AgConnections
AGRICULTURAL SAFETY AND HEALTH
Vol. 1, No. 4
Continued on page 3

Understanding and Addressing Agricultural Work-Related Musculoskeletal Disorders

It is well known that agriculture is a very physical occupation where muscular aches and pains are often considered to be “part of the job”. As one young farmworker said during an informational interview, “you mean, I am not supposed to be in pain all the time?” Field crop production workers are at high risk for work-related musculoskeletal disorders (Murphy 2003). The Bureau of Labor Statistics in 2001 reported the incidence rate for overexertion to be 42.5 per 10,000 agricultural crop production workers. Ergonomic interventions can provide educational, engineering and environmental solutions to help reduce the potential for strains and sprains that decrease a worker’s productivity level and may lead to more serious injuries.

Research on ergonomics in agriculture is limited in comparison to manufacturing and other industries. Until a recent study conducted by the Southern Coastal Agromedicine Center (SCAC) researchers (Costello, 2000), there have been no reports addressing the occurrence of work-related musculoskeletal disorders (WMSD) in crops important to the SCAC region: cucumbers, melons, peanuts, soybeans, sweet potatoes, and tobacco. Field crop production that supplies the fresh fruit and vegetable market requires a high level of product quality and specific packaging labeling. Meeting these production and packaging demands often requires labor intensive harvesting, sorting and packing with worker exposure to either hot and humid field conditions or cold storage areas. Much of this manual labor occurs in awkward postures that are held for prolonged periods of time and are executed under extreme time pressures.

SCAC researchers are combining ergonomic, physical therapy and social science expertise to identify job tasks associated with high levels of WMSD and to develop ergonomic interventions to reduce the incidence and severity of WMSD. A “participatory” ergonomic research/intervention approach is being used that involves input from farmers and family members, farmworkers, agricultural experts and health care providers in both identification of the major stressors and design of ergonomic solutions. This “participatory” approach is expected to increase buy-in, resulting in more effective and sustainable solutions.

In the southern regions of the country particularly, heat stress is a major health concern, and increases risk of WMSD. Another SCAC research study is measuring the effects of different hydration protocols on worker response to heat stress in cucumber, melon, and tobacco harvesting. The heat stress study measures physiologic parameters, including body temperature, pulse, orthostatic blood pressure, and cognitive function in relation to actual field temperature/humidity/radiant heat and worker productivity. Farmer and worker participation in both studies has been enthusiastic. This “participatory approach” promises to enhance the success of future education and corrective intervention initiatives.
The association between farming and MSDs, and the only study on the association between farming and carpal tunnel syndrome (CTS), where the outcome is directly assessed and quantified. Hand symptom diagrams and nerve conduction studies are performed on participants in the KCRHS. Other data collected concurrently from participant interviews supports investigation of occupational and non-occupational CTS risk factors. Existing data from 1640 adult interviews from 1994-1998 in Keokuk County are being analyzed to ascertain the prevalence of other MSDs (low back, shoulder, lower extremity) and associated risk factors.

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The Virtual Corset - A New Logger for the Ambulatory Assessment of Physical Exposures

Peter Johnson, PhD
Pacific Northwest Agricultural Safety and Health Center

The Virtual Corset, a new ergonomic research tool, is available for your use! Dr. Pete Johnson and his research team at Pacific Northwest Agricultural Safety and Health Center and Microstrain, Inc. have developed a new data logger to assess postural and vibrational exposures in agricultural workers. This tool allows researchers to continuously collect data on workers at task over the course of single or multiple days. Studies using the Virtual Corset will better develop our understanding of the relationship between cumulative exposure of vibration and posture to musculoskeletal disorders.

The Virtual Corset measures both back flexion/extension and side-to-side bending simultaneously or, it can be programmed to measure limb rotation. The device is pager-sized so that it can be mounted on the sternum or upper back of the individual. The logger weighs only 6 ounces, has 1 Gigabyte of memory and contains a microprocessor so it is self-activating for passive data collection over several days. The large memory capacity of the logger makes the ambulatory collection of data possible where previously not practical (e.g. vibrational exposures where the collection of exposure data has to be performed at high sample rates).

Researchers who would like to try the Virtual Corsets can contact Dr. Pete Johnson at petej@u.washington.edu.

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The Orchard Ergonomics Pilot Study

Christine Mason, BA
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Improvements to existing apple harvesting equipment are being tested by the Northeast Center. The aim is to reduce injuries due to sprains and strains while improving picking comfort and efficiency.

Ergonomic risk factors to harvesters were identified after observing workers picking apples. Advisory teams (orchard owners, apple pickers, industry experts, and researchers) selected two improvements from a list of suggestions developed by the project Ergonomist.

After piloting the ideas (hip belt, padded suspension harness) with informal farmworker focus groups, prototypes were tested in randomized trials in orchards. Workers were observed using each improvement separately, using their own equipment (control), and then using both improvements combined. Observations assessed body posture, work task, and equipment usage every 45 seconds over 90-minute periods. Worker satisfaction data was obtained.

Workers found the improvements comfortable with minor adjustments to the design. Field posture analysis indicated workers spent on average 85% of an 8.5-hour workday in moderate/severe forward flexion or lateral bend. Lab data (assessing weight disbursement of the hip belt) showed major load reductions in those postures while wearing the hip belt.

Next step: Electromyography testing in both lab and orchard to measure force output of the shoulder and back muscles while wearing the innovations.
Arthritis Study
Steve Kirkhorn, M.D.
Midwest Center

Agriculture has been identified as an industry with statistically significant odds ratios of hip and knee osteoarthritis. Agricultural risk factors associated with arthritis include: tractor driving, years farming, milking, and heavy physical work before age 16. Other occupational risk factors include previous joint injuries, forceful and strenuous work, and frequent knee bending.

Epidemiological data evaluating chronic disease in the farm cohort from the Marshfield Epidemiologic Survey Area was used to determine physician diagnosis-based prevalence rates of osteoarthritis and allied disorders of arthropathy comparing farm to non-farm cohorts. Preliminary data indicate an increased age-adjusted prevalence rate ratio of osteoarthritis in the male farm cohort, decreased in the male cohort, and no overall statistically significant differences between the farm and non-farm cohort. Age adjusted prevalence rates of diagnosis based arthritis and allied disorders range from 11-15% in the cohorts compared to the 23% prevalence rate of physician-diagnosed arthritis in Wisconsin.

The NIOSH sponsored agriculture safety and health research centers engage in research, intervention/prevention, and education/outreach projects designed to respond to regional priorities, investigate issues with potential worker safety/health impact, and document effectiveness of measures to reduce risks and prevent injuries and disease among the agricultural worker population.

Other Center Updates

The Southeast Center
Mr. Henry Cole, Professor of at the University of Kentucky’s Southeast Center for Agricultural Health and Injury Prevention has been invited by NIOSH to present two papers at the October NOIRS in Pittsburgh. Both papers are part of different symposia series prepared by two different NIOSH research divisions, one at Pittsburgh and the other at Spokane. The titles of the two oral presentations are: “Effectiveness of Narrative Approaches to Occupational Injury Prevention Interventions” and “Work in Dynamic and Hazardous Environments: Where Does the Potential for Intelligent Performance Reside and How Is It Acquired?”

The Great Lakes Center
is engaged in a new study to enumerate ROPS-equipped tractors and farm/farmer characteristics in Central Ohio. The Center is also assisting with the implementation of 1) a new OH law regulating lighting and marking for tractors with dual wheels and 2) the ASAE standards work on a Speed Identification Symbol (SIS) for tractors traveling at 40 mph or less. Through leveraged funds, the Center is conducting a safe tractor and machinery operation certification program and tracking those who are certified as part of a national program.

The Southwest Center
The National Center for Farmworker Health, a collaborative partner with the Southwest Center, assembled an advisory group of occupational physicians, migrant farmworkers and their advocates, and health educators to develop a low-literacy, bi-lingual educational handout. The information is available in both poster size and letter size primarily distributed to and through Community and Migrant Health Clinics. Call NCFH (512) 312-2700 to order.

continued from page 1
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Agricultural Safety & Health Conference Announced
The 2004 National Symposium on Agricultural Health & Safety is being planned. Representatives from the NIOSH Agricultural Research Centers, the National Institute for Farm Safety, and the North American Agromedicine Consortium are jointly planning a combined organizational conference. The conference schedule will offer plenary sessions for all conference participants, joint workshops, as well as tracks specifically addressing individual organizational priorities.

The Conference will be held June 20-24, 2004 at the Keystone Resort in Colorado. The call for abstracts is expected to be released in October with mid-February submission deadline.

The High Plains Center (HI-CAHS) is taking the lead to coordinate the conference. Contact Dr. Vicky Buchan (vicky.buchan@cahs.colostate.edu), Cheryl Skjolaas, Administrative Director, NIFS (nifsad@tds.net), or Dr. Steve Kirkhorn, North American Agromedicine Consortium, kirkhorn.steven@mcrf.mfldclin.edu for more information.