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AN ANALYSIS OF LABORATORY SAFETY PRACTICES AMONG AGRICULTURAL EDUCATION TEACHERS IN NORTH CAROLINA. C.L. Ford, F. Walson, North Carolina A&T State University, Greensboro, NC

Safety prevention in agricultural programs has become a major concern when training high school students for careers in agriculture and food science. In North Carolina, little is known about the laboratory safety practices of agricultural teachers when assessing student injuries and laboratory facilities. This study is designed to assess the perceptions of agricultural teachers in North Carolina regarding their laboratory safety practices. More specifically, the investigation is aimed at determining demographic characteristics of teachers, number of major and minor accidents in agricultural programs, instructional time devoted to safety, safety equipment available for students, and safety practices used in laboratories.

The sample population was comprised of 166 agricultural teachers randomly selected from a target population of 310 agricultural teachers in North Carolina. A survey questionnaire was mailed to collect data from the sampling population, which represented 54% of the target population. Seventy-five teachers completed the questionnaire, representing a 45% response rate. Some major findings were: (1) 49 teachers (65%) reported that they had liability insurance; (2) 53 teachers (71%) revealed that they were not certified in first aid and safety; (3) a majority of the agricultural teachers (78%) reported that they had less than 10 minor accidents to occur in the past 5 years; (4) 40 teachers (53%) indicated that they had no major accidents requiring attention from a doctor or nurse to occur in their laboratories during the past 5 years; and (5) 53 teachers (71%) revealed that they devoted less than 11% of their instructional time to teaching safety. In conclusion, there is a need for in-service safety workshops for agricultural teachers in North Carolina and additional curriculum materials to promote safety practices in the workplace.

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NICOTINE AS A FUMIGANT: EXPOSURES AMONG RESEARCH GREENHOUSE EMPLOYEES. A.M. Krake, NIOSH, Cincinnati, OH

An exposure assessment study was conducted by NIOSH investigators in response to a request from the manager of a university occupational health and safety program. The request concerned potential exposures of greenhouse employees and researchers to the insecticide nicotine during fumigation activities and maintenance of research plants. There were no reported health problems; however, there were concerns that employees may be reentering the greenhouse before nicotine air concentrations have decreased to a safe level.

A newly developed NIOSH sampling and analytical method for nicotine in environmental tobacco smoke was used to collect and analyze personal breathing zone (PBZ) and area air samples inside the greenhouse. It was hypothesized that during fumigation, nicotine may be present both as a vapor and bound or absorbed onto particulates generated during the fumigation process. Particle counts were measured over the same time periods as the nicotine concentrations to evaluate the correlation between them and assess the possibility of using the faster and more easily obtained particle count data to estimate nicotine concentration prior to reentry by greenhouse employees. Surface wipe samples were collected on commonly used greenhouse surfaces before and after the fumigation and analyzed for nicotine content.

PBZ samples collected for greenhouse employees ranged from nondetectable to 0.15 mg/m^3 and indicated that none of the employees were exposed to nicotine concentrations exceeding applicable occupational exposure limits (0.5 mg/m^3). Area air samples collected for nicotine in two greenhouse sections before, during, and after a 13-hour fumigation process indicated that nicotine concentrations peaked at 3.3 mg/m^3 within 10 minutes of the start of fumigation but fell within 40 minutes and were less then 0.5 mg/m^3 within 1 hour after fumigation began. Nicotine concentrations collected in a connecting hallway remained low (0.0017-0.16 mg/m^3) throughout the fumigation. The wipe samples results showed that some residual nicotine levels were almost 60 times higher after the fumigation.

Because nicotine is readily absorbed through the skin, employees may be exposed to nicotine when they touch greenhouse surfaces and use equipment. Particle count data were not useful predictors of nicotine concentrations and therefore could not be used to determine when it is safe to reenter the greenhouse.

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ASSESSMENT OF HIGH HAZARD-LOW FREQUENCY ACTIVITIES CONDUCTED ON IOWA FARM OPERATIONS. M.L. Jones, S. Reynolds, C. Zwerling. Institute for Rural and Environmental Health, University of Iowa, Iowa City, IA; W. Popendorf, Utah State University, Logan, UT

The agricultural sector of the United States has seen little change in injury and fatality rates over the last decade, and has been ranked as one of the most dangerous industries in the United States. As part of a multiyear medical and environmental surveillance project (Iowa Farm Family Health and Hazard Surveillance Project) in the state of Iowa, 12 high hazard-low frequency (HH-LF) on-farm activities were identified and evaluated for further in-depth study using an iterative Delphi process. The evaluation process ranked HH-LF activities according to the following criteria: frequency of hazard, severity of hazard, technical feasibility, economic feasibility, and research value. Two of the 12 HH-LF on-farm activities were chosen for further study: grain storage bin clean-out activities and power washing hog confinement buildings. The focus of the studies was on noise, dust, bioaerosols, and toxic gas exposures. The monitoring protocol for the grain storage bin clean-out activities included monitoring for noise; personal and area total particulate and endotoxin; area total bioaerosols; area mycotoxin; and quasi-personal exposure assessment of carbon monoxide, carbon dioxide, temperature, and relative humidity. The monitoring protocol for the power washing of hog confinement buildings included assessing noise; personal and area total particulate and endotoxin; area total bioaerosols; area inhalable dust; area respirable dust; area toxic gases (ammonia, carbon monoxide, hydrogen sulfide, and %LEL-methane); and quasi-personal monitoring of carbon monoxide, carbon dioxide, temperature, and relative humidity. The results from this investigation clearly show that both activities present farm operators with elevated exposures to noise, dust, bioaerosols, and toxic gases. The results from the assessment of these two different HH-LF on-farm activities will be presented and discussed, along with the contents of the monitoring protocols. Further, applicable control measures to reduce noise, dust, bioaerosols, and toxic gas exposures will be presented.

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EFFECT OF IN SITU COMPOSTING ON MALODOROUS GASES IN SWINE CONFINEMENT BUILDINGS. J. A. Kangas, K. Louhelainen, Kuopio Regional Institute of Occupational health, Kuopio, Finland; P. Viilos, A. Veijanen, University of Jyväskylä, Jyväskylä, Finland

Malodorous compounds emitted from swine manure are an important occupational and environmental factor. Ammonia and sulfur gases are the most occupationally harmful of the gases normally found in swine confinement buildings. More than 70 other malodorous compounds have been identified in swine manure. Among these are volatile fatty acids, phenols, and indoles are identified as the most malodorous compounds.

In this project seven swine farms were studied to find out the influence of the in situ composting system to the concentration and occurrence of malodorous compounds compared with those with a slatted floor pit-system. Sawdust was used as a composting material in these swine confinement buildings. The measurements of ambient level of malodorous gases were done in the farms before the change of the system. Afterwards the conditions in swine confinement buildings with in situ composting system were followed for 2 years. Ammonia was measured using diffusion tubes. Malodorous sulfur compounds were analyzed using laminated bags and portable gas chromatograph with FP-detector. Other odor-causing compounds were analyzed by gas chromatography/mass spectrometry system with simultaneous sniffing.

The most intensive and unpleasant odors were caused by p-cresol, carboxylic acids (C2-C7), and some ketones like 3-hydroxy-2-butanone, 2,3-butanedione, and 2-butanone. In swine confinement buildings where the composting system was functioning properly the concentration of sulfur compounds and especially carboxylic acids, ketones, and p-cresol was decreased effectively. The use of sawdust as composting material caused elevated concentrations of terpenes in ambient air.

Ammonia remained at a same level in both types of swine confinement buildings. Concentrations of odorous compounds did not exceed threshold limit values but several compounds exceeded the respective threshold odor concentrations.

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RESPIRABLE DUST AND CRYSTALLINE SILICA (QUARTZ) EXPOSURE RESULTING FROM POTATO HARVESTING OPERATIONS. L.J. Berberet, R. Buchan, M. Beard, Colorado State University, Fort Collins, CO; G. Kullman, NIOSH, Morgantown, WV

Abstracts

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