Final Progress Report

Industrial Hygiene Program
West Virginia University
Morgantown, WV 26506-6070

Graduate Training Program

Project Period: 7/1/2000- 6/30/2002

Grant Number: TO1/CCT310450-07

Program Director: Steven E. Guffey, CIH, Ph.D.

September 29, 2002

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ABSTRACT

During the 2000-2002 years, 8 students received NIOSH training grants. Seven are working towards their Masters of Science degree in Industrial Hygiene and one has transferred within the Department and received a degree in Safety. The program faced some short-term difficulties last year because of the severe illness of the program director, Dr. Guffey. He is now in very good health and the problems arising from his illness have ended.

SIGNIFICANT FINDINGS

1) The name of the program was changed from Occupational Health and Occupational Safety to Industrial Hygiene.

2) Eight masters-level students received NIOSH training grants in the last 2 years. The number per year is reduced from previous years because of funding limitations and because the University no longer waives tuition and fees for trainees.

3) Last year, one trainee switched to Safety and Environmental Management after one semester. Otherwise, all of the trainees from both years are on track to graduate with degrees in industrial hygiene.

4) Considerable funds went unspent last year due to unusual circumstances. One student switched to Safety Management (see above) after one semester, and another trainee voluntarily dropped her traineeship in favor of a part-time job with safety and health on campus but continues in the program in very good standing. Since all other students were covered by other funding sources by that time, the stipends, tuition, and fees allocated for those two students could not be assigned to other students, leaving substantial unallocated funds at the end of the grant year. All traineeship positions are filled this year and we expect to have minimal unexpended funds at the end of the year.

5) Dr. Steven Wiker was hired as a visiting associate professor in January 2001. Dr. Wiker is a highly qualified ergonomist with strong experience as a full-time Associate Professor at the University of Washington and the University of Wisconsin. He is teaching 4 courses in ergonomics, including both undergraduate and graduate ergonomics coursework. He also brings a wealth of research experience to the students.

6) Dr. Guffey, the Program Director, was severely ill from June through April, but managed to keep on top of most issues during that period. His absence during part of that period may have affected items 2 and 3 above.

Body of report with conclusions

Program Focus and Objectives

The objective of the West Virginia University Industrial Hygiene program is to educate students at the masters' level in the field of industrial hygiene, occupational ergonomics, and safety engineering. The IH program is administered through the Industrial and Management Systems Engineering Department (IMSE) in the College of Engineering and Mineral Resources.

The goal of the program is to provide applications-oriented education in the field of industrial hygiene, occupational ergonomics and safety engineering while emphasizing cost-effective and practical solutions to safety and health problems in the workplace. Graduates of the program are prepared to function in both private and public sectors. Secondary goals of the program are:

1) To provide introductory industrial hygiene, safety, and ergonomics education to undergraduate engineering students,
2) to provide similar training to doctoral and masters graduate students in engineering and other parts of the university (e.g. Wood Products, Occupational Medicine, Industrial and Labor Relations, Safety and Environmental Management), and 3) to serve the state of West Virginia by providing limited safety and health services.

From July 1, 2000 till June 30, 2002, 22 students were active in the IH program. Active is defined as any student registered for spring, summer, and/or fall of 2002.

Training Status

In two years of 2000-2002, 4 students each year received NIOSH training grants. Their current status is detailed in Table 1. Of the 8 students, 1 switched to Safety Management and the rest are working towards their Masters of Science degree and on track to graduate in 2002-2003. Three Trainees have finished all coursework but have not yet completed their Masters Projects. Completion is expected this Fall.

Table 1: NIOSH Training Grant Students

Students Receiving NIOSH Traineeships in 2000-2001

Student	Level	Graduation
R. Lorenz*	Masters	December, 2001
J. Leonette*	Masters	August, 2001
J. Wedgewood	Masters	May, 2003
J. Hernandez*	Masters	December, 2001
T. Slokan	Masters	May, 2003
J. Nicholson	Masters	December, 2001

Students Receiving NIOSH Traineeships in 2001-2002

Student	Level	Expected Graduation
A. Lawson	Masters	May, 2003
D. Russo	Masters	May, 2003
T. Stuart	Masters	May, 2003
D. Workman	Masters	Transferred to SEM

Students Receiving NIOSH Traineeships in 2002-2003

Student	Level	Expected Graduation
M. Graziani	Masters	May, 2004
S. Haines	Masters	May, 2004
C. Murray	Masters	May, 2004
K. Reis	Masters	May, 2004

Faculty

The program faculty is as follows:

Guffey, Steve	Program Director, Associate Professor, IMSE
Myers, Warren	Chair and Professor, IMSE
Plummer, Ralph	Professor, IMSE
Wiker, Steven	Visiting Associate Professor, IMSE

Also associated with the program are:

Akladios, Magdy	Assistant Professor, WVU Safety & Health Extension
Coffey, Chris	Adjunct Professor, NIOSH
Davis, Mary	Professor, Pharmacology and Toxicology
Doyle, Ed	Director, Institute of Occupational and Environmental Health
Ducatman, Alan	Chair, Community Medicine and Occupational Medicine
Hewitt, Paul	Adjunct Professor, NIOSH
Islam, Syed	Assistant Professor, Occupational Medicine
Martin, Christopher	Instructor, Occupational Medicine
McCawley, Mike	Adjunct Professor, NIOSH
Reasor, Mark	Professor, Pharmacology and Toxicology

The Industrial Hygiene faculty changed in 2000-2002. Dr. Steve Guffey was hired and began serving as Associate Professor and Program Director in January 2001. Dr. Guffey has a strong background of research in the area of ventilation and of teaching in industrial hygiene. Steven Wiker became a visiting Associate Professor in fall 2001, and Dr. Diane McMullin left to work for Boeing as an ergonomist. Dr. Wiker has a strong record of teaching and research in ergonomics, including serving as Associate Professor at the

University of Washington. Drs. Warren Myers and Ralph Plummer continue as members of the Industrial Hygiene Group within the IMSE department.

The program also lists a number of adjunct and supporting faculty including Drs. Chris Coffey, Christopher Pan, and Michael McCawley from NIOSH; Drs. Mark Reasor and Mary Davis from Pharmacology and Toxicology; Drs. Alan Ducatman, Ed Doyle Chris Martin, and Sayed Islam from Occupational Medicine. Dr. Magdy Akladios is an Assistant Professor and member of the Safety & Health Extension of West Virginia University. In addition, the Safety and Environmental Management faculty work closely with the IH program, especially Gary Winn and Michael Klishis.

Education

Students entering the IH Program must have completed a bachelor's degree, preferably in engineering, a physical science, or a related field. A minimum of 63 hours of acceptable mathematics, science, engineering and technology is required. Within the 63 hours, 2 semesters of physics, 2 semesters of chemistry, 1 semester of statistics, and 1 semester of computer are required. Organic chemistry and human physiology are highly recommended. The admission process involves initial screening of past academic performance, a review of the resume and letters of reference, and ranking of applicants. Students from outside the program are admitted to IH classes with instructor approval and their participation is encouraged since it provides a wider range of backgrounds and viewpoints in the classes.

The IH Masters degree requires the completion of a minimum of 36 semester hours, including either a 3-hour problem report or a 6-hour thesis, with a cumulative grade point of at least 3.0. All students must complete designated courses in industrial hygiene, safety, epidemiology, ergonomics and human factors, toxicology, and environmental science. Additional course work can then be used to complete in-depth study in safety and health and environmental science. All required course work is taught in the College of Engineering and Mineral Resources and the School of Medicine, but students may take elective courses in other colleges of the university. Emphasis is placed on the development of written and oral communication skills through projects, papers, and presentations and on industrial knowledge through workplace tours, work in the Occupational Medicine clinic, and industry-based problem reports. The IH Program is ABET accredited as a related program in Industrial Hygiene. Since its inception in 1980, the program has graduated more than 200 students.

Faculty offices, classrooms, student spaces, and computer facilities for the IH program are located in the Mineral Resources Building (MRB). Separate laboratory spaces for safety, ergonomics, and industrial hygiene as well as additional student spaces are located in the Engineering Research Building. Dr. Guffey has constructed a 9 ft high, 12 ft wide low-velocity wind tunnel in the MRB for research on ventilation and exposure assessment.

The engineering library collection is in the Evansdale library one block from the MRB. The WVU medical center, the location of some classes and the medical library, is less than a mile from the MRB; MRB and the medical center are connected by a rapid transit system. The NIOSH divisions of Safety Research, Respiratory Disease Studies, and

Health Effects Laboratory along with their library are located on the campus adjacent to the medical center. This location provides excellent opportunities for the students to interact with NIOSH professionals and use the NIOSH library.

Conclusions

All current IH students, including Trainees are on track to graduate in a timely manner. Some IH students, including some Trainees, finished all coursework last year but have yet to complete their projects because they started full-time professional positions. Last year, substantial funds were not expended due to anomalous events. We do not expect to have such problems again and are on track to spend all grant funds as budgeted this year.

List of publications resulting from the grant

1. **Guffey SE**, Booth DW, Hibbard R and Stebbins A. Hard Metal Exposures, Part 1: Observed Performance of Local Exhaust Ventilation Systems. Applied Occup. Environ. Hyg. 15(4): 331-341 (2000).
2. Simcox, N, **Guffey SE**, Stebbins A, Booth DW, Hibbard R and Camp. Hard Metal Exposures, Part II: Prospective Exposure Assessment. Applied Occup. Environ. Hyg. 15(4): 342-353 (2000).
3. **Guffey SE**, Flanagan ME and van Belle G. Air Sampling at the Chest and Ear As Representative of the Breathing Zone. Am. Ind. Hyg. Assoc. J. AIHA Journal: Vol. 62, No. 4, pp. 416–427 (2001).
4. **Guffey SE** and Booth DW. An Evaluation of Industrial Ventilation Troubleshooting Methods in Experimental Systems. Am. Ind. Hyg. Assoc. J., Vol. 62, No. 6, pp. 671–679 (2001).
5. Booth DW* and **Guffey SE**. An Evaluation of Industrial Ventilation Branch Screening Methods for Obstructions in Working Exhaust Systems. Am. Ind. Hyg. Assoc. J. (Vol. 62, No. 4, pp. 401–410) (2001). *Precepted student
6. G.A. Croteau, **Guffey, S.E.,** Flanagan, M.E., and Seixas, N.S. The effect of local exhaust ventilation controls on dust exposures during masonry activities. Am. Ind. Hyg. Assoc. J. AIHA Journal 63:458–467 (2002).
7. Zhuang, Z., Coffey, C.C., Jensen, P.A., Campbell, D.L., Lawrence, R.B., **Myers**, W.R. 8. and Colton, C.E., Correlation between quantitative fit factors and protection factors measured under actual workplace environments at a steel foundry. In preparation for publication in American Industrial Hygiene Association Journal 2002
8. Zhuang, Z., Jensen, P.A., Coffey, C.C., Conaway, B.D., Berardinelli Jr., S.P., and **Myers**, W.R., Characterization of foundry particle size distribution and selection of agents for workplace protection factor measurement. In preparation for publication in American Industrial Hygiene Association Journal 2002

9. Zhuang, Z., Coffey, C.C., **Myers**, W.R. and Jensen, P.A., The effect of ambient concentration and exercise used for fit testing on quantitative fit factors. In preparation for publication in Applied Occupational and Environmental Hygiene 2002

10. Coffey, C.C., Lawrence, R.B., Zhuang, Z., Campbell, D.L., Jensen, P.A. and **Myers**, W.R., The efficacy of fit test protocols using N95 filtering-face piece respirators. In preparation for publication in Applied Occupational and Environmental Hygiene 2002

11. Liukonen, L. R., Grogan J. L. and **Myers**, W. R., Diesel Particulate Matter Exposure to Railroad Train Crews. Accepted for publication American Industrial Hygiene Association Journal 2002

12. **Myers**, W. R. and **Winn** G. L., A Doctoral Program for the Next Generation. Professional Safety, Vol 46, No. 10: 47-50, 2001.

13. **Myers**, W. R., Respiratory Protective Equipment Patty's Industrial Hygiene, Fifth Edition, Volume 2, Edited by Robert L. Harris, Published by John Wiley & Sons, Inc. 2000.

14. **Myers**, W.R. and **Winn**, G.L. "West Virginia University Responds to the Need: A Doctoral Program for the Next Generation". Submitted to . Professional Safety, December 8. 2000.

15. **Winn**, G.L., Frederick, L. J. Frederick and Becker, P.E. "Adding Construction to the Academic Safety Curriculum". Professional Safety. July, 2000. p. 16 - 18.

16. **Winn**, G.L., Kirchartz, Y. and Bickerstaff, W. "What is Required if Your Athletic Facility Needs a Blood-Borne Pathogens Plan"? Journal of Physical Education, Recreation and Dance. Vol. 71, No. 6. August, 2000.

Student Publications

1. D. J. Schwerha and D. L. McMullin: Prioritizing Ergonomic Research in Aging for the 21st Century American Workforce. International Journal of Experimental Aging Research, Vol. 28, pp. 99-110, 2002.

Recent Presentations:
D.J. Schwerha: Current Research on the Relationship Between Ergonomics, Quality, and the Older Worker. Given as a presentation at the American Industrial Hygiene Conference and Exhibition, June 1-6, 2002 in San Diego, CA.

D.J. Schwerha: The Effects of Age and Noise on Psychophysical Ratings in Cognitive and Physical Tasks. Given as a presentation at the IIE Doctoral Colloquium, May 18-19, 2002 in Orlando, FL.

D.J. Schwerha: The Effect of Some Worker-Related Variables on Work Ability, Work Technique, and Number of Errors in a Packing Job. Given as a presentation at

the Human Factors and Ergonomics Society Conference, October 8-12, 2001 in Minneapolis, MN.

Selected Adjunct Faculty Publications

1. Pan S., Chiou S., **Hsiao** H., and Wassell J. Evaluation of Drywall Hanging Tasks Using a Questionnaire,@ International Journal of Industrial Ergonomics, 25(1), pp 29-37, 1999.
2. Zeng S., Powers, J., and **Hsiao** H., AA New Video-Synchronized Multi-Channel Biomedical Data Acquisition System," IEEE Transactions on Biomedical Engineering, vol. 47, No. 3, pp 412-419, March 2000.
3. Pan, C. S., Chiou, S., **Hsiao**, H., Becker P., and Akladios, M. AAssessment of Perceived Traumatic Injury Hazards During Drywall Taping/Sanding,@ International Journal of Industrial Ergonomics, 25(6), pp 621-631, 2000.
4. Cutlip R., **Hsiao** H., Becker E., Garcia R., and Mayeux, B., AComparison of Postures for Scaffold End Frames Disassembly,@ Applied Ergonomics 31, pp 507-513, 2000.
5. **Hsiao**, H. and Simeonov, P., "Preventing Falls from Roofs: A Critical Review,@ Ergonomics, 44 (5), pp 537-561, 2001.
6. Giorcelli, R., Hughes, R., Wassell, J., and **Hsiao**, H., AThe Effect of Wearing a Back Belt on Spine Kinematics during Asymmetric Lifting of Large and Small Boxes,@ Spine, 26, pp 1794-1798, 2001.
7. Bobick T., Belard, J, **Hsiao**, H., and Wassell, J., APhysiological Effects of Back Belt Wearing During Asymmetric Lifting,@ Applied Ergonomics, 541-547, 2001.
8. Simeonov P. and **Hsiao** H., "Height, Surface Firmness and Visual Reference Effects on Balance Control," Injury Prevention, vol. 7, supplement I, pp150-153, 2001.
9. **Hsiao**, H., Guan, J., Mayeux, B., & Cutlip, R. Identifying less stressful work methods: Computer-aided simulation vs. human subject study. SAE Transactions, 109(6):2231-2236, 2001.
10. Cutlip R., **Hsiao** H., Becker E., Garcia R., and Mayeux, B., AOptimal Hand Locations for Safe Scaffold-End-Frame Disassembly,@ Applied Ergonomics, 33 (4), pp 349-355.
11. **Hsiao** H., Long D., Snyder K., "Anthropometric Differences Among Occupational Groups," Ergonomics, 45 (2), pp 136-152, 2002.
12. **Hsiao** H., Guan J., and Weatherly M., AAccuracy and Precision of Two Foot Pressure Measurement Systems,@ Ergonomics, 45 (8), pp537-555, 2002.
13. **Hsiao** H., Bradtmiller B., Whitestone J., "Sizing and Fit of Fall-Protection Harnesses" (Submitted to Ergonomics; received the 2002 International Ergonomics Association – Liberty Mutual Prize in Occupational Safety and Ergonomics).

14. Simeonov P., **Hsiao** H., Dotson B., Ammons D., "Comparison Standing Balance in Roof Work Environments," Human Factors (accepted).
15. **Hsiao** H., Dotson B., Simeonov P., Ammons D., Hendricks S., and Chiou S., "Comparison of Real and Virtual Object Effects on Human Responses at Simulated Heights" (Submitted to Ergonomics).
16. Becker, P.; Fullen, M.; **Akladios**, M. Work in Progress: Fall Safe research, Scandinavian Journal of Work Environment and Health. Spring 2003.
17. **Winn**, G; Akladios, M; Gopalakrishnan, B; Becker, P. October 2002. "Texpert: A Tool for Safety Professionals & Design Engineers." Journal of Professional Safety. October, 2002.
18. Becker, P (Editor); Flanagan, ME; **Akladios**, M. 2001 "Development of an ACGIH Construction Industry Silica Exposure Database" Journal of Applied Occupational and Environmental Hygiene. Volume 16(8): 781-783, 2001.
19. Becker, P; Fullen, M; **Akladios**, M.; Hobbs, G. July, 2001. "Prevention of Construction Falls by Organizational Intervention" Injury Prevention Journal.
20. Becker, P; Fullen, M; **Akladios**, M., Carr, M.; and Lundstrom, W. "Use of a Hand Held Computer to Audit Construction Fall Prevention Effectiveness" International Journal of Computer-Integrated Design and Construction (CIDAC). Special Issue on Computerized Safety Management. Volume 3(1), February 2001, pg 16-24. ISSN: 1466-5115

Current Research Projects

Steven Guffey

August 2001 – July 2004: "Investigation of Sampling Errors at the Lapel Using CFD with Experimental Verification Using Human Subjects." NIOSH 1R01OH07578-01. Principal investigator 50% effort.

"Personal" industrial hygiene samples for airborne contaminants are nearly always taken at the lapel. We questioned whether lapel samples are valid representations of inhaled concentrations. With startup funding as a new faculty member and funding from NIOSH, we built a 9 ft high, 12 ft wide, 50 ft long wind tunnel/exposure chamber to test our hypotheses. We are measuring deviations of inhaled concentrations from samples taken at each lapel, the check, and neck. We are varying task, source location, effects of breathing and of heating the mannequin, and cross-draft velocity. We will compare results from human subjects doing these make-work tasks to results from mannequins and predictions from computational fluid mechanics modeling, allowing us to assess the adequacy of mannequins and CFD to represent humans in exposure assessment studies.

January 2003 – December 2005: "Noise Control in Longwall Faces in Mining." NIOSH. 1RO1 OHO7732-01Co-investigator, 20% effort.

Noise levels during ore removal from longwalls in deep mines are extremely high (95-102 dBA, 8-hr TWA). We are characterizing noise sources and developing engineer controls to reduce these levels to acceptable exposures using both active and passive methods.

Warren Myers

Completed study to determine if Air Force personnel assigned standard MCU-2A/P respirator sizes (short, medium, or long), can randomly receive, with reasonable certainty, comparable levels of fit from any other MCU-2A/P respirator of the same size in the population of new or stored respirators. To answer this question, the study team proposed and tested several hypotheses regarding the effects that storage, individual respirators, and individual test subjects have on the respirator fit (as measured by Quantitative Fit Factors, or QFF).

Following preliminary testing at Langley Air Force Base (AFB) in April 2002 to confirm the test protocol and to establish the study design, the study was conducted at Brooks AFB in May 2002.

The Brooks study demonstrated that all respirators were not equal for purposes of fit testing—"New" and "stored" respirators had significantly different QFF scores, with "stored" respirators recording lower QFF scores than "new" respirators. There were no significant differences in QFF scores among the set of all new respirators during the Brooks AFB study.

Research by PhD Students

Erik Gregory

Erik Gregory is conducting research and being funded by the Musculoskeletal Pathomechanics Research Team, Engineering Control and Technology Branch, Health Effects Laboratory Division, NIOSH.

The lab carries out research into both acute and chronic musculoskeletal injuries. We look for functional changes (force and/or performance decrements)and structural changes due to these injuries, and biomarkers to specific to these pathological changes.

Specifically, Erik is looking at the voluntary hind limb performance of the rats and how that correlates with the muscle function during electrical stimulation and the effect of this repetitive lifting (exercise) on the susceptibility of the rat hind limb to eccentric contraction induce injury.

The tentative title of Erik's dissertation is:

Quantifying Volitional Hindlimb Performance of Rats: Model Development and Application.

Sergio Caporali Filho

Description: Through a psychophysical methodology extensively used in Ergonomics, the individual's perception of the

physical stress associated with vibration exposure in the intermittent operation of a simulated power hand tool was measured in a laboratory setting.

The title of Sergio's dissertation is:

Hand Transmitted Vibration in a Simulated Industrial Task: A Psychophysical Evaluation

Sergio worked at NIOSH in the Engineering Control and Technology Branch of the Health Effects Laboratory Division (HELD).

Aaron Bird

Aaron is developing a formal validation methodology for evaluating the accuracy of computational fluid dynamics simulations used to calculate the concentration of dust particles in the breathing zone of workers.

Aaron works at NIOSH in the Exposure Assessment Branch of the Health Effects Laboratory Division (HELD).

Diane. J. Schwerha

The purpose of this study was to determine the possible effects of noise, aging, and frequency on difficulty ratings for a lifting task and a snorting task. The difficulty of each task was rated via a visual analogue scale (VAS) and a percentage of maximum grip strength. Results indicated that noise was a significant factor for both the lifting and sorting task for the VAS but not for the grip strength. For the sorting task, the ANOVA for the VAS indicated that age of subject was significant with older subjects judging the task at both levels of noise to be less difficult than did the younger subjects. For the lifting task, the ANOVA for the VAS also showed a significant age x frequency interaction. These results suggest that the choice of psychophysical rating scales may be sensitive to the environmental conditions in which the task to be rated was performed.

Selected Adjunct Faculty Research

HONGWEI HSIAO

1. Developed the scientific basis and guided the development of NIOSH Virtual Reality (VR) laboratory. This laboratory is the first surround-screen virtual reality facility in the country that is designed for occupational safety research. It allows researchers to investigate occupational safety issues that were very difficult to explore in the past, due to safety concerns for human subjects or impractical cost for developing physical experimental prototypes. The Branch is currently using the VR technology in scaffold and roof safety studies. This laboratory has become a highly visible installation in the country in the area of safety research since it was completed in 1998.

2. Co-investigator for four NIOSH studies which evaluate the effects of visual references, workplace height, work surface firmness, and platform/plank width on human stability, for workers to safely perform their tasks at various heights.
3. Principal investigator for studying the fit of fall-protection harnesses to workers, through both traditional and new 3-dimensional scanning technologies. This is the first research effort in the country that addresses the fit issue of fall-protection harnesses, using a 3-dimensional anthropometric technology and considering pre-and-post-fall conditions. This research has drawn attention and support from protective harness manufacturers and national safety standards committees. We expect a significant improvement in current design guides for harness manufacturers as well as the development of an anthropometric guide for users to select correct sizes of fall-protection harnesses for their work.

Akladios, Magdy

1. Development of an Expert System to Assist Designers in Equipment Development, 1998-2002, Co-Principal Investigator, NEETC/DOE/DOD
2. Organizational Intervention for Fall Prevention, 1994-2004, Participant, NIOSH/CPWR
3. Small Business Safety Outreach, 1997-2002, Participant, WV Division of Workers' Compensation
4. Development of two Questionnaires for Construction, 2000-2001, Principal Investigator, NIOSH
5. Factors Determining Success and Failure of Labor Management Safety Committees Research, 1997-Present, Participant, WV Division of Workers' Comp.
6. Small Construction Safety Leadership Program, 1997-1999, Participant, OSHA Susan Harwood Training Grant.
7. Development of a Web Based Artificial Intelligence System for Safety and Health Issues in Equipment Design, 1998-Present, Co-PI, DOD.

Klishis, Michael

1. Co-Principal Investigator, "Evaluation of Ship Dismantling Procedures," NEETC October 2000 – September 2001
2. Co-Principal Investigator, "The Prevention of Silicosis in Surface Miners" -NIOSH Research Grant Renewal, Oct. 1998 to Sept., 2000

Gary Winn

1. PI in 2002 on a research activity that has developed an expert system for product designers called TEXPERT. That software may be marketed soon to a major US engineering firm. National Environmental Education and Training Center

2. PI on a project to study efficiencies in decommissioning military bases affected by hazardous waste around the country. Both of these projects are funded by the National Environmental Education and Training Center.
3. PI on a project to improve traffic crash data collection in West Virginia with particular emphasis on heavy trucks. That study is funded by USDOT through the West Virginia Department of Motor Vehicles.

David Whaley

Develop quantitative structure-activity relationships (QSAR) of adverse cutaneous effects of chemicals, to help develop rational risk assessment strategies, given incomplete information. Predictive capacity of QSAR depends both on quality and magnitude of the source data set. We demonstrated a critical role of these factors on the example of skin absorption of chemicals, which contributes to OCD etiology. The immediate goal in the present work was to develop a quality-controlled chemical information system (CIS) for OCD QSAR. We collected information on chemical structures and cutaneous effects of 386 pure chemicals, including industrial chemicals and pesticides. Both biological activities and physical-chemical properties (descriptors) of the chemicals were recorded. Biological activities of skin sensitization, skin irritation and corrosivity to skin were entered into the database. Unequivocal characterization of skin sensitization is especially difficult. In our CIS, skin sensitization is characterized by two animal models, the local lymph node assay and guinea pig maximization test, and qualitative clinical results. Chemical structures and physical-chemical descriptors comprise the largest part of the database. Seventeen structure and property related fields have been collected. They include SMILES notation, molecular formulae and weights, experimental and calculated octanol-water partition coefficients, vapor pressures, melting points and other relevant QSAR descriptors. This CIS provides a significant enhancement of the data quality in risk assessment of OCD. The quality controlled data collected are statistically sufficient for the subsequent phase of this work, developing predictive QSAR.