Podium Session 119: Agricultural Health and Safety

Papers 133-139

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Respirable Dust Exposure of FarmWorkers in Onion Processing

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Migrant farmworkers are exposed to significantly high levels of respirable dust, which can contain organic dust, silica, bioaerosols, pesticides, and pharmaceuticals. However, the respirable dust risk and impact on farmworker health is unknown. We measured personal exposure to respirable dust in 29 farmworkers on an onion farm with a processing facility in Vidalia, Ga. Respirable dust exposure was measured by a portable dust spectrometer with cyclone. The reported values are not adjusted by comparable gravimetric exposure. One-day exposure data was excluded due to apparent monitoring error. Exposure during working hours was measured for 4 hr in the morning, except for 2 cases in the late afternoon. Average respirable dust exposure during working hours was 0.62 (±0.28) mg/m3. None of the 4-hr respirable dust exposures exceeded a threshold limit value of 3 mg/m3 for nuisance dust. Average 15-min maximum exposure was 1.15 (±0.63) mg/m3. Average working hour exposure was significantly associated with 15-min maximum exposure (R2=0.804), and the 15-min average was about double the 4-hr average exposure. Four tasks with more than two measurements were office (N=2, mean=0.42 mg/m3); boxing (N=3, mean=0.53 mg/m3); forklift (N=7, mean = 0.68 mg/m3); and grading (N=12, mean=0.62 mg/m3). Average exposure during lunch hour was 0.39 (± 0.29) mg/m3 (N=20), which was significantly lower than exposure level during working hour ($p<0.002$). However, the lunch room was adjacent to the working area, and the respirable dust level during the lunch hour was quite high. In future, we need to determine a calibration factor for the monitoring of onion dust. This pilot study showed a fairly high level of dust exposure among the onion farmworkers. Although the exposure level was not higher than exposure limit for nuisance dust, it is possible that such dust exposure can cause long-term respiratory health effects in migrant farmworkers.

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Endotoxin Exposure and Respiratory Outcomes among Agricultural Workers in Colorado and Nebraska

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Gram-negative bacterial endotoxins play a key role in respiratory disease, affecting more than 1 million U.S. agricultural workers. This project uses a novel recombinant factor C (rFC) assay to evaluate the role of endotoxin exposures in respiratory outcomes among agricultural workers in Colorado and Nebraska. Prework shift measurements included spirometry, a symptom questionnaire. Personal samples were

collected using IOM inhalable samplers during the work shift. Spirometry and symptoms were measured again after the work shift. Results from the first 148 participants are reported here. Overall inhalable dust levels ranged from 0.07 to 76 mg/m^3, while endotoxin levels ranged from 3 to 49,600 EU/m^3. Exposures and respiratory outcomes differed by type of operation. At grain elevators (n = 58), inhalable dust and endotoxin exposures averaged 9.4 mg/m^3 and 3110 EU/m^3 respectively. Exposures averaged 4.3 mg/m^3 and 8,600 EU/m^3 at cattle feedlots (n = 39), 2.7 mg/m^3 and 1500 EU/m^3 at dairies (n = 18), and 4.7 mg/m^3 and 1380 EU/m^3 at farms. In addition the makeup of the endotoxins varied by operation. The mean cross-shift change in FEV1 (forced expiratory volume in the first second) was -3.1 for dairy workers, -7.2 on farms, -1.5 on feedlots, and -1.9 for grain workers. The cross-shift change in FVC was -1.5 on dairies, -8.2 on farms, -0.9 on feedlots, and -2.1 for grain workers. The most common symptoms reported included eye irritation, nose irritation, mucus, and cough. Change in FEV1 correlated with log10 of both dust and endotoxin exposures. Exposures to dust and endotoxin were extremely high in some cases. Changes in pulmonary function were most dramatic for farmers, but flows were significantly affected in all groups. Future work will include evaluation of the role of genetic and environmental factors in these respiratory outcomes.

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Prevalence of Obstructive Lung Disease in Older Kentucky Farmers. Part I: Objective and Subjective Indicators

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A cohort of older farmers (n=134) ages 58-86 was identified from the 1995 Kentucky farm family health hazard surveillance survey (FFHHSS) describing demographics, respiratory symptoms, and pulmonary function measurements. Independent measures of objective pulmonary function, including physician diagnosis, forced expiratory volume (FEV1%), and subjective symptom reports, were used to determine the prevalence of asthma or obstructive lung disease in older farmers. When surveillance relied on symptoms and reports of physician-diagnosed asthma, the prevalence of asthma was 37%. By including a pulmonary function test indicator, such as FEV1% <0.80, an additional 15 farmers with no reported symptoms or disease are identified, increasing the prevalence to over 45%. Older farmers should receive pulmonary function testing for obstructive lung disease. Symptom reports alone may not be reliable. Asthma or other obstructive lung diseases may be prevalent in this population even without reported symptoms.

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Prevalence Of Obstructive Lung Disease In Older Kentucky Farmers. Part II: Reliability Of Respiratory Questions

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Using objective measures of previous diagnosis and spirometry, the probable asthma prevalence in the older farmer cohort for the Kentucky farm family health hazard surveillance survey (FFHHSS) was 28.6%; 13.6% report physician-diagnosis of asthma, and 21.6% have an FEV1% (forced expiratory volume) <0.80 during a screening pulmonary function test. The aim of this study is to evaluate the specificity and sensitivity of asthma symptom questions used in the FFHHSS for this cohort of older Kentucky farmers. Physician-diagnosis of asthma and low pulmonary function measurements was matched with self-reported respiratory symptom data in a cohort (n=134) of Kentucky male farmers.

Specificity and sensitivity of symptom questions and demographic associations with objective indicators were calculated. Answers to respiratory symptom questions, such as wheeze without a cold or chest tightness, were not associated with objective measures of disease, such as asthma diagnosis and FEV1% decline for older Kentucky farmers. Older farmers with these objective measures of disease more frequently reported positive responses to questions on general wheeze and shortness of breath when hurried, and they evaluated their health status as good to excellent. Respiratory symptom questions typically identified as asthma predictive were not associated with objective respiratory disease for older farmers in Kentucky.

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The use of Industrial Hygiene in the Evaluation of Physical Agents and Respirable Particulate Affecting Thoroughbred Horses

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Industrial hygienists (IHs) are often called on to evaluate occupational exposure issues for various industrial settings. In this case, the authors were tasked with determining the agents adversely impacting the respiratory function of a group of thoroughbred horses. Veterinarians discovered fibrous particulate in the mucus of thoroughbred horses housed and exercised at this thoroughbred farm. Using conventional IH investigative techniques and air sampling methodologies, the barn, exercise walking pen, and grounds were examined for agents that may have caused increased mucus production, compromising breathing in the horses. The assessors examined the physical conditions of the barn and areas where the horses exercised. Additionally, materials used in the upkeep of the facility, such as hay, straw, sand, and cleaning supplies, were evaluated as potential agents of concern. Personal breathing samples were collected on the horses to determine what, if any, inhalable particles were in the breathing zone. Personal and area samples along with surface samples were submitted for microscopic analyses and particle characterizations using modified NIOSH 7400 (Phase Contrast Microscopy) and ASTM D5755 (Transmission Electron Microscopy) techniques. The findings of the visual examination of the facility found that the physical disrepair conditions at the barn were the source for airborne and bulk fiber glass exposures to the horses. Additionally, synthetic materials used as ground cover may have contributed to the veterinary findings of particulate in the mucus of the horses. In conclusion, the use of conventional IH evaluation techniques and sampling methodologies has pertinent and relevant applications beyond the typical occupational and office settings.

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Total Noise Exposure Assessment of Three Farm Families in Northwest Ohio

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A NIOSH-funded pilot project was conducted in Northwest Ohio to assess both the occupational and nonoccupational noise exposures of persons living and working on farms. The study was designed to monitor three to five family members from three families for one week each during planting, growing, and harvesting season. Dosimeters were programmed to record 24 hr a day, using both the OSHA and the NIOSH parameters, and were worn by the study participants from the time they got up each morning until they went to bed at night. All participating family members also completed daily time-activity logs

to record all on-farm and off-farm activities. Members of the research team conducted time-activity recording daily, as well, during each monitoring event. The participants included two full-time farmers, three part-time farmers who worked off the farm full time, one part-time farmer who home-schooled her children, and three adolescents, two of whom were home-schooled and who worked on the farm part time. The OSHA standards were not exceeded during farming activities. However, NIOSH guidelines were exceeded by both full-time farmers, one part-time farmer, and one of the adolescents. On-farm, work-related exposures ranged from 81.2 dBA to 89.3 dBA (8-hr time-weighted average [TWA], using OSHA parameters) and from 84.3 dBA to 89.9 dBA (8-hr TWA, using NIOSH parameters) during planting season; from 59.5 dBA to 89.6 dBA (8-hr TWA, using OSHA parameters) and from 69.8 dBA to 92.1 dBA (8-hr TWA, using NIOSH parameters) during growing season; and from 55.3 dBA to 88.9 dBA (8-hr TWA, using OSHA parameters) and from 67.3 dBA to 91.6 dBA (8-hr TWA, using NIOSH parameters) during harvesting season. Noise hazardous activities occurred during tractor operation and included planting, plowing, and tilling.

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Health and Safety Considerations During a Salmonella enterica Serotype Newport Outbreak at a Veterinary Teaching Hospital

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In March 2004, clinicians at The George D. Widener Hospital for Large Animals at the University of Pennsylvania's School of Veterinary Medicine noticed an increased caseload of *salmonellosis* in its equine patient population. Every effort was made by the staff to clean and decontaminate high-risk areas while providing essential hospital services. On May 10, 2004, the dean of the school of veterinary medicine discharged all patients to their owners or other equine health care facilities along the eastern seaboard and closed the hospital until the outbreak was brought under control. The university's Office of Environmental Health and Radiation Safety (EHRS) was contacted to assist in an extensive decontamination and remediation process. The incident command system (ISC) was implemented to assist the newly appointed director of biosecurity manage the task of a rigorous, multistage disinfection process. EHRS identified many work tasks that would require some form of health and safety intervention. It provided daily oversight of the project as part of the ICS. Standard operating procedures were drafted and posted at all work areas regarding the donning and doffing of personal protective equipment (PPE); sequence of disinfection procedures; and use of ladders, scaffolds, small engine-powered fogging equipment, and scissor-lifts. EHRS representatives also trained staff in the use of respiratory protection and personal carbon monoxide detectors; the safe dispensing and use of chemicals used in the disinfection process; and awareness of heat stress. Material safety data sheets for all chemicals used were posted at each work area as well as an incident response plan for this outbreak. The decontamination of the hospital began on May 10, 2004, and continued for the next 85 days. Approximately 100 people worked on the decontamination project without any injury or lost work time.