, little research conducted on the efficacy of current first response or extrication techniques. With the recent introduction of new grain rescue equipment and training programs, it was determined that there was a need to document and summarize prior grain rescue strategies and to develop evidence-based recommendations for first responders designed to enhance the efficacy of the techniques used and to reduce the risks to both the victim and first responders. Utilizing the Purdue University Agricultural Entrapment Database, developed by Freeman, Kingman, and Deboy, all data were queried on information related to extrication of victims from grain that have been documented over the period 1964–2006. In addition, other sources were analyzed including public records related to entrapments and information from on-site investigations. Significant findings include: an average of 16 entrapments were documented per year between 1964 and 2006 with the frequency increasing over the last decade with the most recent year reporting 33 cases; of all cases documented, approximately 45% resulted in fatalities; approximately 44% occurred in shelled corn; in 82% of the cases where the victim was submerged beneath the grain surface the result was a fatality while in 10% of the cases where the victim was only partially engulfed the result was also a fatality; 56% of the known rescue strategies included cutting or punching holes in the side walls of the storage structure; and 19% of the cases utilized on-site fabricated grain retaining walls to extricate partially entrapped victims. Recommendations included the need to conduct further tests on the efficacy of grain rescue strategies, including grain rescue tubes, and incorporate findings into future first responder training programs.

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