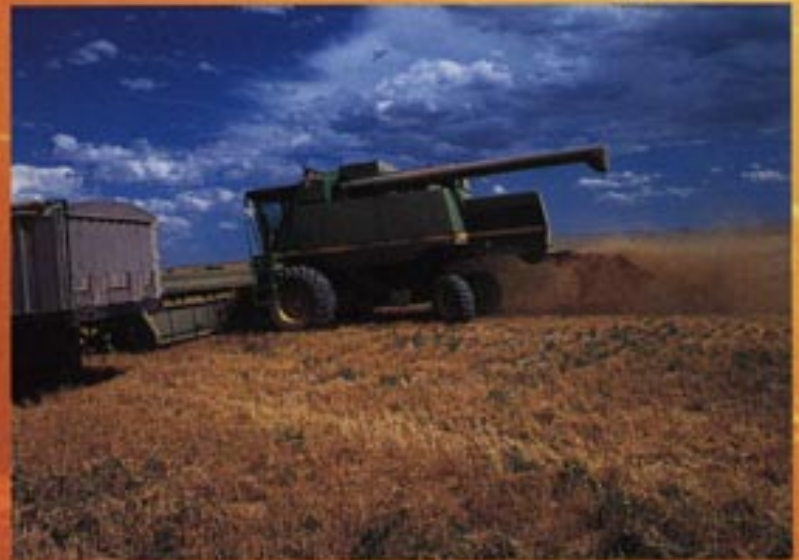


1998 Annual Report



High Plains Intermountain Center for Agricultural Health and Safety



HI
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Director's Statement

Agriculture and construction rank as the most dangerous occupations in the U.S. Both are more hazardous than the mining industry. A disproportionately large number of workers in agriculture experience injury, disability, disease, and death each year due to environmental factors in the workplace. Our sole purpose at the High Plains Inter-mountain Center for Agricultural Health and Safety (HI-CAHS) is to reduce the preventable trauma, disease, and mortality in this most important population, a population whose production is vital to American well-being.

HI-CAHS is one of eight national centers created by the National Institute for Occupational Safety and Health (NIOSH) to address agricultural health and safety through education, direct on-site intervention, and research. This many-faceted project requires a team effort that is multi-disciplinary and collaborative. The HI-CAHS staff is made up of industrial hygienists, epidemiologists, educators, social workers, safety consultants, toxicologists, and engineers. Beyond this core staff, HI-CAHS uses, through its outreach and research programs, numerous other

professions and a wide variety of cooperating organizations.

This past year has been particularly successful, and we have been rewarded by increased support from NIOSH. One of our major goals is to become much more regional than we have been in the past with the added resources provided by NIOSH. We now have representatives on our external advisory committee, members from every state in Region VIII (Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota). Along with our twice-annual meeting of the advisory committee, we will for the first time this Fall host a regional meeting on agricultural safety and health with speakers, programs, and demonstrations from throughout the region. The purpose of the meeting is for us to gain greater insight into the needs in agriculture in Region VIII from the perspective of our clientele, farmers, ranchers, people in agribusiness, agricultural trade organizations, extension agents and specialists, and health and safety professionals. It is our intention to become more responsive than we have ever been in the past, and to extend that responsiveness to a broader constituency.

Before closing, I wish to mention that we have had the extraordinary good fortune of having many collaborative efforts completed this past year. NIOSH has been our closest ally doing analytical work in support of our research and service programs. It is worth particular mention that NIOSH took on a special project this year in the San Luis Valley investigating an unusually large number of injuries to workers in the potato industry, and this Fall we will be working on a study of carbon monoxide exposures in the same industry. We have also seen considerable support from the Occupational Safety and Health Administration (OSHA) in providing analytical and educational information and in promoting agricultural health

and safety through the OSHA State Consultation programs. The Environmental Protection Agency is also cooperating by funding research into the effectiveness of pesticide safety training among migrant workers. We do our very best to get the most out of what resources we have, and collaborative efforts such as these are key to extending current Center services and research and for building a foundation for future cooperation.

The director's statement could go on and on pointing out accomplishments. However, isn't that truly the purpose of the annual report itself? So, please, read the report; it is a summary of a great amount of work by many wonderful people. I am proud of our staff, colleagues and all of the hard working individuals who work with us. A special "thank you" to all of you who work in agriculture – without your expertise and support we would have little hope of making a difference.

*Dr. Roy Buchan
Director*

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Advisory Committee

Mr. Greg Baxter, U.S. Department of Labor - OSHA
Ms. Andrea Box, Rocky Mountain Farmers Union
Mr. Kelly Burch, Casper College, Wyoming
Dr. Dan Farenholtz, Northern Colorado Family Medicine
Ms. Jennifer Felzein, Women in Farm Economics, Colorado
Mr. Jim Geist, Colorado Corn Growers
Mr. Rod Gilmore, North Dakota Department of Health
Ms. Sharon Kindle, Women in Farm Economics, Montana
Dr. Kirvin Knox, Associate Provost, Colorado State University
Mr. Benjie Lemon, Colorado Cattle Feeders Association
Dr. Dean Lillquist, University of Utah
Ms. Jane McCammon, NIOSH
Mr. Buford Rice, Colorado Farm Bureau
Ms. Sarah K. Robbins-Bramble, St. Mary's Occupational Health Center

Research: Engineering Control Strategies Based on Tractor Stability

(Paul Ayers and Juhua Liu)

The reduction of tractor-related accidents and injury due to rollover is important to the agricultural industry. Tractor rollovers account for one out of five farm fatalities. Tractor overturns need to be reduced and operators need to be alerted and/or protected when they are operating in a condition potentially hazardous for a field upset. In addition, deployment of safety control features, including ROPS, restraint systems, stabilizing maneuvers, and/or warnings need to be made based on reliable measurements and models of tractor stability.

The overall objective of this project is to develop and evaluate a tractor stability monitoring system



designed for monitoring relative tractor stability and engineering control deployment strategies. The factors involved in tractor stability include speed, slope, center of gravity, wheelbase, tread width, and turning radius. These factors have been used to develop a stability model to determine the degree of stability of tractor operations. A quantitative value, referred to as a *stability index*, has been developed from a tractor's physical and operating conditions. The *stability index determination* incorporates the dynamic measurements, physical tractor characteristics, and stability models to produce an index from 0 to 100. A stability index of 100 indicates high stability (tractor on level terrain with no velocity). A stability index of 0 indicates a tractor operating under conditions where an upset is likely.

Four radio-controlled tractors have been equipped with the stability monitoring system and field data acquisition has been conducted. The stability monitoring system includes sensors to monitor pitch and roll angle, rate, and acceleration; yaw rate and ground speed. Over 40 lateral and longitudinal field tests

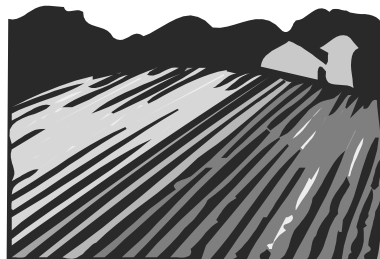


were conducted on slopes ranging from 10 to 60 degrees at the Agricultural Engineering Research Center. Both static and dynamic stability analyses have been performed. The dynamic model provides a prediction of future tractor stability conditions. Video technology has been incorporated to assist in the model verification. The application of the stability monitoring system for the deployment of engineering control strategies, accomplished using a pop-up flag as a deployment indicator, has proved successful.

Research: Farmers' and Ranchers' Perceptions and Practices Regarding Farm Health and Safety (Bob Seiz and Eleanor Downey)

Jean-Francois Lyotard wrote: "The community of the world is not a place of safety. It is a place of tragedy." (1993, p.97) What Lyotard wrote about the world community could just as easily have been written about America's farm and ranch communities, where tragedy strikes often in the form of preventable accidents that result in incapacitating injuries, illnesses, disabilities, and deaths. Society has slowly and belatedly responded to this threat to safety by supporting research into the causes of farm and ranch accidents, by designing improved safety features into farm and ranch equipment, and through development of education and

training programs for farmers and ranchers in the handling and use of powerful and dangerous substances, situations, and machinery. Many have observed that, while a lot of



important safety devices and mechanisms can be engineered into the system, an equally important safety constant is the person behind

the wheel, using the tool, working on and under the machinery, interacting with the animal, handling the chemical, and climbing on the structure. Both experience and history teach that safety is not some fixed, frozen entity existing totally independent of people involved in the workplace. The comprehensive engagement of farm and ranch safety involves including the human quotient in the equation of safety. It progresses beyond the exclusive reliance on environmental and equipment engineering to looking closely at thinking, perceptions, and practices in order to understand what motivates people in matters

(continued on page 4)

(Perceptions and Practices, continued from page 3)

affecting their own safety and the safety of their loved ones. It seeks answers to questions concerning routes of interest, perceptions of salience, and evaluations of risks by those engaged in agricultural production.

An exploratory survey study was designed, and is presently being implemented, to tap into the human aspects of farm and ranch safety by acquiring and comparing data from migrant and non-migrant farm families about their perceptions and thinking in five safety-related areas:

- nature and extent of health and safety risks
- accessibility and validity of safety information

- nature of behavioral changes required to implement safety information
- viability of implementing safety options
- existence and usefulness of safety related support systems.

Tape-recorded, 90-minute, face-to-face interviews are being conducted with parents and youth drawn from migrant and non-migrant farm families in northeast Colorado. The study's principle investigator is Bob Seiz, Ph.D., a faculty member at Colorado State University. Eleanor Downey, Ph.D., also on the CSU faculty, is the project coordinator, and Tricia Van Horssen is the study's graduate research assistant.

Data from the survey could prove particularly helpful for understanding the impact of safety efforts on two populations of special interest to HI-CAHS: namely, children and migrant farm workers. Additionally, feedback directly from farm families will enable HI-CAHS to enhance the effectiveness of its education and prevention efforts by strengthening those elements shown to be making a significant impact and modifying those that can be better. It is hoped that a more extensive, regional research project will develop from the results of this pilot effort.

Lyotard, Jean-Francois, (1993). Political writings. London: University College Press.

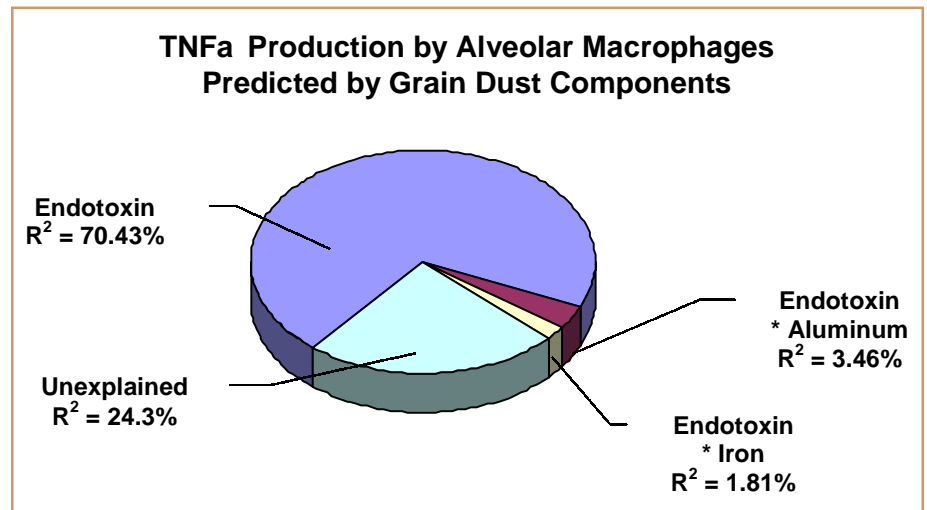
Research: Component Analysis of Grain Dusts that Contribute to Occupational Lung Injury (Greg Cosma and Anthony Martinez)

In this study, a lung cell model was developed to explore the contributions of commonly found contaminants in organic dusts to pro-inflammatory responses by alveolar macrophages (AM) exposed to respirable grain dusts. This study had two goals:

- 1) identify major toxic components of agricultural grain dusts
- 2) define the underlying mechanisms of pro-inflammatory lung cell injury.

A multiple linear regression was designed to show the strengths of associations between individual components of the dusts and pro-inflammatory responses of the AMs.

Airborne, respirable wheat and corn dust samples were collected at 10 different grain elevators in eastern Colorado during the 1997 harvest. In addition, respirable potato dust samples were collected in the San Luis Valley during the 1996 harvest. High flow air pumps, set at 1.7 L/min, were used along with 10 mm cyclones to collect the dust samples. These samples were then analyzed for concentrations of



endotoxin, 20 different metals, and crystalline silica. In addition, dust particles were added to AMs in culture and the following responses were assessed after 24 hours:

- 1) phagocytosis
- 2) cytokine production
- 3) oxidative DNA fragmentation.

After 24 hours, AMs demonstrated a significant pro-inflammatory response to the dusts, including production of the cytokine TNFa. Furthermore, DNA fragments were

detected by immunoassay in the treated AMs. Statistical analysis demonstrated that endotoxin levels in the dust samples predicted 70.4% of the TNFa response, while aluminum and iron contributed only slightly to this response by predicting 3.5% and 1.8%, respectively. Similarly, endotoxin was the contaminant that predicted most of the DNA fragmentation in AM cells, 45%, but none of the other identi-

(continued on page 5)

(Component Analysis of Grain Dusts, continued from page 4)

fied agents in the dust samples contributed to DNA fragmentation. It is clear that, while endotoxins are a major contributor to lung cell injury, there are other agents in grain dusts that account for the unpredicted fractions of lung cell pro-inflammatory responses.

These studies strongly suggest that the measurement and use of endotoxin contaminant levels in grain dusts can provide a much more accurate prediction of respiratory hazards associated with the inhalation of organic dusts, rather than the currently used criteria of

total dust mass. We propose that current consideration for adoption of new exposure limits to grain dusts be based on endotoxin contaminant levels and possibly other contributing agents to be identified in future studies.

Research: “The Carsons’ Difficult Decisions” A Narrative Simulation Ranch/Farm Safety Exercise (Sue Hewitt)

“The Carsons’ Difficult Decisions” narrative farm ranch safety exercise is a collaborative effort of the High Plains Intermountain Center for Agricultural Health and Safety (HI-CAHS) at Colorado State University, The Southeast Center for Agricultural Health and Injury Prevention at the University of Kentucky, and the National Institute of Occupational Safety and Health (NIOSH). Regional experts from the Colorado State University Cooperative Extension Services, as well as persons from Colorado farming and ranching communities, also gave valuable assistance in the development of the materials.

The objectives of this exercise are to:

- Increase awareness of ranch and farm injury risk factors throughout the Rocky Mountain West

- Promote injury prevention attitudes among farmers and ranchers and the people who work with them.

In “The Carsons’ Difficult Decisions,” participants are guided through a realistic story about a fictional ranching family, the Carsons. The intended audience is family ranch or farm owners and operators and the persons who work with them. While working the exercise, users are encouraged to develop strategies and behaviors to prevent injury events as they make choices about the financial and safety predicaments and production problems encountered by the Carson family.

The “Carsons’ Difficult Decisions” narrative farm safety exercise is currently undergoing field-testing among varied agricultural groups

and interested individuals throughout Public Health Region VIII. To date, test subjects have provided information useful towards improving the content and administration of the exercise. Preliminary results indicate that test subjects appreciated the narrative learning format as an alternative to the typical farm safety lecture. Most participants have felt the story was realistic, and it made them think about farm and ranch safety and the possible economic costs of injury.

If you are interested in learning more about “The Carsons’ Difficult Decisions,” or would like to schedule a demonstration of this ranch/farm safety exercise at a meeting, seminar, or other setting, please contact Sue Hewitt at HI-CAHS.

Outreach: Health and Safety Activities

(Del Sandfort, Martha Vela, Lori Berberet, Brit Todd, and Anthony Martinez)

HI-CAHS members formed new partnerships and strengthened existing relationships as outreach efforts continued to grow. Many new activities were started that should lead to long-term health and safety outreach efforts.

HI-CAHS and NIOSH

Based on information gained during past research and outreach activities, HI-CAHS staff members have joined forces with NIOSH personnel to begin investigating two significant health and safety problems in the San Luis Valley of Colorado. The hazards are hand and

extremity injuries to farm workers, mostly during potato harvest and processing; and carbon monoxide exposures during potato storage and processing. Initial fieldwork has been completed with NIOSH to establish contacts and gather information related to hand injuries.

Investigation into carbon monoxide exposures will begin in the Fall of 1998. This is of particular interest since the “valley” is actually more than 7,000 feet above sea level, which might have an effect on the toxic behavior of carbon monoxide gas.

HI-CAHS and Commodity Groups

Last year's success with Colorado Corn Growers in the production of a farm safety video featuring a "staged" corn picker accident has led to additional work with this group. More accidents and situations were staged to provide a platform for health and safety discussion, where HI-CAHS staff members provided technical information and assisted with the production.

Many commodity groups have started active safety committees to help members improve health and safety conditions at their workplace or residence. Members of the HI-CAHS outreach program are active participants on the safety committees of the Onion and Corn Growers Associations.

The Colorado Compensation Insurance Authority (CCIA) has

enlisted the services of HI-CAHS staff to provide technical training to farmers, ranchers, and other businesspersons who use CCIA as a provider of workers compensation insurance. CCIA is actively working with its clients to reduce claims and insurance premiums through structured health and safety programs. HI-CAHS actively supports these programs.

Migrant Worker Activities



HI-CAHS staff members continued collaboration with agencies and groups involved with migrant workers. These included

the Colorado Rural Health Center, the Colorado Migrant Health Program, Colorado Migrant Coalition and the Colorado Migrant Education Center. Bilingual training was conducted for migrant workers to help them obtain EPA "certification" under the Worker Protection Standard. Additional training was conducted with the Migrant Head Start Program. Children received training on

general farm and chemical safety.

Staff members, including Mr. Anthony Martinez, who rejoined our staff this year, visited migrant residence camps to help identify conditions that represented hazards to the individuals who make these locations their home. Health and safety audits of the living quarters and area were conducted. Potable water samples were obtained to evaluate the safety of the drinking water source. These visits helped camp residents and owners alike control or eliminate occupational and environmental hazards.

Training, Education, and Hazard Surveys

Activities centered on client service continued in 1998. Nearly 50 training and education programs were conducted that dealt with specific health and safety topics for agriculture. As in the past, topics were as varied as the audience and included presentations on general health and safety in agriculture, machine guarding, respiratory hazards, and EPA Pesticide Worker Protection. More than 3,000 individuals attended these sessions. These activities continue to represent the most popular outreach service.

More than 20 workplaces were visited this year to help owners and operators identify and eliminate hazards associated with their operations. Some of these visits

were conducted in combination with a research project dealing with corn dust exposures. Machine guarding issues continue to be the major category of hazardous conditions identified. In many instances, these hazards are eliminated quickly by installing appropriate guards. However, many situations are unique or highly customized and



require "one-of-a-kind" hazard controls. HI-CAHS staff members are always available to help individuals find the right solution to a problem.

Outreach: Information Dissemination, Education, and Training

(Bart Beaudin and Don Quick)

AgriAction Information Sheets

Last year we established a product line of safety information sheets. This year we changed the name of that product line to *Agri-Action* (an old name used in the 1980's). We also greatly expanded the line with several new sheets:

- Heat Related Illnesses*
- Farm Tractor Safety*

- Agricultural Health and Safety*
- Safe Pesticide Handling*
- Used Farm Equipment*
- Children on the Farm*
- Grain Storage Bins*

These are single sheet (front and back) products that provide valuable safety information concerning topical areas of concern for the

safety of today's agricultural families and businesses. They are presented in an easy to read format for quick understanding of the safety tips. These can be ordered from HI-CAHS (see the contact information on the back page of this report) or printed from the Internet at our web site.

Agricultural Health and Safety Presentations

During 1998, our health and safety specialist gave several quality presentations using Microsoft PowerPoint presentation software that we have turned into products for distribution:

- Applicator Safety*
- Agricultural Health and Safety*
- Occupational Health Issues in Colorado*
- Safety Begins with the Right Attitude*
- Pesticide Label Interpretation*

- MSDS Interpretation*
- Farm Equipment and Machine Safety*
- Public Safety*
- Chemical Administration and Beef Cattle*
- Health and Safety Issues in the San Luis Valley*

These comprehensive presentations provide agricultural families and businesses with quality safety information. These presentations can be downloaded from our web site.

Visit the HI-CAHS web site at:
<http://www.bernardino.colostate.edu/hicahs/>

Multisite Evaluation Project

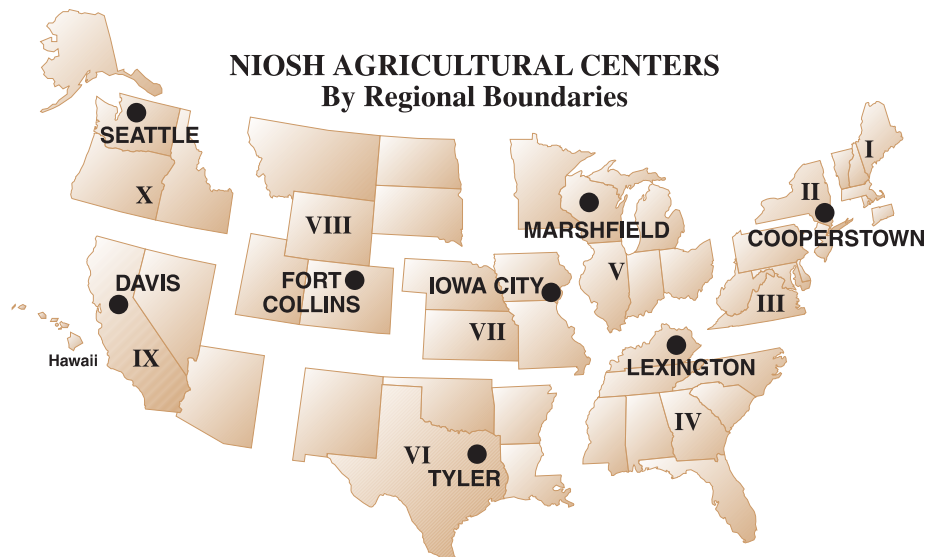
(Vicky Buchan, Sue Hewitt, Sue Tungate, and Tammy Brannen-Smith)

In May of 1997, the HI-CAHS evaluation staff, with the support of NIOSH, hosted a workshop to explore the potential of a multisite approach to evaluation for the eight regional Agricultural Health and Safety Centers. The map presents the location of each Center and the states within the Public Health Region(s) it serves. An evaluator from each regional Center was involved and great enthusiasm was generated for a collaborative approach to developing a unique model of program monitoring to assist both NIOSH and the Centers in assessing progress on the Centers' initiative.

Based upon the success of this workshop and with encouragement from NIOSH, HI-CAHS submitted and received funding to provide the leadership and administrative overview necessary to facilitate the development of this collaborative

approach to evaluation. The funding allowed us to bring the collaborators back to Fort Collins to continue the project; a two day meeting was held July 21st and 22nd.

Members of the collaborative team had already developed a set of "indicators" (criteria) that will help reflect collective progress towards
(continued on page 8)



(Multisite Evaluation Project, continued from page 7)

the objectives NIOSH has for the Centers. These indicators include: collaboration, dissemination, regionalization, replication, and special sector activities. Tasks ahead include developing a common database with variables related to NIOSH reporting formats, creating a network to share expertise and experience among the collaborative team members, and strengthening our collective efforts on behalf of all persons employed in agriculture.

Members of the Multisite project included:

NIOSH	Morgantown, WV	Teri Palermo
Regions 1-3	Northeast Center	Giulia Earle-Richardson
Region 4	Southeast Center	Hank Cole and Marian McDonald
Region 5	National Farm Medicine	Nancy Young
Region 6	Southwest Center	Karen Gilmore and Mary Lynn Thames
Region 7	Great Plains Center	Barbara Pies
Region 8	HI-CAHS	Vicky Buchan, Sue Tungate and Sue Hewitt
Region 9	UC Center at Davis	Rose Krebill-Prather
Region 10	Pacific Northwest Center	Barbara Brooner and Sharon Morris

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