

CLEAN AIR FILTER FOR TRACTORS

By *Mike Schmitz, Eugene Ahrenholtz*
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Workers exposed to chemical fumes inside their cabs are reported to have headaches, nausea, and sickness as a result of these fumes. It seems the tractor cab filtration systems are not designed to filter chemical fumes. The authors researched and developed a design for an air filter that reduces chemical fumes and particulate matter in the tractor cab. They suggest this filter should be added to gloves, goggles and other protective equipment used when applying pesticides and herbicides. The clean air filter has a three-stage design. Stage one is a paper media that removes dust. Stage two is an activated carbon that adsorbs organic vapors. Stage three is a final filter which prevents carbon dust infiltration. The filter is patent-pending, but as yet untested by a large research company. Many farmers in Iowa are already using the product regardless of lack of testing, and say it does significantly reduce the chemical fume leakage into the tractor cab. The authors would like to work with a research company to test the product.

IOWA'S BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM



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The Iowa Department of Public Health (IDPH) has identified cardiovascular disease as the number one health problem in Iowa. Data from death certificates and other sources show the annualized 1984-86 mortality rate from ischemic heart disease is 253 per 100,000 population as compared to the national rate of 217 per 100,000 population. How do Iowans rate with their lifestyle behaviors? The Behavioral Risk Factor Surveillance System (BRFSS) is providing some answers. Data Collection--The goal of the BRFSS is to provide data to identify health promotion and disease prevention priorities for the public and private sectors of Iowa. Specific objectives are to determine the state-specific prevalence of personal health behaviors related to the leading causes of premature death and to advance the understanding that health-related behaviors are critical indices of health. Interview Process--The telephone interview process uses a modified random digit dialing and random selection of adults over 18 from the household. One hundred fifty interviews are conducted each month, totaling 1,800 interviews a year. There are currently 47 states using the 77 core questions developed at the Centers for Disease Control. 1989 Behavioral Health Risks of Iowans:

- Cholesterol - 57.6 percent reported having their cholesterol checked at least once.
- Hypertension - 15.8 percent had been told by a doctor or health professional they have high blood pressure.
- Exercise - 28.1 percent reported more than 20 minutes, 3 times a week of leisure-time physical activity.
- Binge or acute drinking - 16.6 percent of the respondents reported having 5 or more drinks on an occasion, one or more times in the past month.
- Seat belt use - 76.2 percent of those surveyed reported using a seat belt always or nearly always.
- Overweight - 25.3 percent based on body mass index.
- Smoking - 22.7 percent reported they now smoke.

OVERTURNING PERCEPTIONS OF TRACTOR OVERTURN HAZARDS



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Tractor-related fatalities in Iowa account for approximately 41 percent of the total fatalities recorded during 1988 through 1990. The National Safety Council identifies tractors as a major agent for death of agricultural workers. Overturns, runovers, and power-take-offs (PTOs) are a few specific examples of different dangers associated with tractor operations. Elevation of agricultural workers' awareness for tractor overturn hazards is accomplished by an interactive display. A table-top terrain and remote-controlled tractor operated by 4-H youth graphically illustrate the overturn hazards. Improper and proper responses to situations when a tractor wheel slips off the road are performed. Demonstrations of safe ascension of tractors on sloped ground is shown. The success and effectiveness of this educational and intervention display results from several factors. The high level of interaction is one factor. Participants view a dynamic model of a real life situation, while a narrative explains the significant details. The presenter disarms the audience because the 4-H youth do not represent authoritative figures stating guidelines, common procedures, and regulations. The display "*Drive Head over Wheels*" is an effective and popular display that promotes tractor safety and elevates the level of awareness for tractor overturn hazards.

PESTICIDE RESIDUES IN A MIDWESTERN FARMER'S COVERALLS

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Careful use and management of clothing can assist in minimizing exposure to crop chemicals and contribute to the farm worker's health and safety. This research concerns protective cotton coveralls actually worn during corn and soybean production. An Iowa farm family cooperated in this case study and provided used coveralls that had been worn for four crop seasons and laundered after every wearing during application of many thousands of pounds of eight different pesticides. Samples were cut from the lower leg, thigh, crotch, shoulders, sleeves, pockets, collar and waistband of the coveralls, both front and back, totaling 40. Each was separately extracted using ethyl acetate with 5 minutes of shaking and 16 hours standing. The solvent was analyzed for Trethane by electron capture GLC. After the EC analysis, samples were concentrated and analyzed for organophosphorus pesticides. All samples were quantified by two replicate systems. Standards were run after every five sample injections. Every fifth sample was amended with a mixture of the six pesticides anticipated to be present (because the owner had reported using them). Quantitative analyses for these were made; 90-100 percent recovery was obtained of the added pesticides. The pesticide deposition per square centimeter (cm^2) of fabric for each sample was separately calculated based on the cm^2 size of the extracted sample. The farmer was reported to be in good health, but his coveralls contained unexpected levels of five pesticides. Residues of pesticides used only in the first season that the coveralls were worn remained in them at the time they were retired, despite laundering after every wearing. Garment areas (pockets, waistband) frequently touched by hands seemed to have higher contamination levels. Measurable amounts of Trethane, Lorsbane and Counter were found in all samples of the coveralls, but no Lasso/Atrazine was detected. This could be explained by the latter's known solubility in water. A few samples contained Thimete and Dyfonate, although they had been used only in the first and second crop seasons, respectively. Residues released in the first extraction of lower leg samples ranged from 0.2 ng/cm^2 of Dyfonate and 0.5 ng/cm^2 of Thimete to 4.9 ng/cm^2 of Trethane and 7.3 ng/cm^2 of Lorsbane. Sleeve cuffs showed 14.0 ng/cm^2 Trethane, 91.9 ng/cm^2 Lorsban, and 10.5 ng/cm^2 Counter. A second extraction from selected samples from the lower leg, abdomen, shoulders, chest pocket, sleeve and cuff proved that pesticides had not been exhausted from the fabric by the first extraction. Dyfonate and Thimete appeared in a few samples with the second extraction that had not appeared with the first extraction. Two samples selected for a third extraction produced about 30 percent additional pesticide. Although original contamination levels were unknown, this study shows the difficulty of removal of pesticides from a textile matrix and suggests that work based on a single extraction may underestimate the amount of pesticide present. It also underscores the importance of dosimeter materials in affecting results of exposure studies. The residues per cm^2 seem small, but the total garment load must be considered. The health risk associated with chemicals so firmly bound in cloth is uncertain, especially when other clothing layers are worn beneath. Laundering after every wearing does not seem to completely clean pesticides from clothes in real-life minimum exposure situations of corn and soybean farming, but many studies have previously indicated that laundering greatly reduces pesticide residues. The persistence of Thimete and Dyfonate(s) which were used four and three years before this analysis, respectively, was unexpected. Cotton coveralls offer several advantages over disposables that are expensive, cannot be decontaminated, contribute to hazardous-waste problems, and are often too hot for comfort. This work suggests that it may be wise to replace cotton coveralls each crop season to prevent residue buildup.

ASSESSMENT OF BIOAEROSOL EXPOSURES IN GRAIN AND DRY VEGETABLE HANDLERS



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Workers exposed to grain and dry vegetable dust are reported to experience airway inflammation and progressive airflow obstruction. A population-based, longitudinal study was undertaken to determine the association of specific workplace exposures with pulmonary changes in grain handlers. A unique component of this study is the quantification of airborne levels of fungi, total bacteria, gram negative bacteria and thermophilic organisms. In addition, total and respirable dust, endotoxin levels, and other environmental parameters will be assessed for approximately 400 workers on three occasions over 5 years. At the outset, a survey was sent to 669 operating grain facilities in eastern Iowa. Completed surveys were received from 80 percent which illustrated the high degree of cooperation from these mixed grain, corn and soybean facilities. The mean number of production employees was 7.7 (range: 1 to 800) and employees numbered five or less in 71 percent of these sites. In the first two quarters of the study, exposure assessments and respiratory health evaluations were performed on 185 workers at 50 sites. Levels of indoor airborne fungi averaged 600 CFU/m³ for postal workers, who serve as our control population, while grain facilities averaged in excess of 20,000 CFU/m³. Airborne bacteria were generally twofold higher than fungi with 23 percent of the grain sites exceeding 1 x 10⁵ CFU/m³. Thermophilic microbes averaged 200 CFU/m³ in postal stations but were 10 to 40 times higher at grain sites, and gram negative bacteria at grain sites averaged 4000 CFU/m³. For all types of microbes, levels appear to be highest at mixed grain facilities. Microbial counts were split approximately evenly between respirable and non-respirable sizes. These data indicate that microbial exposure levels cover a broad range. Moreover, the range of exposure levels will enhance our ability to test our hypothesis that pulmonary function deficits are exposure dependent. (Funded by the Veterans Administration Merit Review and NIEHS ES00202).

DEVELOPMENT OF AN INHALATION TOXICOLOGICAL MODEL FOR FARMER'S LUNG



By Peter S. Thorne, M.S., Ph.D., Susan D. Kaliszewski
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Farmers inhale a complex mixture of xenobiotics that includes respiratory irritants, microbial toxins, nuisance dust and a multitude of aeroallergens derived from plants, animals, arthropods, and microbes. Farmer's Lung is an extrinsic allergic alveolitis characterized by lymphocytic and granulomatous interstitial lesions. It is most often associated with exposure to the thermophilic spore-forming bacterium, *Faeni rectivirgula* (*M. faeni*), found in moldy hay. In order to study the pulmonary immunologic processes associated with the early stages of this disease, we undertook to develop murine and guinea pig models of Farmer's Lung using inhalation exposure. Large quantities of pure *M. faeni* were grown in tryptic soy broth at 50°C, then washed and concentrated. Aerosols of a homogenate of this *M. faeni* preparation were generated into exposure chambers using a PITT#1 nebulizer. This procedure allowed generation of atmospheres containing up to 8 mg/m³ pure *M. faeni*. Two exposure systems allowed inhalation challenge to either mice or guinea pigs with responses determined from histopathology, immunochemistry and pulmonary function evaluations. In one such study, mice inhaled *M. faeni* aerosols (5.7 ± 1.7 mg/m³) for 30 min, once each week. Three groups of 10 mice received either 4 or 8 exposures or were sham exposed, and each group consisted of 5 animals fed a standard diet and 5 fed a diet containing a stimulant of delayed hypersensitivity responses (vitamin A). Histopathological examination of the mouse lungs demonstrated marked perivascular and peribronchiolar histiocytosis, localized acute inflammatory cells, fibrosis, and giant cells in granulomatous lesions in the mice fed the vit. A-supplemented diet and exposed on 4 occasions. Other treatments resulted in mice with less severe responses. Inhalation exposures of guinea pigs in plethysmography will incorporate measurement of bronchoconstriction, airway hyperreactivity and immunochemistry into the model. This appears to be the first animal model to demonstrate Farmer's Lung solely by the inhalation route of exposure.

FARM FAMILY REHABILITATION MANAGEMENT PROGRAM (FARM)



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There are more than 45,000 Iowa farm families who have been affected by permanent disabling accidents, injuries, or illnesses. Until recently, many farm families were forced to prematurely discontinue this rural way of life or attempt to farm with a disability that often resulted in secondary injuries. In 1986, the Iowa Easter Seal Farm Family Rehabilitation Management (FaRM) Program was developed to address the needs of this "at risk" population. The FaRM Program provides onsite rural rehabilitation services to farm families affected by disabilities. These services promote return to farming, the community, and increased independence by both the disabled individual and family members through adaptive equipment, modifications to the farm and home, secondary injury prevention education, and community support services. The success of this program has been recognized nationwide as an innovative and grassroots service delivery program. In November of 1990, President Bush signed the Farm Bill which included an amendment to establish programs in other states that will assist farmers with disabilities based on the successful Iowa FaRM Program. The Iowa Easter Seal FaRM Program relies heavily on its cooperative agreements, coalitions, contracts, and networking with the following organizations: The Farm Bureau, Pork Producers, Cattleman's Association, and other community organizations to assist in identifying individuals with disabilities and providing assistive technology services; Iowa State University Agricultural Engineering Program to assist in designing agricultural work site adaptations; the University of Iowa Ag-Medicine Program and the Iowa Program for Assistive Technology to assist in injury-prevention activities, statewide awareness, and direct service delivery; State Vocational Rehabilitation, rehabilitation hospitals, and The Department of Public Health to assist in referrals and funding of services. In addition, the FaRM Program utilizes: a statewide ingenuity network comprised of volunteers who assist in obtaining, designing, and fabricating rural assistive technologies; a peer technology support network comprised of individuals with disabilities who share their experiences with individuals who are newly disabled; and an on-site Mobile Rural Assistive Technology Unit.

EDUCATING IOWA FARMERS ABOUT PESTICIDE SAFETY AND HEALTH RISKS



By Wendy K. Wintersteen, Ph.D.
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Minimizing the health risk inherent in pesticide application is a major goal of the Pesticide Applicator Training (PAT) program. In the past three years, more than 40,000 Iowa farmers attended a 4-hour training session on the health and safety concerns associated with pesticides. Although pesticides are toxic, the health risk they pose can be significantly reduced by practices that limit exposure. The Iowa State Cooperative Extension Service PAT program seeks to reduce harmful health effects by alerting farmers to the exact toxic nature of pesticides, and strategies to minimize pesticide exposure. When handling pesticides, farmers are cautioned to read the pesticide label and wear the suggested protective clothing. Neoprene or nitrile gloves, goggles or face shields, rubber aprons or coated Tyvek disposable suits are items that can dramatically decrease pesticide exposure and limit harmful health effects. Farmers are also taught to re-enter sprayed fields only after a safe interval and methods to reduce pesticide drift on themselves and their neighbors. Pesticide poisoning symptoms and exposure routes receive considerable attention as well. Recognizing pesticide poisoning symptoms for each class of pesticides, and responding with the proper first aid and medical treatment is essential farm safety knowledge. Program evaluations have been very favorable and participants have adopted safer pesticide-handling practices as a result of attending the program. A post-training survey of 1,040 applicators asked respondents if they would change their farming practices as a result of attending the training program. The response choices were: likely, not likely, or not sure. As a result of attending the training sessions, 91 percent said they would check pesticide labels for signal words indicating product toxicity. Also, 87 percent thought they would increase their use of protective equipment, such as gloves, goggles, and coveralls.

THE AGRICULTURAL SAFETY AND HEALTH PROMOTION PROGRAM FOR OLDER KANSANS



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The Agricultural Safety and Health Promotion Program for Older Kansans was launched this year in an effort to communicate safety information to farmers who may not have been reached successfully in the past. To this end, we are taking a slightly different approach in our outreach than that of previous safety programs. Since farmers' past attendance at seminars and meetings focused specifically on safety has been disappointing, we are attempting to communicate our safety message by taking advantage of already existing community forums. In each of Kansas' 105 counties, we are recruiting and training a team of volunteers who will make brief, 7-to-10-minute presentations on various safety topics to community gatherings such as Extension meetings, Farm Bureau meetings, seed and fertilizer sale days, church events, and meetings of local service organizations. Each team of volunteers is backed up by a support team consisting of the county Extension agents, the county Farm Bureau safety chairperson, and the county health director or local representative of the Area Agency on Aging. The volunteers will base their presentations on a series of 4-page tabloids dealing with the following seven topics:

- Tractor Safety.
- Pesticide application and farm chemical handling.
- Farm machinery (other than tractors).
- Farm vehicles (trucks, wagons, ATVs, etc.).
- Livestock safety.
- Health issues.
- Farmstead safety (electrical hazards, grain bins, manure pits).

Volunteers will be provided with lesson plans containing suggestions for conducting the presentations, although volunteers are encouraged to be original and to use their personal knowledge and experience in formulating their own approach to their audience. Volunteers will distribute the tabloids at each of the meetings at which they make presentations. To further broaden our audience, the project will include production of a series of eight videotapes, one on each of the above topics, plus an additional video dealing with the aging process and how it relates to farm work. The project also involves incorporating units on safety into college agricultural courses and holding an annual Agricultural Engineering Safety Design Contest for college students.

RISK OF EXPOSURE TO CRYPTOSPORIDIUM AMONG FARMERS IN WISCONSIN



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Cryptosporidium infection is an important cause of diarrhea in humans and domestic animals; no effective therapy is known. Because the livelihood of farmers often requires contact with potentially infected animals, farmers may be at greater risk for *Cryptosporidium* exposure and disease than non-farmers. We used an enzyme-linked immunosorbent assay to determine the serologic status of current farmers, ex-farmers, and persons who never farmed in a cohort of 116 Wisconsin men. Of 75 men who reported to be currently farming, 31 (41.3 percent) were seropositive for *Cryptosporidium*, compared with 8 (19.5 percent) of 41 ex-farmers and never-farmers (odds ratio = 2.9, 95 percent confidence interval 1.1-7.9). After leaving the occupation of farming, ex-farmers experienced a decrease in seropositivity ($p = 0.06$). These findings suggest that current farmers are at greater risk of *Cryptosporidium* infection than are ex-farmers and persons who never farmed. Additional work is needed to define high-risk farming activities and determine modes of transmission in the farm setting so that farmers can take effective measures to prevent this potentially serious disease.

NON-HODGKIN'S LYMPHOMA ASSOCIATED WITH THE AGRICULTURAL USE OF HERBICIDES



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Recent epidemiologic case-control studies in Kansas and Nebraska have shown that agricultural herbicide use, particularly that of 2,4-D, is associated with an increased risk of non-Hodgkin's lymphoma (NHL). To better characterize this risk with regard to histologic type, we combined the results of the two studies (370 male cases, 1,671 controls) using the Working Formulation histologic classification. Among men, the use of herbicides was associated with a 50 percent increased risk of NHL (OR=1.5; 95 percent CI=1.1,2.1), and the use of 2,4-D was associated with a two-fold increased risk (OR=1.9; 95 percent CI=1.3,2.8). Exposure to 2,4-D more than 20 days/year increased the risk more than four-fold (OR=4.5; 95 percent CI=1.1,18.3). Interestingly, increased risks were seen for all ten major histologic types of NHL (categories AJ) in the Working Formulation. The highest risks associated with exposure occurred in intermediate-grade NHL (categories D-G). The use of herbicides was associated with a 70 percent increased risk of intermediate-grade NHL (OR=1.7; 95 percent CI=1.2,2.6), and the use of 2,4-D was associated with a more than two-fold increased risk (OR=2.4; 95 percent CI=1.5,3.9). Exposure to 2,4-D more than 20 days/year increased the risk of intermediate-grade NHL by more than eight-fold (OR=8.3; 95 percent CI=1.7,38.7). Within intermediate-grade NHL, follicular large cell NHL (category D) was the highest risk type with a nearly seven-fold increased risk associated with the use of herbicides (OR=6.7; 95 percent CI=1.4,44.1) and a ten-fold risk associated with the use of 2,4-D (OR=10.0; 95 percent CI=1.9,69.8). We conclude that agricultural herbicide use is associated with an increased risk for all major types of NHL, and for follicular large cell NHL in particular.

TRACTOR SAFETY CLASSES FOR YOUTH

By Geraldine Smith

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"Farming Safely in the Thumb" is a program serving Huron, Sanilac, and Tuscola Counties of Michigan. It is funded by a grant from the Michigan Department of Labor, Safety Education and Training Division. One of the major events of this program has been the Safe Tractor Operation classes for youth ages 10 years and older in each of the three counties. The 4-H Tractor Operation Program was established in 1970 as a means for youth to receive an exemption from the tractor driving restrictions of the Hazardous Occupations Order. For many years, the training needed by youth to receive this exemption was handled through Vo-Ag programs of local high schools. As a result of the discontinuation of or change in these programs and the concerns of liability, most youth in the "Upper Thumb" of Michigan had no way of earning a "certificate of training." This training has been demonstrated to be very successful in reducing injuries among those youth completing the program. The Safe Tractor Operation classes meet all of the requirements for providing youth 14-15 years of age with the training needed to earn this certificate. At the same time, these classes provide safety education to younger youth when they are beginning to learn to drive tractors. The classes are co-sponsored by "Farming Safely in the Thumb," the county 4-H Council and the county Farm Bureau. They run 7 weeks, meeting 1 night a week for 2 hours. The classes are strictly classroom instruction (there is no practical tractor driving) and are divided by ages (10-12 years and 13 or older). Each youth has a manual, and the instructors make use of slide/tape presentations (available through the Cooperative Extension Service, Michigan State University), safety videos and outside speakers. Every youth receives a 4-H Certificate of Participation and a Tractor Safety T-shirt. The students 14 and 15 years old who wish to earn a "certificate of training" must pass both a written test and a practical driving test. Over 1,000 youth participated in the classes this winter.

GREEN ISLE PROJECT: MY HEALTH FOR BETTER LIVING

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Rarely are there programs that outlive the grants that have given birth to them. Fewer still leave their imprint by serving as a model for a state public health sector. *The My Health for Better Living Project* influenced a rural community and two townships of 1,600 to re-examine their lifestyle to make changes in their eating patterns and exercise habits. The project incorporated the effort of 4-H members, community leaders, parents, schools, and county health professionals to improve the health and well-being of the families in the rural area surrounding and including the Green Isle community in western Minnesota. This project included the development of a health promotion education model that fostered community participation. The specific purpose of the project was to fill a need as expressed by the citizens of the Green Isle rural community and evidenced by the number of overweight children, undernourished elderly, medical complications, and chronic disease cases. Due to the worsening rural economic crisis, rural families were manifesting poor health habits which exacerbated their underlying health concerns. This project is unique because it was spearheaded by concerned youth and their parents. A Health Advisory Committee assisted in translating the ideas into action. The results have been positive. Designed for 1 year, the program has lasted 3! The cost of the programs was done on less than \$8,500 and has involved more than 1,200 hours of volunteer time. Many people have admittedly taken the time to make changes in their eating and exercise habits, positive changes influenced by programs initiated by the Sundown Busy Bees 4-H Club. The programs address several age groups and continue to occur because they either have been integrated into existing establishments or have become self-sustaining. This project has received recognition from the Governor of Minnesota and the U.S. Secretary of Health and Human Services.

TEEN STRESS, DEPRESSION, AND SUICIDE

By Diane Norland

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According to University of Minnesota researchers, teen stress, depression, and suicide are occurring at high levels. These findings help dispel the notion that childhood is an unbroken, happy, carefree time. To address these issues, Sibley County, Minnesota, set up a Teen Stress Committee to develop an education and intervention program for school personnel, young people, parents, and interested community members. The committee used a program *Tackling Tough Stuff* developed by Joyce Walker, a University of Minnesota Youth Development Specialist. The Teen Stress Committee carried out two trainings of Sibley County school personnel which educated the participants about the prevalence of stress, depression, and suicide among young people. The participants also learned about signs and symptoms. Most importantly, they learned how to help. Selected teachers were recruited and trained in the use of the *Tackling Tough Stuff* curriculum to be used in their classrooms. A Student Assistance Team was recruited and trained in each school to deal with referrals from other school personnel and students. A play about teen depression, suicide and possible responses was performed for the community to raise their awareness about the issues. Several types of parenting workshops have been held twice a year on parenting challenges. Finally, a workshop featuring resources was held for all area professionals, such as school personnel, health professionals, social services, law enforcement, and clergy.

ROCK COUNTRY WALKS AROUND THE WORLD IN 30 DAYS



By Gloria Tollefson
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Rock Healthy is a community-based health promotion coalition whose mission is to reduce the risk factors of chronic disease through proper nutrition and fitness. The coalition is made up of representatives from food retailers, businesses, county agencies, schools, producer groups, commodity groups, consumers, and the local hospital and medical clinic. The coalition planned and implemented a county-wide program, *Rock County Walks Around the World in 30 Days*. The goals of the program were to: (1) increase awareness of the relationship between exercise and heart health; (2) promote walking as a heart healthy exercise; (3) increase awareness of the available walking sites and trails in Rock County; (4) provide the opportunity for residents to engage in a walking program; and (5) to sign up 1,000 participants. Participants were recruited from the community-at-large, work sites, schools, community groups, and churches. Participants were given a sample walking program, weekly log cards, and exercise tip sheets. Each week walkers turned in their log cards. Miles were added up each week and tracked on a map of the world that was on display at the downtown newspaper office. Rock County has a population of 10,442; its major industry is agriculture and related to businesses. Almost 18 percent ($n = 1,772$, 805 men and 967 women) of the population participated in the Walking Campaign—walking a total of 43,942 miles. The rural community of Hardwick, population 150, had 50 percent of its residents participate. All the school districts in the county (elementary, junior and senior high) participated for a total of 1,069 school-age children. Rock Healthy Coalition has put together a campaign overview and a media guide (sample ads, stories, etc.) that can be used by other communities.

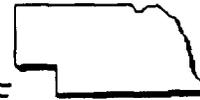
NETWORKING THE NEBRASKA SAFETY PROGRAM



By Rollin D. Schneider
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There are many organizations, groups, and private citizens who are willing to help in delivering a message. Nebraskans are willing to help, if given the opportunity. For the last 30 years, I have been able to use a number of people to tell the safety and health story across the state of Nebraska and some other states within the United States. Foreign countries are not excluded. Altogether, I have over 1,000 people helping me tell the safety and health story. This includes upwards of 375 State Patrol Personnel, Sheriff's Departments, EMTs, County Extension Agents, Vocational Agriculture Instructors, Farm Organizations, etc. This figure is greatly expanded when you consider there are approximately 21,000 Emergency Medical Technicians who carry the story to the local level. After all, it is to their benefit if they can teach about an accident potential in a positive manner rather than having to pick up an injured person. Each state has this cadre of people to work with. It is just a matter of getting the people to understand what is needed and then giving them the facilities or information to work with. There is a segment of the "You scratch my back and I'll scratch yours." If I expect people to help me, they may also want my help at some time. Overall, I use 50 or more organizations or groups to help with the safety and health story. This practice has proven to be very beneficial. Some people I talked to point out they cannot get cooperation. The first question I ask them is, "Did you ask for help?" The answer is usually "No. They did not help someone else I know so they probably will not help me." My reply is, "They are going to either say *yes* or *no*. You don't know which it will be until you ask."

GRAIN SORGHUM DUST EXTRACT CHALLENGE CAUSES NEUTROPHIL MIGRATION TO THE PERIPHERAL BLOOD, THE UPPER RESPIRATORY TRACT AND THE LOWER RESPIRATORY TRACT



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Inhalation of grain dust is known to cause acute bronchitis symptoms, nasal irritation, and peripheral blood neutrophilia. We proposed that challenge with grain sorghum dust extract (GSDE) causes neutrophils to migrate to both the upper respiratory tract (URT) and lower respiratory tract (LRT). To test this hypothesis, 8 normal non-smoking, non-allergic volunteers were challenged with 24 ml of grain sorghum dust extract delivered to the URT and LRT as an aerosol generated by a Pulmoaid nebulizer. Assessment of the URT and LRT for signs of inflammation was done using nasal lavage (NL) and bronchoscopy with bronchoalveolar lavage. NL performed at baseline and +24 hours was done by instilling 3.5 ml. aliquots of saline which were immediately, forcibly expelled. There were more PMNs at +24 hours than at baseline ($.29 \pm .09$ vs $.233 \pm 1.40 \times 10^6$, $p < .1$). BAL was performed at +24 hours by instilling 5, 20 ml aliquots of saline followed by gentle aspiration. The returns from the first aliquot were processed as the "bronchial" sample and the remaining BAL fluid was pooled as the "alveolar" sample. There was significantly more PMNs in the "bronchial" and "alveolar" compared to normal controls ("bronchial": 40 ± 4 vs 10 ± 1 percent, $p < 0.05$; "alveolar": 46 ± 7 vs 1 ± 4 percent, $p < 0.05$). Although GSDE can attract neutrophils by a variety of mechanisms, an alternative, not mutually exclusive, hypothesis is that neutrophils are stimulated to randomly migrate (chemokinesis). To test this hypothesis, blood neutrophils are collected from the GSDE challenged volunteers at baseline and +7 hours. Neutrophil chemotaxis to GSDE was done with these PMNs using a modified blindwell chamber technique and significantly more PMNs migrated towards GSDE 7 hours after aerosol challenge with GSDE than at baseline (126 ± 7 vs 164 ± 7 cells/hps, $p < .05$). These experiments demonstrated that there is a PMN influx into the URT and LRT. This may be explained, at least in part, by increased chemokinesis of the exposed patients' PMNs.

**MANAGEMENT PROCEDURES TO ENSURE HORSE
FARM SAFETY AND TO REDUCE LIABILITY COSTS AND
RISK TO OWNERS**



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Liability costs are a prohibitive factor to horse farm owners and riding instructors to the extent of making it financially unfeasible to remain in business. The objective of this extension educational program was to increase the awareness of horse farm owners and riding instructors of proper farm management and riding techniques that not only ensure personal safety and well-being, but also reduce insurance premiums and risk of lawsuit from liability claims. The program was designed to provide horse farm owners with a model horse farm to assist in meeting standards for farm safety techniques that will serve as evidence they are making a conscious effort to provide a safe atmosphere for themselves, clients, and horses. The model farm and safety techniques are described on videotape and in a series of fact sheets. The agenda for the videotape included: 1) general barn, surrounding acreage and pasture safety; 2) demonstration of what constitutes an "attractive nuisance"; 3) proper storage and care of equipment and outbuildings; and 4) examples of posted signs and considerations for liability coverage. Topics of fact sheets included: 1) safe management techniques while approaching, handling, leading, tying, saddling, and bridling; 2) proper riding safety while mounting, dismounting, and astride; 3) preventive measures for fire safety and what to do in the event of fire; and 4) considerations for liability coverage and examples of hold-harmless agreements. Success of the program was determined by increased awareness of the need for horse farm owners to take a proactive role in reducing farm and instructor liability and demonstrated improved farm safety management practices and riding techniques by horse farm owners in New Jersey. Overall program success will be identified by reduced farm liability premiums and the number of horse farm and riding accidents.

A RESPIRATORY AWARENESS PROGRAM FOR NEW YORK FARMERS



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Workers in agriculture are at risk for a variety of occupational respiratory diseases (ORD). To address this problem, we designed an outreach program aimed at heightening the awareness of New York farmers regarding ORD. We elicited information regarding occupational dust exposures as well as respirator use from 431 farmers prior to routine spirometric evaluation at 10 agricultural exhibits. One hundred eighty-one farmers (42 percent) reported using respirators prior to participation in the program. However, further questioning revealed that 118 of these (65 percent) were using handkerchiefs and single-strap masks. Following an explanation of the screening results, a brief review of the risks of ORD, the benefits of dust avoidance, and instruction on the proper use of approved respirators, each participant was given a list of respirator suppliers. Effectiveness of this interventional approach was determined by 6 week follow-up with postcards (55 percent response rate) and with telephone interviews of a 10 percent sub-sample of the non-responders. Follow-up of those not previously reporting use of protection showed current respirator use in 60 percent of the postcard responders and 50 percent of the sample of non-responders for a total weighted average of 54.6 percent improved compliance following the program. There was a prevalence (36 percent) of abnormal spirometric results in those not converting. This prevalence was not significantly different from the 34 percent prevalence found in those converting. Therefore, we concluded that abnormal results were not a predictor of behavioral change. We conclude that this approach is effective in improving respirator compliance among farmers and that this improvement is independent of their spirometric results.

FATAL FARM ACCIDENTS IN NEW YORK: CONSEQUENCES AND ECONOMIC IMPACT



By Timothy W. Kelsey, Ph.D.

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Farming is often identified as one of the nation's most hazardous occupations. The National Safety Council estimates that 1,300 people die each year in agricultural accidents. Despite the high fatality rate, there has been only anecdotal evidence about the consequences of fatal farm accidents on farms, farm families, and local communities. Existing analyses considering the impact of farm accidents have primarily been case studies which concentrated on non-fatal accidents. Studies focused on fatal accidents have generally only considered the causes of accidents and to whom they occur. Using information from a previous newspaper clipping and death certificate-based study of fatal farm accidents, 87 families who had a member die in a farm accident in New York between 1985 and 1987 were identified. Fifty-two (60 percent) of these farm families were successfully interviewed by telephone. Income foregone by the accidents was estimated from the responses, using discounted future earnings and weighing by age-based and sex-specific survival probabilities. The discount rate was 5, and was combined with a productivity increase of 2 percent per annum. The net discount rate was thus 3 percent. All calculations were in 1987 dollars. Income foregone included on-farm and off-farm income and the value of household work. Fatal farm accidents cost New York an estimated \$1.3 million a year in lost income. The average present value of lifetime expected income foregone included \$447,157 per male owner, \$472,607 per hired worker, \$268,918 per female owner, and \$514,754 per child killed. The accidents had other costs as well; 67 percent of the families had quit farming entirely, and 44 percent of the families had moved and were no longer living on those farms. The relatively high displacement from agriculture and from homes shows that fatal farm accidents do not just mean the tragic loss of life. These accidents also often have tragic implications for the families' livelihoods and lifestyle. On the other hand, these family tragedies clearly do not overshadow other difficulties in agriculture. With at least 1,000 farms in New York quitting operation every year during this time period, fatal farm accidents were not a major source of farm family displacement. Furthermore, the total value of the income foregone by accidental deaths to farm operators was only equivalent to 1.2 percent of the returns from farming to farm operators in New York, and only 0.48 percent when both on-and off-farm income of farm households in New York is considered. Fatal farm accidents are major tragedies for the affected families, but such accidents' foregone income impacts and displacement are relatively small from a societal perspective.

**NORTH CAROLINA AGRICULTURE: DO WE POSSESS
THE RIGHT TOOLS FOR HUMAN ILLNESS IN SWINE
AND POULTRY OPERATIONS AND INJURIES
FROM AGRICULTURE MACHINES?**



By Robert L. McLymore, M.S.
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The Agricultural Health Promotion Systems program in North Carolina is addressing the high rate of injury and illness of the agricultural worker. In North Carolina, according to the North Carolina Department of Labor, those involved in agricultural occupations had an occupational rate of 8.3 /100,000 in 1987, compared to the overall incident rate of 7.3. North Carolina State Data Center statistics indicate that of the 48 farm-related fatalities reported in 1988, one-third involved agricultural machinery. Curriculum materials are being developed during the first year for the College of Agriculture and Life Sciences that will educate students about "*Human Illnesses resulting from Swine and Poultry Confinement Facilities,*" and "*Agricultural Machinery Hazards.*" These materials will be presented in the 1991 Fall Semester for both associate and baccalaureate courses at NCSU. In addition, courses at the East Carolina University School of Medicine will benefit from the developed materials. In the second year, eight County Extension Service programs will pilot the developed materials prior to statewide dissemination. The development of a Lay Advisors' Program in the third year of the project will lay the foundations for an ongoing program that will continue to address the health and safety of the agriculture workers. The relationship which exists between East Carolina University School of Medicine, local Extension Services Offices, state and local Health Departments and the agricultural community will become stronger. Through these interactions, a decrease in work-related injuries and illnesses and the promotion of health in agricultural workers and their families should occur in North Carolina.

FARM OPERATOR INJURY AND HEALTH STATUS



By Michael D. Schulman, Ph.D.
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Panel data from random sample surveys of North Carolina farm operators provide data about injury and health status. Among farm operators who stayed in farming during both survey waves (N-95), 10 percent said they or a member of their family had been injured on the farm seriously enough to miss a day's work, a day of school, or to require a visit to a doctor. Farmers with 200 or more days of on-farm work, those with no off-farm work, those under 45 years of age, and those with high gross farm incomes had the highest injury rates. Seventeen percent of continuing farm operators fell into the poor health category on an index composed of 10 questions about common health problems. Eighteen percent of continuing farm operators reported having a chronic health problem that sometimes interfered with their work. Seven percent of continuing farm operators reported they lacked health insurance. Among farm operators who exited farming (N-198), 7 percent cited health as the most important reason they left farming and 11 percent said they were disabled. Approximately 27 percent of ex-farmers fell into the poor category on the health index and 13 percent lacked health insurance. The results point to the need to consider both the short-term and long-term effects of agricultural hazards on the health status of farmers and ex-farmers.

**THE USE OF PROCESS HAZARD ANALYSIS FOR PREVENTION
OF INJURIES FROM ANHYDROUS AMMONIA**



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In order to prevent occupational illness and injury, it is desirable to anticipate potential hazards and to proactively implement appropriate preventive measures. One possible tool for doing this is Process Hazard Analysis (PHA). Researchers from the National Institute for Occupational Safety and Health (NIOSH) have applied a form of PHA called Hazard and Operability (HAZOP) analysis to analyze the use of anhydrous ammonia by farmers. Due to the extensive use of anhydrous ammonia, it is particularly important that the equipment, hardware, and procedures be both safe and highly tolerant to potential misuse. The HAZOP analysis involves: a systematic evaluation of the potential failure points that can occur with the equipment and procedures used in anhydrous ammonia storage, transfer, and application; the identification of credible and hazardous accident scenarios; and the identification of practical solutions or of research needs. Specific examples of these findings are given. In the future, we plan to use Process Hazard Analysis in the handling of acutely hazardous pesticides and working with power equipment. Results from these studies will be disseminated and their effectiveness assessed.

IGE ANTIBODIES TO SWINE ANTIGENS IN THE SERA OF PORK PROCESSORS



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As part of an investigation of respiratory illness among workers at a pork processing facility, we obtained serum samples from 37 workers and bulk samples of substances to which the workers were exposed. The serum samples were analyzed for total IgE content by a commercial radioimmunoassay (PRIST), and for specific IgE antibodies by the radioallergosorbent test (RAST) using extracts of swine urine, serum, blood, and dander coupled to cyanogen bromide-activated cellulose beads. A sample was considered positive if the binding to the antigen-coated beads was at least twice the binding to human serum albumin-coated beads. By this criteria, IgE antibodies to one or more antigens was detected in 28 (75.7 percent) of the sera tested. All 28 sera reacted with the whole blood extract, while 16 reacted with the dander, 10 with the urine, and 8 with the serum. No correlation between the total IgE content and specific IgE antibodies was observed. By questionnaire, 25 of the subjects were symptomatic for respiratory disease; 14 of these subjects had abnormal serial peak flow measurements. The antibody data was analyzed with respect to the symptoms and peak flow finding, and revealed that 9 of 14 (64 percent) symptomatic with abnormal peak flow measurements had IgE antibodies while 10 of 11 (91 percent) of symptomatic with normal peak flow measurement had IgE antibodies. These results demonstrate that pork processing workers develop IgE antibodies to swine antigens, and that antibody activity may correlate with symptoms but not impaired pulmonary function.

**DEVELOPMENT OF AN IMMUNOASSAY METHOD FOR THE
DETECTION OF ALACHLOR IN AGRICULTURAL WORKERS'
URINE: CORRELATION WITH A GAS CHROMATOGRAPHIC
(GC) CHEMICAL METHOD**



By Raymond E. Biagini, Ph.D.
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A NIOSH field study of commercial pesticide applicators was conducted to characterize their exposure to alachlor, a major component of Lasso, which is a commonly used pre-emergent herbicide. To assess exposure and estimate uptake of alachlor, worker urine samples were analyzed using two different techniques for alachlor or its metabolites. The first was a published gas chromatographic method for analysis of urinary alachlor metabolites. We also developed an enzyme-linked immunosorbent assay (ELISA) method. The ELISA method is based on the use of antibodies directed against alachlor. The antibodies are also tagged with an enzyme whose reaction products are colored; adding the substrate of the enzyme to the reaction mixture yields varying intensities of color which are related to alachlor concentration. Preliminary results indicate a high correlation between the two methods. Immunochemical technology appears to be a viable alternative to traditional wet chemical and instrumental methods of analyses for assessing exposures in agricultural environments. Benefits of this technology include simpler sample preparation, reduced cost and analysis time, and the potential for onsite field measurements. A detailed description of the ELISA method and the results of the analyses for the field study samples will be presented.

**THE USE OF CONTINUOUS EXPOSURE MONITORING
COMBINED WITH VIDEO TASK ANALYSIS TO CHARACTERIZE
AND PREVENT OCCUPATIONAL HAZARDS IN AGRICULTURE**



By James A. Gideon, Ph.D., Mike Gressel, Leroy Mickelsen, M.S.
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NIOSH researchers have developed a powerful new technique that combines two separate tools for analyzing occupational hazards: videotaping and "real-time" continuous exposure monitoring. The level of hazard exposure can then be superimposed onto the videotape in the form of a moving bar. This permits a simultaneous inspection of individual tasks that are performed during a workday and of the exposures associated with each task. The result is a much clearer understanding of the sources of exposures and the ability to formulate a much more specific intervention strategy. This technique applies to chemical, physical, ergonomic, and any other hazards for which the level of hazard can be continuously monitored. A videotape of industrial processes demonstrating this technique will be available.