

**FINAL PROGRESS REPORT  
DEEP SOUTH CENTER FOR OCCUPATIONAL  
HEALTH AND SAFETY**

**UNIVERSITY OF ALABAMA AT BIRMINGHAM  
AND  
AUBURN UNIVERSITY**

**Project Period: July 1, 2001 - June 30, 2004**

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## ABSTRACT

During the project period 2001 – 2004, the Deep South Education and Research Center for Occupational Safety and Health provided opportunities for graduate academic and continuing education training in the professions of occupational and environmental medicine, occupational health nursing, industrial hygiene, and occupational safety and ergonomics.

Entering its twenty third year as an NIOSH ERC, the Deep South Center included masters and doctoral academic programs in the Industrial Hygiene at the University of Alabama at Birmingham (UAB) School of Public Health, Occupational Health Nursing at the UAB School of Nursing, Occupational and Environmental Medicine at the UAB School of Medicine, and Occupational Safety and Ergonomics at the Department of Industrial and Systems Engineering in the College of Engineering, at Auburn University. In addition, the Center maintained a supplementary program in Hazardous Substances Academic Training within the Industrial Hygiene program and Occupational Injury Prevention Research within the Occupational Safety and Ergonomics program. The Center also has a Continuing Education and Outreach program at the UAB School of Public Health, which includes a Hazardous Substance Training component. The Center is administratively located in the UAB School of Public Health.

The academic programs in the Center have well established curricula in occupational health and safety education and research that are taught by nationally-recognized faculty members. The research foci of the Center are the NORA priority health and safety hazards; especially those found in the forestry and related industries. During the reporting period, student and new faculty research projects were supported by the Pilot Project Research Training Program.

A high priority for the Center during the past three years has been the enhancement of interdisciplinary education and research activities. In addition to the quarterly interdisciplinary field trips and research seminars, students in the academic programs at both campuses enrolled in courses together through interactive television and web-supported formats. Plans were developed to expand these activities through a multidisciplinary workplace evaluation course offered in the 2002 spring semester. In addition to these activities, students conducted interdisciplinary research that involved faculty from two or more of the academic programs.

During the project period 79 masters students, 48 doctoral students and 3 residents were enrolled in Center academic programs. There were 51 graduates from these programs during that time: 38 masters, 10 doctoral, and 3 residents. The continuing education program offered 197 courses that reached over 3590 attendees. In addition, the continuing education program conducted several needs assessments for the academic programs as well as the continuing education and hazardous substances training programs.

Through these activities, the Centers continued to be a “Center of excellence that promotes occupational health and safety through interdisciplinary education and research” that served the needs of professionals in the Southeast.

## **SIGNIFICANT FINDINGS**

During this project period the goals and objectives for the Deep South Center for Occupational Health and Safety were more clearly defined, and significant progress has been made toward becoming a "center of excellence that promotes occupational health and safety through interdisciplinary education and research." Graduates from the Center's academic programs continue to receive the exceptional educational opportunities for which it has become recognized. In addition, they have been involved in more interdisciplinary exercises that will broaden their perspectives and make them more effective practicing occupational health and safety professionals. Almost 70% of these graduates are currently practicing in Alabama, Mississippi, Georgia, Tennessee, and north Florida. Thereby, the Center continues to play an important role in meeting the professional occupational safety and health needs of this region. These needs are further met through courses offered by the Center's Continuing Education Program. The Center has kept abreast of these needs through needs assessments, focus groups, and most importantly, input from the Board of Advisors. Extramural research support of the Center's faculty increased significantly during this period. An important complement to these research activities has been the availability of NORA Research Training funds to support student research projects. All of these accomplishments have been achieved despite many challenges related to program and curriculum changes within the Center. However, a renewed sense of direction and purpose on the part of the faculty and staff of the Center has created an environment of optimism toward accomplishing new goals in the coming three years.

## **NOTEWORTHY ACCOMPLISHMENTS / EVENTS**

### **2001-2002**

- Continued successful conversion of all OSE courses from a quarter to a semester format.
- Dr. Gerard A. Davis was added to the OSE faculty.
- An optional epidemiology course (NUR 630-Principles of Epidemiology) was added to the OSE curriculum.
- The OSE and IH programs began requiring trainee rotations at an occupational health clinic.
- Enhanced interdisciplinary training with two new ERC interdisciplinary courses; one in Fall semester and one in Spring semester.
- OIPRT Program established in the Industrial and Systems Engineering Department at Auburn University
- OHN and IH converted from the quarter academic calendar to the semester system.
- Majority of MSN core courses were converted to web-based format.
- Dr. Dillon was the PI on a 3-year HUD Healthy Homes grant to address substandard housing conditions in the Birmingham area.
- Dr. Dillon was the PI on a 3-year grant from ASPH/CDC to support enhanced training of the Environmental Health Workforce of State Departments of Public Health in the Deep South.
- Dr. Oestenstad was the PI of a 3-year grant with the U.S. Coast Guard to conduct risk assessments, including exposure assessment, for various tasks related to the inspection of port warehouses and cargoes on ships.

### **2002-2003**

- Began involving OSE students in providing safety support to other, non-OSE College of Engineering student projects.
- A common fundamentals of industrial hygiene course taught by UAB faculty enhanced interdisciplinary training.
- OIPRT trainees made presentations in the NIOSH NORA Symposium 2003.

- The first OHN PhD student defended dissertation.
- OHN faculty at the City of Birmingham Good Health Program received the Birmingham Business Journal "Health Care Hero Award".

2003-2004

- Strengthened research training by requiring all OSE students (both NIOSH and non-NIOSH supported) to participate in weekly research journal club.
- The OSE program sent record number of students to attend and participate in professional conferences (ASSE, HFES, AIHA, IIE, Applied Ergonomics).
- Offered two ergonomics workshops in conjunction with the CE program.
- The OSE program received a \$100,000 DOT/ Federal Highway Administration sponsored research grant from the Southern Consortium of Injury Biomechanics.
- The first doctoral graduates from the OIPRT program.
- The last DSN student in OHN graduated.
- The Board of Directors met in June 2004 to establish goals, objectives and measures of effectiveness for the individual programs and the Center.

## **BODY OF REPORT WITH CONCLUSIONS**

### **Organizational Structure**

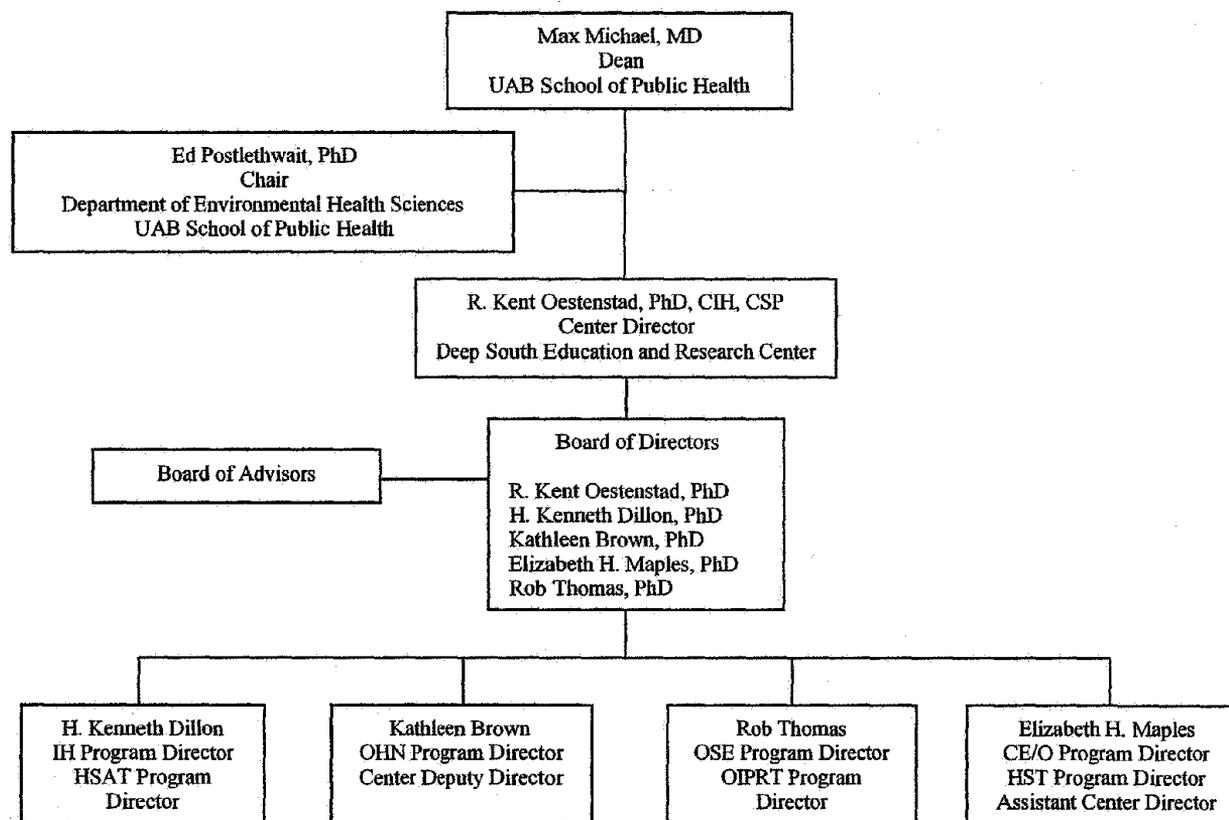
The Deep South Center was established in October 1981 when the Tennessee Valley Authority (TVA) and UAB entered a cooperative agreement to develop resources to educate and train occupational health and safety professional for careers in the Southeastern United States. This effort was supported with resources from NIOSH. Two years later the Center was recognized as a NIOSH ERC, joining 13 other ERCs in existence at that time.

At the beginning of the project period the Center consisted of Center Administration in the UAB School of Public Health, four primary academic programs: Occupational and Environmental Medicine in the UAB School of Medicine, the Occupational Health Nursing in the UAB School of Nursing, the Industrial Hygiene Program in the UAB School of Public Health, and the Occupational Safety and Ergonomics Program in the Industrial and Systems Engineering Department at Auburn University and the Continuing Education Program in the UAB School of Public Health. In addition, there were supplemental programs in Hazardous Substance Academic Training in the Industrial Hygiene Program, and Hazardous Substance Training in the Continuing Education Program and Occupational Injury Prevention Research Training in the Occupational Safety and Ergonomics program. However, the Occupational and Environmental Medicine program was only funded for two years, and was not renewed in 2003-2004. In the winter of 2003 problems within the residency as then administered by the Department of Physical Medicine & Rehabilitation resulted in the resignation of the residency program director. When the two remaining PGY-3 residents finished their residencies in June 2003, the program was moved from the School of Medicine to the School of Public Health and placed in an inactive status. Since that time, the Dean of the School of Public Health has been working to develop a business plan which would support sufficient faculty to re-establish the residency and apply for NIOSH support. At this time, this plan is being considered by the UAB Provost.

Center Administration consists of the Center Director, Deputy Director, Assistant Center Director, and an administrative associate. As Center Director, Dr. Kent Oestenstad is responsible for the overall operation of the Center. As the Deputy Director, Dr. Kathleen Brown is primarily responsible for the development of interdisciplinary activities in the Center. Dr. Elizabeth Maples is the Assistant Center Director, and is

responsible for planning and coordinating interdisciplinary field trips for the academic programs, coordinate the Center's Board of Advisors, and to conduct impact and needs assessments for the Center. The Executive Committee consists of the Center Director, the Deputy Director, Assistant Center Director, and the program directors. Its function is to establish goals, implement programs, and monitor progress of Center activities. These activities include, coordination of educational programs, coordination of continuing education efforts, definition and coordination of interdisciplinary research, and maintaining effective administrative linkages. The organizational structure of the Center is illustrated in Figure 1.

**Figure 1. Deep South Center Organizational Structure**



When the Board of Advisors is completely appointed, it consists of three individuals to represent each academic discipline and continuing education/outreach. In addition, advisors for Center Administration and labor are also included. The names and affiliations of the current members of the Board of Advisors are shown in Table 1. The Board was essential in the development of goals and objectives for the Center and has been helpful in projecting trends and needs in professional education, continuing education, and outreach for occupational health and safety in this region. In addition to their advisory capacity, many board members have also been actively involved in the education, research, and continuing education activities of the Center. Included in these activities were planning professional development or academic program activities, arranging internships for students and assisted them with industry contacts and selection of relevant research and project topics, serving as preceptors to students, providing intern sites for students, and instruction in academic and continuing education courses.

**Table 1: Board of Advisors**

David Alexander, PE, CPE President Auburn Engineers, Inc. PO Drawer 3038 Auburn, AL 36831	Travis Brown, NP-C, MSN, MBA Director, Employee Health/Worker's Comp Emory Crawford Long Hospital 550 Peachtree Street NE Atlanta, GA 30308	Peter Casten, MD, MPH Medical Director DCH Regional Medical Center 701 University Blvd E Suite 211 Tuscaloosa, AL 35401
Andy Fischer Corporate Safety & Environmental Director Hager, Inc. 150 Folmar Pkwy. Montgomery, AL 36105	Bob Forrester HSE/Training Manager Neptune Technology Group, Inc. 1600 AL Highway 229 Tallasse, AL 36078	Michael Jarrett Director of Operations Employee Injury Program Division of Risk Management State of AL Dept. Finance 777 South Lawrence Street Montgomery, AL 36130-3250
Penny Nicholls, BS, RN, CCM, COHN-S President Nicholls and Associates 2348 Plantation Circle Moody, AL 35004	Gilbert W. Oden Safety Manager Weyerhaeuser Paper Converting and Recycling 340 Victoria Drive Thomasville, AL 36784	Kenneth Oldfield, MSPH, CIH IH Services Manager Center for Labor Education & Research Bldg 1043 1530 3 <sup>rd</sup> Ave S Birmingham, AL 35294-4490
Deb Oppenheim, CIH Senior Industrial Hygienist Alabama Power Company PO Box 2641 Birmingham, AL 35291-0234	Felicia Phillips, MSEM, CIH, CSP Laboratory Manager Technical Micronics Control, Inc. (TMC) 210 Wynn Drive Huntsville, AL 35805	Randal H. Robertson, PhD, RRT Associate Professor Department of Health Services Administration WEBB 603 1530 3 <sup>rd</sup> Ave S Birmingham, AL 35294-3361
Carlos R. Robinson, MSPH Industrial Hygienist Vulcan Materials Industry 1200 Urban Center Drive Birmingham, AL 35242	Roberto Sanchez Area Director Occupational Safety and Health Administration 2047 Canyon Road Birmingham, AL 35216	Cheryl J. Szabo, MD, MPH Medical Director USS Fairfield Works MS MED PO Box 599 Fairfield, AL 35064
Bill Weems, DrPH, CIH Director, Safe State University of Alabama PO Box 870388 Tuscaloosa, AL 35487-0388		

**Faculty**

During the project period, the core disciplines of occupational and environmental medicine, occupational health nursing, industrial hygiene, and occupational safety and ergonomics were represented by 13 full-time faculty: 5 professors, 3 associate professors, 5 assistant professors, a nurse practitioner, and a teaching assistant. In addition 4 adjunct professors were utilized by the Industrial Hygiene program to teach introductory-level courses. Dr. Martin Harper left the Center faculty in October 2002 to take a position with NIOSH at Morgantown, WV. Dr. Kenneth Dillon, a long-time faculty and Director of the

Industrial Hygiene program was killed in a tragic accident in May 2004. A search for two new IH faculty members is currently being conducted by the Department of Environmental Health Sciences. Center faculty that were recognized for honors or special achievements during the project period follows.

#### **Faculty Honors 2001-2004**

- Dr. Kathleen Brown received the UAB President's Excellence in Teaching Award for the School of Nursing in 2004.
- Dr. Weaver was invited to the NIH Regional Translational Research Centers (RTRC) Planning Meeting in 2004.
- Dr. Kathleen Brown was appointed to the NIOSH Board of Scientific Advisors in 2004.
- Dr. Davis was selected as the outstanding faculty member in Industrial and Systems Engineering for the 2002-3 academic year.
- Dr. Thomas was selected as the outstanding faculty member in Industrial and Systems Engineering for the 2003-4 academic year.
- Dr. Davis earned certifications in professional safety (Certified Safety Professional) and ergonomics (Certified Professional Ergonomist) in 2004.
- Dr. Thomas was appointed to the rank of Full Professor in 2004.
- Dr. Davis was elected to the Board of Directors of the Society for Work Science of the Institute of Industrial Engineers in 2004.
- Dr. Thomas was elected to the Steering Group of the Ergonomics Committee of the American Industrial Hygiene Association in 2004.
- Dr. Dillon was posthumously awarded the Lifetime Achievement in Safety and Health by the University of Alabama.

#### **Meeting Regional Needs**

The Deep South Center is a regional resource for Alabama, Georgia, Florida, Mississippi, Tennessee, and north Florida. It is committed to providing graduate education programs and professional training needed by occupational safety and health professionals and to serving as a resource to schools, government organizations and industries in this region. Some examples of these services are during the project period are listed below.

- Almost 70% of the graduates from the Center academic programs during the project period practice in the region (See Appendix A).
- The Continuing Education program annually offers a significant number of discipline-specific, as well as interdisciplinary courses throughout the region. A number of these were new courses that were developed in response to recommendations received from needs assessments, focus groups, and the Board of Advisors. In addition, the Continuing Education program presented in-house training courses for industries in the region. The program also collaborated with a numbers of governmental agencies and professional organizations to co-sponsor additional programs.
- The Center provided materials to help other educational programs teach or promote the field of occupational safety and health. This included providing faculty lecturers in courses or seminars, and providing materials for undergraduate career days.
- The Center has also provided industry with materials and videotapes to help develop in-house training courses, i.e., ergonomics. We have also presented lectures to regional workplaces, provided assistance to state and local health departments in developing workshops on occupational health and safety.
- Faculty and students in the Center have conducted numerous research projects to assist regional industries with occupational health problems such as hearing conservation, injury control, workplace design, cost containment, hazardous waste control, respirator fit, occupational skin

disease, and ergonomics hazards. The Center Executive Committee has initiated a series of impact and needs assessment surveys of alumni and employers to determine the occupational safety and health needs of the region.

- OSE program courses are taught in a video-based format, thus permitting persons who are employed full-time in the region and elsewhere to pursue graduate work in OSE. The IH Fundamentals of Industrial Hygiene and Fundamentals of Occupational Safety and Ergonomics courses are now on web-based and web-supported formats.
- All of the ERC faculty assist regional industry by providing numerous no-fee consultations on a variety of occupational safety and health issues.

The Center interacts with various professional organizations on the region including the Alabama Occupational and Environmental Medicine Association, local chapters of the American Association of Occupational Health Nurses, local sections of the American Industrial Hygiene Association and the American Society of Safety Engineers, and the Alabama chapter of the National Safety Council.

Regional governmental agencies that the Center interacts with include the area and regional offices of the Occupational Safety and Health Administration, the Anniston Army Depot, the Alabama Department of Public Health, Alabama Department of Forensic Sciences, a number of county health departments across the region, and many local fire departments. The Alabama state OSHA consultation program, "Safe State," supports the Center and collaborates on a variety of programs. Our IH alumni form the majority of the Safe State staff.

Organizations representing workers, business and industry have expressed their interest in and support for Center activities. Unions that have worked with the Center during the project period include the Alabama Labor Council and the United Paperworkers International Union. Business and industry groups involved with the Center have included the Birmingham Chamber of Commerce, the Association of Alabama Industries and the Alabama Loggers Council. There are numerous regional industries that support and interact with the Center. These companies include Wellborn Cabinets, General Electric Corporation, General Motors Corporation, U.S. Alliance, Amoco/BP, Solutia, Delphi, CIBA Specialty Chemicals, Lockheed, Kimberly Clark, South Central Bell, the Tennessee Valley Authority, International Paper, Arizona Chemical, USX Corporation, and Southern Power Company.

### **Interdisciplinary Activities**

The physical distance between UAB and Auburn University has not hindered the interdisciplinary efforts of the Deep South Center. We believe that the expansion of interdisciplinary activities has been the most significant accomplishment of the Center during the past three years. We have implemented all of the aspects of the comprehensive plan that were presented in the last competing application. The observed increase in student understanding and appreciation of the role of all of the occupational safety and health disciplines can be attributed to the innovative interdisciplinary activities that have taken place during the past two years. These include course requirements, field trips, seminars, research projects, and clinical rotations.

The Center has continued to utilize the Alabama Intercampus Interactive Telecommunication System (IITS). This is a network of 26 interactive television classrooms in 12 cities across the state of Alabama. This network includes three classrooms at UAB (one in the School of Nursing), and one at Auburn University. IITS allows users at multiple locations to interact with people at other locations as if they were all in the same room. All participants see and hear other participants through live, interactive television. The Center is fortunate to have this technology available at a very nominal cost. During the coming years we plan to continue to make use of this state resource for teaching, seminars, and meetings. In addition, we

will utilize IITS for outreach efforts to the undergraduate IH program at the University of North Alabama and the Safety Technology program at Jacksonville State University.

Course Requirements - Two additional field-based courses, ENH 680 Interdisciplinary Field Trips and ENH 681 Interdisciplinary Worksite Evaluations were added during the last project period to enhance the interdisciplinary activities of students in the center. It is noteworthy that all ERC academic programs, masters and doctoral, require their students to enroll in these courses for two academic years representing a significant interdisciplinary commitment across disciplines. IH and OHN students are also required to enroll in ENH 621 Fundamentals of Industrial Hygiene (OSE students simultaneously take the course as INSY 7050 Industrial Hygiene and Environmental Hazards), Fundamentals of Occupational Safety and Ergonomics ENH 670, and Occupational and Environmental Toxicology and Disease ENH 620. In addition, these courses are required or are taken as electives by students in the MPH in Occupational Health and Safety program. Every other year students in all of the programs are now required to take NUR 670 Principles of Occupational Health Management in the School of Nursing as a one-hour academic course. Interdisciplinary interaction is enhanced by guest lecturers and faculty representing occupational medicine, occupational health nursing, industrial hygiene, safety, human resources, marketing and management. Interdisciplinary course planning and instruction occurs in the Occupational Disease and Toxicology ENH 650 (IH and OEM faculty), and Fundamentals of Safety ENH 670 (IH and OSE faculty).

Field Trips - ENH 680 Interdisciplinary Field Trips has been offered in the fall term for the past three years. It includes one field trip to an industrial site, and for the past two years, an additional one-day occupational safety and health NORA research seminar. This course is now designated as a course requirement in all of the academic programs. Field trip sites are selected based on the type of operations being conducted, and the presence of occupational safety and health programs. Site-visits in the past three years have included TapeCraft, a packaging manufacturing facility (October 2001), PEMCO, a military aircraft rebuilding facility (October 2002) and Neptune Technology Group, a water meter manufacturer and foundry, in Tallahassee, AL (October 2003). These visits begin with an overview of the facility and its operations, meeting with in-house safety and health personnel, a plant tour, and a post-tour question-and-answer period.

The second new course, ENH 681 Interdisciplinary Worksite Evaluations, has been offered as a one-hour required course the 2001 2002 spring semester. Worksite evaluations were conducted at Hager Hinge (March 2002), Wellborn Cabinets (February, 2003), and US Pipe Company (March 2004). This course involved all four academic disciplines in the interdisciplinary evaluation of real-world exposure situations. The course objective is to provide the students with the opportunity to conduct complex, real-world hazard evaluations in an interdisciplinary context. It consists of a lecture on hazard evaluation methods, and the identification and the description of the type of industry to be visited. Prior to the site visit, the students are assigned to interdisciplinary groups and given the assignment to conduct a literature background survey of the safety and health hazards that exist in the designated industry. Before the site visit, the groups are assigned a specific operation to evaluate. The site tour consists of an overall survey of the facility and an in-depth survey by the groups of their designated operation to make observations of any safety and health hazards. The groups then prepare and present a summary of the information collected in their background survey, the hazards identified in their operation survey, the possible health outcomes of these hazards, citation of any applicable regulatory or consensus standards, and recommendations for appropriate controls. After the site visit, students at UAB and Auburn interact by phone and e-mail to prepare their presentations, and they are presented over interactive television by group members at both universities. A measure of the interdisciplinary success of this exercise was made evident by students from UAB and Auburn preparing a common PowerPoint presentation that was

controlled at one campus while the speaker was at the other campus during an IITS interactive television class session.

Seminars - The fall interdisciplinary seminar is intended to inform students of NORA-related research being conducted in all of the academic programs, and give them the opportunity to identify and review occupational safety and health problems in the NORA priority areas. The seminars begin with an overview of the Center and the academic programs by Drs. Oestenstad, Dillon, Brown and Thomas. This is followed by presentations on student research projects, and then an interdisciplinary group discussions on NORA topics. The Center overview includes brief lecture by Dr. Oestenstad on the importance of understanding the perspectives of all disciplines when evaluating the same occupational safety or health problem. The same presentation is made at the beginning of the Interdisciplinary Worksite Evaluations ENH 681. Since these courses are required for both years of the masters curricula, Center students will have heard this talk at least four times before matriculating from their programs. The first seminar was presented at Auburn University in the fall of 2001, and included the following presentations: "A Study of Pharmaceutical Dispensing Errors" by Nathan Dorris and Talley Holman of the OSE masters program, "Safety Hazards in Metal Cutting Operations" by Lewis Payton, a doctoral candidate in the OSE program, "Development and Validation of Methods for Collection and Analysis of Antineoplastic Contaminants" by Rob Larson, a doctoral graduate from the IH program, "Confidentiality of Ethical Decision-Making in Occupational Safety and Health" by Betty Sue McGarvey, a doctoral candidate in OHN, and "Paper and Pulp Industry: An Overview of the Industry and Health and Safety Issues" by James Lance, a resident in the OEM program. The interdisciplinary groups discussed an assigned NORA priority area in relation to the forestry and wood products industries, and identified two research questions that applied to this area within those industries. A second seminar was held at Auburn in November 2002. The research topics presented included: "Current Status of Warning Systems in Forest Harvesting Equipment" by Nathan Dorris, a doctoral student in OSE, "Working During Pregnancy: State of the Science" by Debi Woods, an OHN doctoral student, and "Occupational Ocular Trauma" by Alice Barker, an OEM resident. The NORA group discussions were directed toward identifying two research questions relative to pregnant workers. The 2003 fall semester seminar was held at UAB on October 10, 2003. The research topics presented included "The Development of Safety Symbols through Interactive Evolutionary Design" by Nathan Dorris, a doctoral student in OSE, "A Visual and Statistical Method for Monitoring Lung Function in Occupational Asthma" by Fazel Hayati, a doctoral student in OSE and "Psychomotor and Cognitive Performance and the Occurrence of Error in Registered Nurses Who Work the Night Shift" by Arlene Johnson, a doctoral candidate in the OHN program. In addition to student research presentations, Cheryl Szabo, MD, the medical director at the USSteel Fairfield Works presented a case study in occupational medicine, and John Waterbor, MD presented an overview of occupational epidemiology methods.

Research Projects - Doctoral candidates are required to have ERC faculty members on their research committees. For example, Dr. Oestenstad served on the research committee for Betty Sue McGarvey, an Occupational Health Nursing DSN candidate who graduated in December 2002. The title of Dr. McGarvey's dissertation was *Predictors of Occupational Health Nurses' Likely Action Regarding Confidentiality of Employee Health Records*. Dr. Brown was her research advisor. Dr. Oestenstad also serves on the research committee of Ms. Rachael Robinson who is conducting a study of worksite violence experienced by emergency room nurses. Dr. Brown is her research advisor. Dr. Oestenstad also served on the project committee of Auburn MISE student Drew Schwalbe who was conducting an evaluation of the effectiveness of machine modifications to reduce noise exposures. Mr. Schwalbe graduated in August 2003. During the 01-02 academic year Dr. Davis of the OSE faculty provided equipment and direction to IH students Steve Minor and Cydi Lang who were conducting a study on the effect of wearing Level-A suits on heart rate and body temperature of firefighters. During the 02-03 academic year, Dr. Michael DeVivo of the OEM faculty taught an epidemiology readings course for

Auburn OIPRT doctoral students, and is on the research committees of Nathan Dorris and Fazel Mayati. Also, during that year Dr. Hankins of the OEM program was on the research committee of Ms. Dannylu Wilson, an OHN DSN candidate. The title of Dr. Wilson's dissertation is *The Effect of a Multidimensional Stress Management Intervention on Worker Anxiety, Perceived Occupational Stress and Coping*. She graduated in December 2002, and her research advisor was Dr. Brown. Dr. Thomas was on the research committee of Dr. Thanee Kaewthummanukul, who graduated from the OHN PhD program in the summer of 2003. Dr. Brown was his research advisor, and the title of his dissertation is *Predictors of Exercise Participation among Thai Female Hospital Nurses*. Dr. Oestenstad was on the research committee of Arlene Johnson, DSN who graduated from the OHN program in the spring of 2004. Dr. Brown was her research advisor, and the title of her dissertation was *Relationship Among Emergency Room Nurses' Perception of Violence, Occupational Stress, and Coping*".

**Clinical Activities** - Clinic rotations occupational health nurses and/or occupational physicians are now required for all IH and OSE students as part of ENH 681 Interdisciplinary Worksite Evaluations. IH students are assigned to half-day clinic rotations at the UAB School of Nursing/City of Birmingham Medical Services Clinic, and Auburn OSE students rotate through the The Hughston Clinic, an occupational medicine clinic in Auburn. These rotations give students the opportunity to observe physical assessments, elicit occupational histories, and discuss occupational disease entities with nurses and physicians.

**Students and Graduates**

A summary of student enrollment is presented in Table 2, and a summary of graduates is presented in Table 3. A list of individual graduates, their degree and their place of employment is shown in Appendix A.

**Table 2 - Yearly Enrollment by Discipline and Degree Type**

Discipline	2001-2002		2002-2003		2003-2004	
	Masters	Doctoral	Masters	Doctoral	Masters	Doctoral
OEM	3	0	2	0	0	0
OHN	6	8	6	8	8	7
IH	15	4	11	4	6	4
OSE	9	5	7	4	9	4
<b>TOTAL</b>	<b>33</b>	<b>17</b>	<b>26</b>	<b>16</b>	<b>23</b>	<b>15</b>

**Table 3 - Yearly Graduates by Discipline and Degree Type**

Discipline	2001-2002		2002-2003		2003-2004		Total
	Masters	Doctoral	Masters	Doctoral	Masters	Doctoral	
OEM	1	0	2	0	0	0	3
OHN	4	1	3	4	2	1	15
IH	7	1	7	0	2	0	17
OSE	4	1	7	1	2	1	16
TOTAL	16	3	19	5	6	2	51

Students who received honors during the project period included:

- Jessica Keplinger was awarded the Vernon E. Rose Scholarship for the 2001- 2002 academic year.
- Jessica Keplinger received the George & Florence Clayton Endowed Scholarship in 2002-2003.
- Britt Davis was awarded the Vernon E. Rose Scholarship for the 2002 - 2003 academic year.
- Kevin Oliver's poster, entitled "A Study of the Effectiveness of Spill Clean-Up Procedures for Cyclophosphamide Based on the Use of a Detergent Wash and a Post Wash Bleaching Solution" won the "Best of Session" award for the Student Poster Session at the 2003 AIHCE.
- Carey Taylor, Occupational Health Nurse Practitioner / MPH student received the Donna J. Petersen award from the UAB School of Public Health in 2004.
- Nathan Dorris, doctoral student at Auburn University's Industrial and Systems Engineering program, received First Place Award for Engineering Oral Presentations at the 14th Annual Graduate School Awards Presentation at Auburn University.

For the past 17 years, the American Industrial Hygiene Conference and Exposition (AIHCE) has sponsored a Graduate Student Poster Session. This session was originally conceived and organized by Drs. Perkins and Rose of the UAB IH program and is currently arranged by Dr. Oestenstad. Students' abstracts are based on project research completed as part of their degree requirements. Each year during the project period, the IH program sent all of the students who presented a poster to the AIHCE. A number of the students from the OSE program have also attended these conferences.

### Curricula

A number of important curricula changes were made in the Center's academic programs during this project period. The IH and OHN programs switched from a quarter academic calendar to a semester system during the 2001-2002 academic year. All of the MSN core courses at the UAB School of Nursing were converted to a web-based format in the by the end of the 2002-2003 academic year. In the 2003-2004 academic year the OHN program initiated an Individually Designed Study Option of 37 semester hours to meet the needs of goal-directed nurses who want to pursue an advanced degree in occupational health nursing other than the nurse practitioner role. The IH program reduced the number of hours for the MPH with thesis degree from 72 to 65 hours in the 2003-2004 academic year to put the hour requirement more in line with those at other IH masters programs. Also in that year, the IH program initiated an accelerated MPH with thesis curriculum to facilitate the matriculation of Master's students who were graduates of undergraduate NIOSH training-program grant undergraduate IH programs by waiving several

basic IH courses. It was felt that NIOSH support ensured that the basic skills of IH practice are comprehensively presented in these undergraduate programs. The internship, thesis research experience, and courses involving interdisciplinary interaction in the Deep South Center were not waived. The reduced hours resulting from these changes made it possible for a student to finish the curriculum in one calendar year.

### **Research Training**

During this period, the Center expanded its research foci as the NORA priority areas: especially those that pertain to the forestry and related industries in the Southeast. The scope of the research conducted by the various academic components of the Center during the reporting period was broad and provided the foundation for effective collaborative research in the future. The breadth of research interests of Center faculty are illustrated by the topics of their publications listed in Appendix B. There is great potential for development of projects that combine the talents and experience of faculty and students of all academic programs of the Center. For example, the Occupational Health Nursing and Safety and Ergonomics programs have research experience in low back pain and injury. The Occupational Safety and Ergonomics and Industrial Hygiene programs have research experience in thermal stress. Occupational Health Nursing and Industrial Hygiene conducted research on management practices of their respective disciplines. In addition, each component has also demonstrated individual strengths that may serve as a foundation for future research collaboration. Industrial Hygiene has a strong track record in exposure assessment and biological agents; Occupational Safety and Ergonomics in repetitive trauma disorders and transportation safety; and Occupational Health Nursing in health risk identification and worksite health promotion.

During this period, research training activities of students were greatly supplemented by funds from the NORA program. Grants obtained by faculty have also enhanced student research training opportunities. During the period, the IH program obtained three research grants: one to study allergens in indoor air, one to study the relationship between noise exposure and hearing loss among workers in the heavy equipment manufacturing industry, and another to study US Coast Guard Marine Safety Inspectors' exposure to chemical and physical agents. These grants have provided research material for several industrial hygiene doctoral students.

### **Continuing Education / Outreach**

During this reporting period, the Center's Continuing Education Program reached at least 1000 participants each year with a variety of professional development programs. Topics ranged from very specific subject matters to updates in occupational and environmental safety and health issues. All occupational health and safety disciplines were reached through the Center's CE programs. The majority of participants were from the southeast region, though the Center's programs draw attendance from throughout the United States and foreign countries. New offerings were developed and offered each year with assistance from the Center's faculty and Board of Advisors.

The Center is fortunate to have faculty support for its CE program. The Center faculty plays an active role in various stages of CE offerings; they provide guidance in course topic selection, recommend and approve course faculty and assist in the evaluation of courses and provide input on the direction of the CE program – including marketing and promotion of CE offerings. In addition to the Center faculty, the CE program relies upon consultants in the field of occupational health and safety to serve as course directors and instructors. Before an individual was added to the faculty list, the Center Director and the appropriate Program Director reviewed biographical information, including education, credentials and work experience. During this reporting period, the CE program reached all disciplines as mandated by NIOSH.

The Center continually evaluates its offerings and searches for new directions for the CE Program. Input from course participants, Center faculty, course faculty and the Board of Advisors is considered in developing and implementing new CE programs. New programs offered during this reporting period included: *Writing Skills Workshop; Spirometry for Physicians; Update in Occupational Health; Ergonomic Workshop; and Mold Remediation*. Working closely with the academic programs, the CE program conducted several needs assessments of Center graduates during the project period.

The Board of Advisors contributes greatly to the CE program. The Board provides suggestions on course content, ideas on CE advancement and qualified presenters. Many of the Board members serve as course directors for CE offerings or have provided lectures for the Center (Kenneth Oldfield, MSPH, CIH, Penny Nicholls, RN, BSN, CCM, COHN-S, Cheryl Szabo, MD, MPH, Randal Robertson, PhD, RRT, David Alexander, PE, CPE, and Felicia Phillips, MSEM, CIH, CSP).

Outreach continues to be an important element of the Center's activities. The faculty and staff have been involved in numerous outreach efforts throughout the reporting period. From presenting lectures, providing resources and assistance in developing workshops, the Center promotes the field of occupational health and safety to others.

The Center continues to build on its reputation as a regional source of information by assisting other academic institutions, government agencies, non-profit associations, professional associations, unions and business and industry leaders with their occupational health and safety educational needs. The Center offers quality adult education programs and provides professional development points for all occupational health and safety professions.

### **Hazardous Substances Training**

The Center's Hazardous Substances Training program strives to meet the educational needs of those who must supervisor or those who deal with hazardous substances. A major strength of the program is the offering of scholarships to state and local government agencies that need training, but have limited funds.

Since initial HST offerings in 1990, the HST program has worked with experienced professionals in the field of management of hazardous substances in offering its training programs. Key faculty includes consultants from outside of UAB and expert trainers from the Center for Labor Education and Research.

The HST Program places a great deal of emphasis on working with state and local agencies in offering HST courses. Throughout the project period a major strength of the program has been its strong working relationship with the UAB Center for Labor Education and Research (CLEAR). CLEAR is a grantee of the National Institute for Environmental Health Sciences (NIEHS) and specializes in training the adult learner in the area of hazardous materials emergency response. The HST program and CLEAR's efforts compliment one another. Marketing efforts, evaluation procedures, course instruction are collaborative efforts. The relationship with CLEAR enriches training programs and eliminates competition of limited government funds.

The HST program also recognizes the importance of fostering working relationships with government agencies and other organizations to continue to build on its successful HST offerings. Through strong relationships with government agencies, the Center was been able to be responsive to their educational needs. For example, a one day workshop on confined space programs specifically for municipalities was developed and offered three times during this reporting period.

In addition to working with CLEAR, the program collaborates with numerous local and state governments and their agencies throughout the region to develop, promote, and offer HST courses. A most successful venture has been a collaborative effort of Public Employees Safety and Council of Alabama (PESCA). PESCA is a non-profit organization of federal, state, county and city employees who are dedicated to improving the workplace safety and providing an invaluable medium to share knowledge with safety professionals throughout the state of Alabama. In addition to quarterly meetings, PESCA offers a one day conference that focuses on the educational needs of government employees and safety and health issues. The conference is cosponsored by PESCA, the Deep South Center, National Safety Council – Alabama Chapter and the League of Municipalities.

The Center also collaborated with the Jackson State College of Public Health to offer a one day workshop on respirator fit testing. The workshop was attended by faculty, graduate students and fire and rescue personnel of Jackson State University, a Historically Black College.

**Table 4 - Summary of Continuing Education / Hazardous Substance Training Programs 2001-2004**

Reporting Period	Number of Courses	Total Trainees	Medicine	Nursing	Industrial Hygiene	Safety	Other
2001-2002	76	1392	30	241	59	553	509
2002-2003	69	1169	55	159	25	126	911
2003-2004	52	1029	28	233	36	349	217
Totals	197	3590	113	633	120	1028	1637

### Summary

During this project period we have been very successful in moving from conceptual planning to the practical implementation of Center programs while working toward achieving the vision and mission of the Center. We have substantially expanded the research component of the Center, made significant progress in developing distance learning capabilities in the academic and continuing education programs, conducted major needs and impact surveys, and our most noteworthy accomplishment has been the continued enhancement interdisciplinary activities within the Center. Our plans for the future include the continuation of the development of distance learning capabilities, maintaining a strong research program, enhancing the interdisciplinary experience for students, addressing the issues of populations at risk, and recruiting minority students. We will continue to utilize the knowledge and talent on our interdisciplinary Board of Advisors to provide direction in the improvement of Center programs.

## **APPENDIX A. LISTING OF PROJECT PERIOD GRADUATES BY PROGRAM**

### **Occupational Medicine**

Male, MD, 2002

Reid Hospital and Health Care Services  
Richmond, IN

Male, MD, 2003

The Workplace  
Birmingham, AL

Female, MD, 2003

Consultant  
Jacksonville, FL

### **Occupational Health Nursing**

Female, MSN, 2001

Occupational Health Consultant  
Tuscaloosa, AL

Female, MSN, 2001

Occupational Health Group  
Huntsville, AL

Male, MSN, 2001

Kirkland Clinic  
Birmingham, AL

Female, MSN, 2001

UAB Occupational Health and Safety  
Birmingham, AL

Female, DSN, 2001

Southern Adventist University School of Nursing  
Chattanooga, TN  
"Wellness Program Influence on Health Risk Factors  
and Medical Costs among Seventh Day Adventist  
Workers"

Female, MSN, 2002

Jefferson Health Foundation  
Birmingham, AL

Female, MSN, 2002

Seeking OHN employment after relocation to  
Dallas, TX

Female, DSN, 2002

Southern Adventist University School of Nursing

Chattanooga, TN  
"Relationships among Hospital Staff Nurses' Occupational  
Stress, Caring Behaviors and Spiritual Well-Being"

Female, DSN, 2002  
School of Nursing  
New Jersey  
"Relationship of Ongoing and Episodic Work Environment  
Stressors, Social Support, Anxiety and Depression in  
Secondary School Teachers"

Female, DSN, 2002  
Middle Tennessee Health Group  
"The Effect of a Multidimensional Stress Management  
Intervention on Worker Anxiety, Perceived Occupational  
Stress and Coping"

Female, DSN, 2002  
Baptist School of Nursing  
Memphis, TN  
"Predictors of Occupational Health Nurses' Likely Ethical Action  
Regarding Confidentiality of Employee Health Records"

Male, PhD, 2003  
Occupational Health Nursing Program  
Chiang Mai University Faculty of Nursing  
Chiang Mai, Thailand  
"Predictors of Exercise Participation among Thai  
Female Hospital Nurses"

Female, MSN, 2003  
Birmingham, AL

Female, MSN, 2003  
Birmingham, AL

Female, MSN, 2003  
UAB School of Medicine  
Birmingham, AL

Female, MSN, 2003  
PhD program, Occupational Health Nursing  
UAB School of Nursing and  
Kennesaw, AL

Female, DSN, 2004  
Tallahassee, FL  
"Relationship Among Emergency Room Nurses'  
Perception of Violence, Occupational Stress, and  
Coping"

**Industrial Hygiene**

Male, MPH, 2004

US EPA

Industrial Hygienist

Richmond, VA

“A Comparison Study of Two Bioaerosol Samplers for the Collection of Fungal Spores”

Male, MPH, 2004

Army Fleet Support, LLC

Dothan, AL

“Validation of Models to Predict the Overall Fit Factors for Half-Mask and Full-Facepiece Respirators”

Male, MPH, 2003

Industrial Hygienist

John C. Stennis, MS

“A Comparison of Spearman Rank Correlation and a Multinomial Likelihood Ratio Test When Applied to Indoor and Outdoor Fungal Sample Data”

Male, MPH, 2003

ACT

Industrial Hygienist

Miami, Florida

“A Study on the Effectiveness of Spill Clean up Procedures for Cyclophosphamide Based on the Use of a Detergent Wash and a Post Wash Bleaching Solution”

Male, MPH 2003

Georgia Institute of Technology

Industrial Hygienist

Atlanta, GA

“Comparison Study of Two Bioaerosol Samplers that Combine Impingement and Centrifugation to Collect Fungal Spores In Areas Suspect of Fungal Growth”

Male, MPH 2003

Environmental Safety and Health Services

Industrial Hygienist

Birmingham, AL

“A Regional Comparison of Mold Spore Concentrations Outdoors and Inside Remediated Southern California Residences”

Female, MPH, 2003

UAB CLEAR

Project Instructor

“Differences of Fit Factors Among a Series of Fit Tests for Individuals”

Female, MPH 2003

GE

Industrial Hygienist

Decatur, AL

“Comparison of Fit Factors Between Male and Female Respirator Wearers”

Male, MPH 2003

ALCOA

EH&S Coordinator

Richmond, VA

“Comparison of Lead Surface Contamination Measurements by X-ray Fluorescence Spectrometry and Wipe Samples with Inductively Coupled Plasma-Atomic Absorption Spectrometry“

Male, MSPH 2002

Apex Safety and Health Consultants

Industrial Hygienist

Aliso Viejo, CA

“The Relationship Between Visible Fungal Growth and its Household Contributing Factors, and Fungal Spore Counts in Air Samples From Southern California Residences“

Male, MSPH 2002

Honda Mfg

Industrial Hygienist

Lincoln, AL

“Comparison of Analytical Methods for Aspergillus Fumigatus in Environmental Air Samples“

Female, MSPH 2002

US Army

“The Identification of Novel Biomarkers for Endocrine Disruptors“

Male, MSPH 2002

E. R. Alley and Associates

Decatur, AL

“The Effects of Level A Protective Equipment on Heart Rate in Firefighters Performing Hazardous Response Training The Effects of Level A Protective Equipment on Heart Rate in Firefighters Performing Hazardous Response Training“

Female, MSPH 2002

Jeff State

Birmingham, AL

“Comparison of Discharge Silver Concentrations in Electrolytic Plating Silver Recovery Units and Metallic Replacement Silver Recovery Units“

Female, MSPH 2002

Clayton Group Services

Kennesaw, GA

“Evaluation of Core Body Temperature in Relation to Heat Strain Among Firefighters while Performing Simulated Tasks in Level A Protective Clothing“

Male, PhD 2002

University of Colorado

Bolder, CO

“Development and Validation of a method for accurate collection and analysis of select antineoplastic contaminants, both in air and on surfaces, and implications for exposure assessment“

**Occupational Safety and Ergonomics**

Female, MS ,2001

US Air Force

Edwards AFB, CA

“Evaluation of the Effect on Spinal Curvature of Various Lifting Regimes and Recovery Techniques in Females”

Female, MS, 2001

Delta Airlines

Atlanta, GA.

“The Effects of Chair Type, Work Surface Angle and Footrests on Performance and Comfort of Females”

Male, MS, 2002

Lockheed-Martin Inc.

Atlanta, GA

“Evaluation of Job Rotation Plans to Improve Noise Exposure”

Male, Ph.D.,2002

Auburn University

Auburn, AL

“Dislocation Theory of Orthogonal Metal Cutting of Cu-Zn Alloys,”

Female, MISE, 2002\*

Temple Inland Inc.

Rome, GA

Female, ISE , 2003\*

Northrop-Grumman Corp

St. Augustine, FL

Male, MISE , 2003\*

Honda Inc.

Lincoln, AL

Male, MS, 2003

Neptune Technology Group

Tallassee, AL

“Studying Psychomotor Skills and Behavior characteristics of Forest Product and Sanitation Drivers”

Female, MISE, 2003\*

Homemaker (former Ergonomic Engineer, Boeing Co.)

Puyallup, WA

Female, MISE, 2003\*

Auburn University, Risk Management and Safety Office

Auburn, AL

Male, MISE, 2003\*

National Gypsum Inc

Savannah, GA

Male, MISE 2003\*  
Captain, US Army  
Los Angeles, CA

Male, Ph.D., 2003  
NASA HQ  
Washington, DC  
“Tactile Display Landing Safety, Situational Awareness, and workload Reduction Improvements for the Space Shuttle”

Female, MS, 2004  
Milliken Co.  
LaGrange, GA  
“Self-Report Work Sampling: A Study on sampling Frequency”

Male, MS, 2004  
Doctoral student  
Auburn University, AL  
“An Algorithmic Design of Workplace Layout: a Feasibility Study”

\*- Master of Industrial and Systems Engineering (MISE), Non - thesis

## APPENDIX B. LISTING OF PROJECT PERIOD FACULTY / STUDENT PUBLICATIONS

### Occupational Health Nursing

- Smitha, M., Oestenstad, K., Brown, K. (2001). State workers' compensation reform and workplace safety regulations. Professional Safety 46(12):45-50.
- Smitha, M., Kirk, K., Oestenstad, K., Brown, K., & Lee, S. (2001). Effect of state workplace safety laws on occupational injury rates. Journal of Occupational and Environmental Medicine 43 (12), 1001- 1009.
- James, N., Miller, C, Brown, K (2003). Pain Disability Among Older Adults with Arthritis. Arthritis & Rheumatism (48) 9, S422 (abstract).
- James, N., Miller, C., Brown, K., Weaver, M. Pain Disability Among Older Adults with Arthritis. *Accepted for publication for early in 2005* The Journal of Aging and Health.
- James, N., Miller, C., Brown, K., Weaver, M. Psychological Distress Among Older Adults with Arthritis. Under review at The Journal of Aging and Health.
- Kaewthummanukul, T., Brown, K., Weaver, M., Thomas, R. Predictors of Exercise Participation Among Thai Female Hospital Nurses. Under review at Journal of Advanced Nursing.
- Kaewthummanukul, T., Brown, K. Determinants of Physical Activity Participation Among Employees: A Critical Review of Literature. Under review at Association of Occupational Health Nurses' Journal.
- Sin M, Sanderson B, Weaver M, Giger J, Pemberton J, & Klapow J (2004). Personal characteristics, health status, physical activity, and quality of life in cardiac rehabilitation participants. International Journal of Nursing Studies, 41(2), 173-181.
- Person S, Allison J, Kiefe C, Weaver M, Williams O, Centor R, & Weissman N (2004). Nurse staffing and mortality for medicare patients with acute myocardial infarction. Med Care, 42, 4-12.
- Kiefe C, Allison J, Williams O, Person S, Weaver M, Weissman W (2001) Improving Quality Improvement Using Achievable Benchmarks For Physician Feedback A Randomized Controlled Trial. JAMA, 285: 2871-2879
- Hunter G, Newman Giger J, Weaver M, Strickland O, Taylor H, & Zucker P (2000). Fat distribution and cardiovascular disease risk in african-american women. Journal of National Black Nurses Association, 11(2): 7-11.
- Lynch D, Repka F, Nagel R, Birk T, Gohara A, Leighton R, Walsh M, & Weaver M (2000). Prediction of dietary adherence in cholesterol reduction: relative contribution of personality variables and health attitudes. Psychology and Health, 15: 821-828.

## **Industrial Hygiene and HSAT**

- DuMond JW and Roy D. The biphasic stimulation of proliferation of Leydig cells by estrogen exposure. *Int J Oncol* 18, 623-628, 2001
- Thomas RD and Roy D. Base sequence specific attack of stilbene estrogen metabolites on the mitochondrial DNA: Implications in the induction of instability in the mitochondrial genome of Syrian hamsters. *Int J Mol Med*, 7, 389-395, 2001
- Dumond J, Singh KP and Roy D. Regulation of the growth of mouse Leydig cells by the inactive stereoisomer, 17 alpha-estradiol: Lack of correlation between the elevated expression of ERalpha and difference in sensitivity to estradiol isomers. *Oncol. Rep.*, 8, 899-902, 2001
- Singh KP and Roy D. Novel mutations in the q12.2 region of the chromosome 17 in breast tumors. *Gene*, 269, 33-43, 2001.
- Thomas RD and Roy D. Modifications in mitochondrial DNA by stilbene estrogen and hepatocarcinogenicity. *Oncol. Rep.*, 8, 1035-1938, 2001.
- DuMond, Jr JD and Roy D. The inhibition of DNA repair capacity by stilbene estrogen in Leydig cells: its implication in the induction of instability in the testicular genome. *Mut. Res.*, 483, 27-33, 2001.
- Roy D and Cai Q. Estrogen, immunoactivation, gene damages and development of breast, endometrial, ovary, prostate and testicular tumors. *Recent Advances in Steroid Biochemistry and Molecular Biology*, 3, 1-32, 2002.
- Narayan S. and Roy D. Role of APC and DNA mismatch repair genes in the development of colorectal cancers. *Molecular Cancer*, 2:41 2003
- Larson, R.R., M.B. Khazaeli, H. K. Dillon. Development and review of a surface monitoring method for select antineoplastics. *American Journal of Health-System Pharmacy (AJHP)* 59: 270-277, 2002.
- Larson, R. R., M.B. Khazaeli, and H. K. Dillon. Development of an HPLC method for simultaneous analysis of five antineoplastic agents. *Applied Occupational and Environmental Hygiene* 18: 109-119, 2003.
- Boling, Keith and H.K. Dillon. Comparison of Quantitative Polymerase Chain Reaction (QPCR) Method for Determining Cells of *Aspergillus fumigatus* with Other Measures of the Organism. Presented at the American Industrial Hygiene Conference and Exposition, San Diego, May 2002.
- Srivatsa, Kousthub and H.K. Dillon. The Relationship between Visible Fungal Growth and its Household Contributing Factors, and Fungal Spore Counts in Air Samples from Southern California Residences. Presented at the American Industrial Hygiene Conference and Exposition, San Diego, May 2002.
- Bice, Michael Todd and H.K. Dillon. A Regional Comparison of Mold Spore Concentrations Outdoors and Inside Remediated Southern California Residences. Presented at the American Industrial Hygiene Conference and Exposition, Dallas, May 2003.

- Walraven, David and H.K. Dillon. Comparison Study of Two Bioaerosol Samplers that Combine Impingement and Centrifugation to Collect Fungal Spores in Areas Suspect of Fungal Growth. Presented at the American Industrial Hygiene Conference and Exposition, Dallas, May 2003.
- Oliver, Kevin and H.K. Dillon. A Study on the Effectiveness of Spill Clean-Up Procedures for Cyclophosphamide Based on the Use of a Detergent Wash and a Post Wash Bleaching Solution. Presented at the American Industrial Hygiene Conference and Exposition, Dallas, May 2003.
- May, John and H.K. Dillon. A Comparison of Spearman Rank Correlation and a Multinomial Likelihood Ratio Test When Applied to Indoor and Outdoor Fungal Sample Data. Presented at the American Industrial Hygiene Conference and Exposition, Dallas, May 2003.
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- Smitha, M., Kirk, K., Oestenstad, K., Brown, K., & Lee, S. Effect of State Workplace Safety Laws on Occupational Injury Rates: *J. Occ. & Env. Med.* 43(12):1001-1009 (2001).
- R.K. Oestenstad, Y. Honda, E. Delzell, I Brill: Assessment of Historical Exposures to Talc at a Mining and Milling Facility, *Ann. Occup. Hyg.* 47(7): 587-596 (2002).
- Y. Honda, C. Beall, E. Delzell, K. Oestenstad, I. Brill, and R. Matthews: Mortality among Workers at a Talc Mining and Milling Facility, *Ann. Occup. Hyg.* 47(7): 575-585 (2002).
- Minor, S.J. and R.K. Oestenstad: The Effects of Level-A Protective Equipment on Heart Rate in Firefighters While Performing Hazardous Response Training, American Industrial Hygiene Conference, San Diego, CA, June 3-6, 2002.
- Lange, C.M., and R.K. Oestenstad: Evaluation of Core Body Temperature in Relation to Heat Strain among Firefighters While Performing Simulated Tasks in Level-A Protective Clothing, San Diego, CA, June 3-6, 2002.
- DeWitt, J.P. and R.K. Oestenstad: Comparison of Lead Surface Contamination Measurements by X-ray Fluorescence Spectrometry and Wipe Samples with Inductively Coupled Plasma-Atomic Absorption Spectrometry, American Industrial Hygiene Conference, Dallas, TX, May 11-15, 2003.
- Keplinger, J.L. and R.K. Oestenstad: Comparison of Fit Factors Between Male and Female Respirator Wearers, American Industrial Hygiene Conference, Dallas, TX, May 11-15, 2003.
- Fitzgerald, S.F. and R.K. Oestenstad: Validation of Models to Predict the Overall Fit Factors of Half-Mask and Full-Facepiece Respirators, American Industrial Hygiene Conference, Atlanta, GA, May 8 - 13, 2004.
- Britton, W.T. and H.K. Dillon. A Comparison Study of Two Bioaerosol Samplers for the Collection of Fungal Spores, American Industrial Hygiene Conference, Atlanta, GA, May 8 - 13, 2004.

## Occupational Safety and Ergonomics and OIPRT

- Carnahan, B.J. (2004) Identifying Training Needs of Logging Truck Drivers Using a Skill Inventory," *Journal of Agricultural Safety and Health* (in press)
- LR Wade\*, W Weimar & GA Davis "Effect of Personal Protective Eyewear on Postural Stability." *Ergonomics* (in press, May 2004).
- Carnahan B.J., Redfern M.S. (2004) "Assessing Occupational Back Injury Risk Using Evolving Neural Networks," *IEEE Transaction on Systems, Man, and Cybernetics* (Accepted)
- Carnahan B.J., Meyer G., Kuntz L. (2003) "Comparing Statistical and Machine Learning Classifiers: Alternatives for Predictive Modeling in Human Factors Research" *Human Factors* , 45 (3), 408-423
- Tharmmaphomphilas W., Greene, B., Carnahan B.J., Norman B. (2003) "Applying Mathematical Modeling to Create Job Rotation Schedules for Minimizing Occupational Noise Exposure," *American Industrial Hygiene Association Journal* (in Press)
- Flynn E.A., Barker K.N., Carnahan B.J. (2003) "Observation Study of Prescription Dispensing Accuracy in 50 Pharmacies," *Journal of the American Pharmaceutical Association* Vol. 43, No. 2, 191-200.
- Carnahan B.J., Norman B, Redfern M. (2001) "Incorporating Physical Demand Criteria Into Assembly Line Balancing," *IIE Transactions*, Vol. 33, pp. 875-887
- Carnahan B.J., Redfern M.S., Norman B, (2000) "Designing Safe Job Rotation Schedules Using Optimization and Heuristic Search," *Ergonomics* Vol. 43(4), pp. 543-560.
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- Carnahan B.J., Redfern M.S. (1998) "Application of Genetic Algorithms to the Design of Lifting Tasks," *International Journal of Industrial Ergonomics*, Vol. 21, pp. 145-158.
- N. Dorris & GA Davis (2003). "Testing the Effects of Label Deterioration on the Legibility and Comprehensibility of Warnings," *Proceedings of the Human Factors and Ergonomics Society*, 47<sup>th</sup> Annual Meeting-2003, accepted.
- GA Davis, R Kuhns & DJ Watson (2003). "Evaluating Emergency Medical Services: Controlling the Rising Costs of Saving Lives," *Journal of Health and Human Services Administration* (Under Review)
- GA Davis & F Hayati (2003). "Building a Solar House: An Exercise in Safety Education & Experience." *Journal of the American Society of Safety Engineers*, 48(5), 24-28.
- Watson, DJ, Hassett, WL, Davis, GA and RE Thomas (2002). Use of Industrial Engineering in Measuring Police Manpower: A Small City Case Study. *Journal of Public Performance and Management Review*. 26(2): 132-147.
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- Hunter, S.L., Thomas, R.E., Dischinger C. & Babai, B., "Collosal Tooling Design with 3-D Simluation," Ergonomics In Design, Winter 2003, pp. 23-27
- Haight, J.M. and Thomas, R.E., "Intervention effectiveness research: A Review of the literature on leading indicators," Chemical Health and Safety, April/ March 2003, 10(2), pp. 21-25
- Godbey, J.F., Murphy, J.G., Thomas, R.E., "Training managers for a Safer Workplace: Giving Managers Tools to Better Protect Their Workers," Professional Safety , July 2002, pp 28-31
- Haight, J.M., Thomas, R.E., Smith, L.A. Hopkins, B.L. and Bulfin, R.L., "Loss Prevention Intervention Effectiveness Analysis - Phase 2 - Design Optimization and Verification of the Loss Prevention System and Analysis Models," Professional Safety, June 2001, pp. 33-37
- Haight, J.M., Thomas, R.E., Smith, L.A. Hopkins, B.L. and Bulfin, R.L., "Evaluation of Loss Prevention Intervention Effectiveness-Developing a Mathematical Relationship between Interventions and Incident Rates for Design of Loss Prevention System (Phase 1 - Research)," Professional Safety, May 2001, pp. 38-44.
- Hunter, S.L., "Manufacturing Cell Design Ergonomics." Journal of Manufacturing Systems. ( 2002)
- Hunter, S.L., JT. Black, Thomas, R.E.. 2002. Lean Production in the Furniture Industry: The Double-D Assembly Cell. Forest Products Journal. (under peer review 2002)
- Payton, L.N. and Black, J.T., "Orthogonal Metal Cutting Theory I: F.W. Taylor's "Material Properties"," Journal of Manufacturing Science and Engineering, Transactions of the ASME (Submitted July 2002).