FINAL PERFORMANCE REPORT

NORTHWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY

UNIVERSITY OF WASHINGTON

SEATTLE, WA 98195-7234

PROJECT TITLE: EDUCATIONAL RESOURCE CENTER

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ABSTRACT

The purpose of this Center program is to provide trained professionals specializing in occupational health and safety fields for the Pacific Northwest (Region X), and to provide continuing education courses and outreach programs in the field to practicing specialists and citizens of this region. Established programs in Industrial Hygiene and Safety, Occupational Medicine, Occupational Health Nursing, and Occupational Safety continued with modest expansion in size but with major efforts to enhance the quality of the research and clinical experiences of the trainees. These efforts focused on new leadership of the Center, recruitment of faculty with strong research orientation, and more comprehensive integration of the Center programs with the other research, education, and service activities of the sponsoring departments: Environmental Health in the School of Public Health and Community medicine, Medicine in the School of Medicine, and Occupational Health Nursing, Family and Child Nursing in the School of Nursing.

Students include masters degree candidates specializing in Industrial Hygiene (IH), Occupational Health Nursing (OHN), Occupational Medicine (OM), and Occupational Safety (OS), as well as Ph.D. candidates in IH and in OHN. During this period 14 to 16 IH students working toward the M.S. degree were admitted annually for a total of 70-80 graduates over the 5-year period; in addition, admission of 1 to 2 doctoral candidates occurred. 11 OHN students received M.N. degrees each year for a total of 55 graduates, and 2 Ph.D. students completed the degree requirements per year. 6 to 8 physicians were admitted each year to the O.M. residency program leading to the M.P.H. degree. All students met the Graduate School and the School of Public Health and Community Medicine or School of Nursing admission and graduate requirements.

Programs were carried out in the classrooms, laboratories and field research facilities of the Department of Environmental Health, the offices and classrooms of the Department of Occupational Health Nursing - Family and Child Nursing, and the conference rooms, offices and clinics of the Harborview Medical Center Occupational Medicine Clinic, and in related facilities in the University of Washington's Warren G. Magnuson Health Sciences Center. Clinic and field practice experience for OM residents also utilized facilities of clinical faculty in affiliated industries of institutions (e.g., the Boeing Company, Hanford Environmental Health Foundation, and Weyerhaeuser).

SIGNIFICANT FINDINGS

INDUSTRIAL HYGIENE

- Drs. Noah Seixas and Michael Yost joined the program faculty as Assistant Professors. Each has taken on a major role in both the teaching and research activities in Industrial Hygiene and in the Department of Environmental Health.

- Thirty-nine students completed the requirements for graduation from the program, of which one earned the first Ph.D. All have found employment in the field of Industrial Hygiene and Safety. In addition, eleven students will complete the MS degree requirements and will be graduated at the end of Spring quarter, 1996.

- Mr. Peter Breysse will retire from the Program effective June 30, 1996, after serving the University since 1957. Mr. Lee Monteith elected partial retirement but continues to participate in the program at 40% time.

- Students in the program were honored by scholarship awards from the American Industrial Hygiene Association Foundation and the Pacific Northwest Section of the American Industrial Hygiene Association. Two current students are recipient of prestigious fellowships from the Oak Ridge Institute for Science and Engineering, and the National Defense Science and Engineering Graduate Fellowship Program.

- Steven E. Guffey, Ph.D, was promoted to Associate Professor in the Industrial Hygiene and Safety Program of the Department of Environmental Health. Steven F. Wiker was appointed Associate Professor, and was awarded funding from NIOSH to offer a separate MS program in Occupational Safety and Ergonomics. The latter program is a strong complement to the long-standing educational program in Industrial Hygiene.

- Program faculty, staff and students presented research papers at each annual American Industrial Hygiene Conference.

- The research training portion of the program was enhanced by the awarding of several major research grants from extramural sources to members of the core program faculty.

- The curriculum for the MS degree was thoroughly reviewed and revised to reflect comments from external sources and from current and former students.

OCCUPATIONAL HEALTH NURSING

The OHN program has been attentive to our identified goals and objectives related to the recruitment and training of master's and Ph.D. in Nursing Science students, the enhancement of our program through the student and faculty contributions, and the development and dissemination of research activities which will benefit the future practice of occupational health nursing. The following are examples of progress towards our goals and objectives:

- A total of 40 trainees participated in the occupational health nursing program since the start of the current five year period, 36 M.N. students and 4 Ph.D. students.

Twenty of these trainees have completed the requirements for the Master of Nursing (M.N.) degree; an additional 7 are expected to complete in 1996. Eighteen of these were in the Administration/Management Pathway and nine were in Primary Health Care (nurse practitioner). Additionally, two of the Ph.D. trainees have completed the program.

- OHN trainees and faculty continue to be recognized nationally for their contributions to occupational health nursing. For example, at least six OHN trainees and faculty have received research awards from national organizations such as the American Association of Occupational Health Nurses (Mary Dirksen, Jeannie Viges, Ann Fetrick, Mary Salazar), the US Public Health Services (Linda Brophy), and the Oncology Nurses Society (Donna Berry). Four trainees have been awarded OSHA internships since the beginning of this grant period.

- Drs. Mary Salazar and Katherine Graham are currently working on two research projects with the Washington State Department of Labor and Industries (DOLI). One project will evaluate the effectiveness of DOLI's Medical Case Management program. The second will evaluate three instruments which will be used to determine the extent of three identified occupational health problems, repetitive trauma, skin disorders, and upper respiratory irritation. Eleven OHN trainees are participating in these two projects.

- Nine nursing faculty contribute a total of 1.44 FTE to the OHN program. These faculty members have more than 60 publications and multiple national and international presentations and consultations to their credit this grant period. Additionally, they have more than 20 research projects completed or in progress since 1992.

OCCUPATIONAL MEDICINE

- Program Leadership and Faculty: New Direction and Broader Scope:

  Scott Barnhart was appointed Program Director to replace Linda Rosenstock;
  Dr. Carl Brodkin was appointed as Associate Director of the Residency Program;
  Dr. Jeffery Thompson was appointed as a clinician-teacher and divides his time between teaching and practice at the University of Washington while serving as the Medical Director of Weyerhaeuser;
  Dr. Jeffery Burgess was appointed as a clinician-teacher and directs the Center of Excellence for Chemically-Related Illness.

- Curriculum: A Renewed Focus on Prevention:

  Practicum experiences including external rotations have been reviewed to emphasize primary and secondary prevention;
  The industrial hygienist has increased site visits, focusing on hazard identification and reduction;
  There is increased focus on primary and secondary prevention at the Department of Energy site at Hanford.

- Clinical Practice: Broader Scope and Focus on Prevention:

  We were awarded the sole Washington State designation as a Center of Excellence for Chemically-Related Illness;
  The program assumed responsibility as Medical Director for Weyerhaeuser Corporation.

- Residency Recruitment:

  As of July 1, 1996, 15 residents will have graduated in the past five years;
  Two residents incoming in 1996 received Occupational Physician Scholarship Awards.

- Accreditation: The program was site visited in 1994 by the ACGME and received full reaccreditation.

OCCUPATIONAL SAFETY

- The safety program with the ERC was approved in July of 1995, and provided funding for 2 MS students. Since approval, we have increased the student census to 5. Three students will have graduated by the end of the 1996 Summer Quarter.

- Faculty in the safety program authored over 18 refereed publications and have received over $2.4 million dollars in grants, research contracts, and gifts.

- Five affiliate and adjunct faculty with expertise in the area of safety and ergonomics were added to the department (Woodrow Barfield and Scott Iverson, Adjunct Associate Professors, Kailash Kapur, Adjunct Professor, Alvah Bittner, Affiliate Professor, Mark Stuart, Affiliate Assistant Professor).

- Dr. Wiker and the graduate students worked with the local and national office of the American Society of Safety Engineers to form a student chapter of ASSE at the University of Washington. Peregrin Spielholz became the founding president. The chapter is comprised of students within the departments of environmental health, industrial, and mechanical engineering. They actively attend the ASSE Pacific Northwest Chapter meetings, have established a job line for students, and are establishing a scholarship program for future students.

- Dr. Wiker was elected Technical Chair for the American Institute of Astronautics and Aeronautics Program at the SAE's International Conference on Environmental Systems, 1994. After that conference he was elected to serve as the International Chair of the conference for 1995-1996. He was also elected as Chair, Industrial Ergonomics Technical Group, Human Factors and Ergonomics Society for 1995-1996.

- Dr. Dan Baker, has joined the department as a Research Scientist and is supporting the Field Research and Consultation Group. He earned his Ph.D. in Mechanical Engineering from the University of Utah and his B.S.E. and M.S.E. degrees in Industrial & Operations Engineering from the Center for Ergonomics at the University of Michigan. He specializes in spine biomechanics and safety. He has

helped the program by teaching in our continuing education program and ENVH 562 Technical Aspects of Safety.

- Ken Stewart joined the department as a biomedical engineer in the Ergonomics Laboratory. Ken is a recent graduate of the biomedical engineering masters program at California State University at Sacramento. His expertise in occupational biomechanics, biomedical engineering, and bioinstrumentation is used to assist students in learning instrumentation techniques and in development of research and test gear for safety research and thesis projects.

CONTINUING EDUCATION/OUTREACH

The Continuing Education program has exceeded most of the goals set for the 1991-96 grant period:

- To present at least 15 excellent Continuing Education programs each year which meet regional and national needs.

  From 21-27 courses have been presented each year attended by a total of 7,800 safety and health professionals and others concerned about preventing occupational illness and injuries. The courses have ranged from basic skill building in spirometry to conferences on the health effects of non-ionizing radiation.

- To obtain highly qualified faculty from the public and private sector with theoretical and practical knowledge of the issues presented.

  The commitment and breadth of the faculty is impressive. The nearly 400 speakers in the last five years have included faculty from the University of Washington and nationally known experts from other universities, government agencies, medical facilities, private industry, unions, law firms and consulting firms.

- To attract at least 600 occupational safety and health professionals each year.

  Nearly 1,900 industrial hygienists, safety professionals, nurses and physicians have attended our courses each year.

- To present at least one course each year directed toward persons not trained in occupational safety and health.

  Courses on how to prevent occupational safety and health problems directed to non-safety and health professionals were Lead Exposure at Firing Ranges, Health and Safety in the Fish Processing Industry, Ergonomics for Managers, and the Regional Conference on Ergonomics, Health and Safety in Construction. We did not quite meet this goal because a course on Health Hazards in the Home was canceled due to low enrollment.

- To involve representatives of the target audience in planning and implementing programs.

  The Center works closely with national and regional associations, agencies and other educational institutions in presenting courses. A course is presented annually at the Washington Governor's Industrial Safety and Health Conference that is developed by an advisory committee composed of representatives of labor, management and academia.

- To hold at least one course a year in Alaska, Oregon, and Eastern Washington or Idaho.

  Five courses were presented in Eastern Washington, five in Oregon, and one each in Alaska and Idaho.

HAZARDOUS SUBSTANCE TRAINING

- Hazardous substances training programs that meet the needs of government employees in the region.

  90 percent of the 910 attendees at the 1991-96 hazardous substances training courses were from federal, state and local government agencies. They included environmental health specialists, engineers, safety professionals, industrial hygienists, worker representatives, and occupational health professionals.

- Programs that include qualified faculty from the public and private sector with theoretical and practical knowledge of protecting workers and the general public from hazardous substances.

  Faculty included experts in hazardous substances from the New York/New Jersey ERC and the University of Washington Department of Environmental Health; from state government agencies, including the Departments of Transportation, Labor and Industries, and Ecology; and from local agencies, including fire departments and public works departments.

- Involvement of representatives of the target audience in planning and implementing programs.

  The Center works closely with local, state and national agencies in planning and presenting hazardous substances courses. Interaction among these agencies is assured through an advisory committee of agency representatives which stays directly involved as courses are developed. Prior to the 1995-96 training year, the committee canvassed agency offices throughout the region and determined that two new hazardous substances courses were needed. As a result, Safety and Health in Confined Spaces and Hazardous Materials Transportation were offered for the first time in July 1995 and will be repeated in July 1996.

- Courses which meet the unique needs of government employees in the Northwest.

  The Managing Hazardous Materials Events (formerly Hazardous Waste Incident Response) course has consistently received excellent evaluations and provides advanced training in interagency coordination. A unique program that brings together

representatives from key federal, state and local agencies involved in incident response, the course provides attendees with information about other agency roles and responsibilities as well as practice responding to an incident in an interdisciplinary manner. We offer the course in different geographic locations and work with local officials to adapt the course content, case studies and major scenarios to local problems and resources.

HAZARDOUS SUBSTANCE ACADEMIC TRAINING

- Five students were supported during the current year of this program. Three earned MS degrees in the Spring or Summer of 1996.
- Program faculty continue to attract research support from outside sources which contribute to the overall support for this program
- Several students entering the programs in the Department of Environmental Health have expressed strong interest in this option within the Industrial Hygiene & Safety program, and would qualify for additional support if it became available.

FINAL REPORT

CENTER ADMINISTRATION

Background

The Northwest Educational Resource Center for Occupational Health and Safety was established in 1977 within the Department of Environmental Health at the University of Washington. This was a major milestone in the long history of industrial health and safety education and research at the University of Washington. The department has been supported by funds from the Medical Aid and Accident Fund of the State of Washington's Department of Labor and Industries. These funds have allowed the department to build a solid infrastructure in the area of occupational safety and health. The current level of support from these funds is approximately $4.5 million for the year July 1, 1996 to June 30, 1997. Requested funds for the year July 1, 1997 to June 30, 1998 is slightly under $5 million. The close ties with the Washington State Department of Labor and Industries has resulted in a variety of collaborative projects ranging from hazards of pesticides by agricultural workers to joint work on emerging occupational diseases (syndromes) such as Multiple Chemical Sensitivity.

The Department of Environmental Health has continued to grow and mature since the last submission of the application in 1991. Faculty have been added to the Industrial Hygiene Program and the Occupational and Environmental Medicine Program. Details can be found in the relevant sections. Highlights in the department's history in the last five years include acquisition of substantial laboratory and office space at 4225 Roosevelt (over 30, 000 square feet), establishment of an Ergonomics Laboratory at Children's Hospital and Medical Center, and establishment of a Ventilation Laboratory and Wind Tunnel at Northlake Way. This is a partial solution to the space problem identified in the previous review and represents a substantial contribution of the University of Washington by allowing the department to rent space in an area within one mile of the university known as the Impact Zone. The Department competed successfully for an NIEHS Center for Ecogenetics and Environmental Health (funded in 1995). In toxicology the faculty has been unusually successful with a five-year Burroughs Wellcome award in Toxicology to Dr. Curt Omiecinski, and Society of Toxicology awards to Dr. Lucio Costa and Dr. David Eaton. The department also started a partnership with Rutgers University in the area of risk assessment associated with the cleanup of the nation's nuclear weapons complex. This planned multi-decade effort will provide training and research opportunities for occupational physicians, industrial hygienists, and occupational health nurses. The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) completed its first year of work in March 1996.

The department established a Molecular Biomarker Laboratory. We are especially interested in training students in this area because of its potential for prevention of occupational disease by permitting early detection of exposure, mechanism, and effect. We are also aware of substantial moral and ethical problems associated with these techniques and will address them in tandem with their development.

With Dr. Wiker's arrival in 1994 a stronger emphasis on Occupational Safety and Ergonomics was established. Close interdisciplinary ties have been established with the Department of Mechanical Engineering's Industrial Engineering Program. The department successfully competed for a training program in Occupational Safety and Ergonomics. The first year of support started July 1, 1995. Currently there is support for an M.S. level program.

In 1995 the Department of Environmental Health was selected as the Region X OSHA Training Institute Educational Center, serving Washington, Oregon, Idaho, and Alaska. The center represents a collaborative effort between the UW's established Northwest Center and top occupational, safety and health instructors in the Northwest, including Prezant Associates.

ERC staff collaborated with the NIOSH town meetings in February 1996, and participated fully in the development of the NIOSH National Occupational Research Agenda. Gerald van Belle gave a presentation at the town meetings emphasizing the importance of training and extramural research.

Center Leadership and Management

Gerald van Belle assumed the chairmanship of the Department July 1, 1991, after serving as Interim Chair the previous year following the death of Dr. Sheldon Murphy. Dr. van Belle assumed the directorship of this ERC upon assuming the permanent chairmanship of the department. He has been active in the Association of University Programs in Occupational Health and Safety (the national organization of ERC directors). In 1994 he was elected president of the Association. The Association has met regularly to promote a federal presence in occupational safety and health and to discuss training and research issues of common interest. Dr. van Belle holds a Ph.D. in mathematical statistics from the University of Toronto, 1967. He is active in the area of environmental and occupational risk factors for neurodegenerative diseases, particularly Alzheimer's Disease, Parkinson's Disease, and Amyoptrophic Lateral Sclerosis. With respect to the last disease, a comprehensive case control study in the King County area indicated elevated risks associated with agricultural chemicals. He is a fellow of the American Statistical Association and the American Association for the Advancement of Science, and is a member of the International Statistical Institute. He is a congressionally appointed member of the Board of the Mickey Leland National Urban Air Toxics Center (1994), a member of the Research Committee of the Health Effects Institute (1993), and a member of the Board of Environmental Studies and Toxicology of the National Research Council (1993).

Program Directors

The Industrial Hygiene Core Program Director is Dr. Michael Morgan. Dr. Morgan holds a doctoral degree in chemical engineering from MIT (1972). He received postdoctoral training in pulmonary physiology at the Harvard School of Public Health (1972-1974). Dr. Morgan has been a faculty member of the Department of Environmental Health since 1974. He is certified in the comprehensive practice of industrial hygiene, and he is a member of the American Institute of Chemical Engineers (Health and Safety Division), and the American Industrial Hygiene Association.

With the appointment of Dr. Linda Rosenstock as Director of NIOSH in 1994, Scott Barnhart, M.D. was appointed to the directorship of the Occupational and Environmental Medicine Program (OEMP). With the introduction of managed care in the state of Washington (reflecting a national trend) the OEMP faces new challenges and fundamental questions about the role of occupational medicine and occupational physicians in a managed care setting. The section of this application dealing with occupational and environmental medicine will describe some of these challenges and the OEMP's approach to meeting them.

The Core Program Director for Occupational Health Nursing is Dr. Mary K. Salazar. who is an assistant professor. She received her MN degree in Occupational Health Nursing from the University of Washington in 1986 and her doctoral degree in Educational Leadership from Seattle University in June, 1991. Dr. Salazar has greatly enriched the OHN

program in the last five years through her active involvement with the regional and national occupational health community and her commitment to excellence in education and research. As past President of the Washington State Association of Occupational Health Nurses, she has been instrumental in strengthening the links between members of this association and the University of Washington, resulting in the enhancement of clinical placement and employment opportunities for OHN students. Dr. Salazar brings energy and enthusiasm to the administration of the program including continued curriculum development, recruitment and advisement of students, and ongoing program evaluation, as well as the development of research related to occupational health nursing.

The Director of the Safety and Ergonomics Program is associate professor Dr. Steven Wiker. He graduated from the University of Michigan in 1986 with a Ph.D. specializing in ergonomics, human factors, and safety engineering. The objectives of his research are to improve worker health and safety, and performance by improving the working environment, including equipment and job design. His efforts are directed at identifying and controlling occupational performance, health and safety problems arising from biomechanical, physiological, or perceptual-motor stressors encountered in the industrial workplace, aboard aerospace or marine vehicles, or when operating sophisticated hand tools.

The Director of the Continuing Education Program, Outreach and Hazardous Substance Training Programs is Ms. Sharon Morris, Senior Lecturer in the Department of Environmental Health. Ms. Morris has been associated with NIOSH and its activities since the formation of the agency. Her most recent role was as special assistant to the Director of NIOSH from 1994 to 1995. In 1995 she returned to Washington state and was appointed Assistant Chair for Outreach and Continuing Education, reflecting the department's commitment and interest in these areas. As Director of Continuing Education for the Department of Environmental Health and the School of Public Health and Community Medicine she is responsible for all aspects of presenting short courses and conferences on a variety of topics in occupational safety and health and public health topics.

Center Management

The Center Director, Deputy Director and Core Program Directors, as well as the coordinators of the other graduate programs in the Department of Environmental Health serve as an internal Executive committee. This committee meets formally each month to discuss the academic, research and service activities of the Center and to advise the Director on policy matters including the awarding of support to trainees. Each year, at least one of these meetings is held in conjunction with the ERC External Advisory Committee

The committee members were selected to represent four states in the region, the disciplines of occupational health nursing, occupational medicine and industrial hygiene, as well as academia, labor, and industry. The most recent meeting of the External Advisory Committee was on January 19, 1996.

Institutional Setting

The Department of Environmental Health (DEH) is one of five departments in the School of Public Health and Community Medicine at the University of Washington. The other departments are Biostatistics, Epidemiology, Health Services, and Pathobiology. The School is administered by Dean Gilbert S. Omenn, formerly Chair and presently Professor in DEH, and Associate Dean Patricia Wahl, Professor of Biostatistics. Dean Omenn chairs the School of Public Health Executive Committee, which consists of the Dean and Associate Dean, the five department chairs, and one student member. This committee meets monthly to

discuss and develop school-wide policies. The School is accredited for a seven-year period by the Council on Education in Public Health valid until 1998.

The DEH has a special relationship to occupational health and safety in the State in that the Department was established (initially as the Occupational and Environmental Research Facility) by legislative mandate in 1963. This facility was charged with "having as its object and purpose: testing, research teaching, consulting and service in the fields of industrial and occupational medicine and health, the prevention of industrial and occupational disease among workmen, the promotion and protection of safer working environments and dissemination of the knowledge and information acquired from such objects and purposes" (Revised Code of Washington, 28B.20.450). This legislative action also provided for partial funding of the DEH from state industrial insurance funds collected and administered by the Washington Department of Labor and Industries. Over 90% of the state funds allocated to the DEH are derived from that source. They represent 1/4 of the Department 's budget. Although these funds are not adequate to support all the teaching and research activities of the DEH, the fact that they are allocated in support of a charge so closely related to the NIOSH ERC's allows many of the DEH faculty to contribute much of their time to ERC-related activities while charging only a small portion or none of their salaries to ERC budgets. Nonetheless, ERC support for the educational programs is essential, since DEH State funding does not extend to providing stipends and tuition assistance to students.

The founding charge to the DEH, and its support from state allocated industrial insurance funds, also provide unique opportunities to conduct research and provide practical training experiences for students in industrial hygiene, industrial safety, occupational medicine, and occupational health nursing. For example the DEH provides consultation and service to the Department of Labor and Industries and to the workers and industries of the State upon request of organized labor groups and/or corporate management. To provide this service, the DEH maintains a Field Research and Consultation Group (FRCG) and an Environmental Health Laboratory (EHL) under the direction of Ms. Janice Camp and Dr. David Kalman, respectively. Both are faculty members of the ERC's Industrial Hygiene core program. In addition, Dr. Kalman is the Program Director of the Department's Environmental Health Technology Program. These units provide opportunities for students in all of the core programs to: a) participate in field research initiated by the FRCG in industrial sites; b) work with staff industrial hygienists to obtain direct experience in application of industrial hygiene, safety and occupational medicine; and c) have available expert staff and state of the art equipment to aid in sampling and analysis of chemical physical agents in the work environment. The FRCG consists of three staff industrial hygienists (three are ABIH-certified). Currently the FRCG also employs an ergonomist for 50% of the time (Dr. Daniel Baker).

Although the FRCG and EHL represent operational units of the DEH, each led by a faculty member appointed by the Department Chairman, virtual all members of the ERC become involved from time to time in the field consultation and research activities of these units. All ERC faculty are encouraged to use the unique opportunities of the FRCG to conduct applied research in occupational health problems. These activities frequently involve faculty and students in more than one discipline. Most notable was the initiation of a large field-based research project with the agricultural industry. The goal of this project is to evaluate farm worker exposure to organophosphorus insecticides in the Eastern Washington tree fruit industry during apple thinning activities. These efforts will improve the understanding of the magnitude and range of exposures presently occurring during apple thinning, and thereby provide a foundation for estimating acute and chronic health risks associated with this activity. Apple orchardists from Eastern Washington who conduct conventional spray application rates of organophosphates during the thinning season (mid-May-June) were recruited for this study. Foliar pesticide residue, the primary alkyl

phosphate metabolites of glutathion, red blood cell and plasma cholinesterase, and serum paraoxonase measures from workers were included in the exposure assessment.

Interdisciplinary Interaction

Each program has addressed the issue of interdisciplinary interaction. Here we highlight some interactions that have become part of the Center.

A special student research event is carried on by the DEH, including students from the Occupational Health Nursing program, each spring. On Student Research Day each of the Master's and Doctoral students presents a brief summary of his or her project to the entire faculty, staff, and student body of the Department. In particular, this provides first year students with a valuable introduction to the variety and depth of research in the DEH (and the ERC), which stimulates the generation of new research proposals. The program for the most recent Student Research Day presentations is included at the end of this section. This day provides a venue for students from at least three programs.

The number of courses that students from the core disciplines take together include ENVH 453, ENVH 564, and ENVH 572. This provides the students with a common exposure to problems in occupational health and safety.

Beside the courses shared in Environmental Health, all students are required to take courses in epidemiology and biostatistics giving contact with each other.

Another example of interaction is the monthly occupational health case conference/didactic session organized by the Occupational Medicine Program but attended by faculty, students, and staff of the other programs. This session includes a formal presentation by a member of one of the three groups (student, staff or faculty) on a topic of current interest, followed by discussion of recent cases from any of the programs.

All students also share experiences through projects. A notable example is the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) consisting of a cooperative grant with the Department of Energy (DOE) to provide advice to the DOE with respect to risks associated with the clean up of the nation's Nuclear Weapons Complex. This multi-faceted project uses students from all programs in the department, and students from other departments including Geography and the Graduate School of Public Affairs. Students may start with a project in CRESP and then go on to an ERC traineeship bringing with them an appreciation for interdisciplinary work that will stand them in good stead in their academic and professional careers.

INDUSTRIAL HYGIENE

Current and Past Training: Academic Training

July 1, 1991 to June 30, 1996:

During the five-year period, the MS program continued with one substantial change. Beginning with the 1994-95 academic year, a separate pathway in occupational safety and ergonomics was offered. Enrollment in the program in Industrial Hygiene & Safety prior to 1994, and the program in Industrial Hygiene after that date totaled sixty-one students; through December of 1995, 38 of these have graduated, with the yearly distribution shown below.

Year	1991-92	1992-93	1993-94	1994-95	1995-96
Graduates	8	6	11	8	5

In addition, eleven students are expected to complete the degree requirements during the spring or summer of 1996 and will graduate in June or August. There are seven students who will complete their first year of the program and will be returning in the fall of 1996. Five students withdrew from the program during this period. Of the 38 MS graduates, all but two part-time students were able to complete the graduation requirements within two calendar years of enrollment. The graduation date, current employment, and ABIH certification status of the MS program graduates are given in Appendix D.

Also during this period there were several changes in the principal faculty. In December of 1992 Dr. Noah Seixas was appointed Assistant Professor. Dr. Seixas was recruited from the University of Michigan, where he earned the Ph.D. in industrial hygiene, followed by post-doctoral training there. Dr. Michael Yost was appointed Assistant Professor in January of 1993, joining the program from the University of California at Berkeley. In 1993, Dr. David Covert, Research Associate Professor in the Department of Environmental Health, resigned his position to join the Joint Institute for the Study of the Atmosphere and Oceans, still at the UW. He was appointed Adjunct Research Associate Professor in Environmental Health at that time, and continues to provide consultation to the Industrial Hygiene program; he serves on graduate student research committees, when expertise in atmospheric chemistry and physics is needed. In 1995 Mr. Monteith entered partial retirement, remaining at 40% time as a Lecturer. He will continue to devote this effort to the program for at least one additional academic year. During the present year, Mr. Breysse retired from the University. Effective July 1, 1996, Ms. Janice E. Camp will join the faculty as Lecturer; she is the present Director of the Field Research and Consultation Group, and will teach two elective courses in the program.

Progress Report: July 1, 1995 to June 30, 1996:

A listing of trainees who completed the MS degree requirements during the reporting period is given below, including date of completion, thesis title and faculty supervisor. Also included are the eleven students who are expected to complete the degree requirements summer quarter, and receive their degrees in June of 1996.

Ann Pinsky, M.S. March 1996. Comparison of efficacies of current methods for troubleshooting industrial exhaust ventilation systems to a proposed new method. Preceptor: Steven E. Guffey.

Christopher Hill Kirk, M.S. December 1995. Characterization of volatile chemicals associated with the heating of cured composite materials. Preceptor: David A. Kalman.

Jennifer Anne Touchstone, M.S. August 1995. A comparison of EMF exposure assessment methods: On-site assessment versus a job exposure matrix. Preceptor: Michael Yost.

Sylvie Andree Adam, M.S. August 1995. Respiratory health effects of exposure to wood dust. Preceptor: Noah Seixas.

Jeanne Schlictman Hoppe, M.S. August 1995. Empirical determination of the error in the ACGIH method of predicting airflow distribution in two industrial ventilation systems. Preceptor: Steven E. Guffey.

The following students completed the degree requirements during 1996-97 academic year:

Tamia I. Boyer. Using a Job Exposure Matrix (JEM) to Predict Occupational Wood Dust Exposure. Dr. Morgan
Carrie Carrel. Urinary Metabolite Monitoring in Children with Paraoccupational Exposure to Dimethyl Organophosphorous (OP) Pesticides. Dr. Fenske.
Laura Denovan. Comparison of salivary monitoring for pesticide exposure with traditional airborne concentration measurements. Dr. Fenske.
JoAnn Johnson. A Cryogenic Technique Using Differential Temperature for Sampling Volatile Organic Compounds in Air. Dr. Kalman.
Rainbow Leung. Evaluation of a Home Health Promotional Program. Dr. Koenig, Toxicology Faculty.
Douglas Moody. Comparison of Troubleshooting Methodologies for Ventilation Systems -- A Field Test. Dr. Guffey.
Morgan Perry. Demolition Worker Lead Exposures: Comparisons Based on Worker Activity Substrate Conditions and Air Supply. Dr. Morgan.
Martin Rose. Breath Sampling for VOCs: Applications to Gas-Phase FTIR and Rapid Exhaled Breath Analysis. Dr. Yost.
Jason Sanders. Development of a Methodology for Evaluating Risk of Acute Injury and Fatality in the Construction Industry. Dr. Seixas
David Yu. Human Subject Exposures Working at a Downdraft Ventilation Hood at Different Crossdraft and Face Velocities. Dr. Guffey.
Brian Zevenbergen. Aluminum Potroom Fluoride Exposure Assessment. Dr. Seixas.

Seven students are now completing their first academic year in the MS program and will be returning this fall. Of these, six have accepted summer internship positions with the following employers: Boeing Commercial Airplane Co., Kaiser Aluminum Co., US Army Corps of Engineers, US West Communications, British Petroleum, and the Department's Field Research and Consultation Group. The program also received formal internship announcements from Exxon Corporation, Clayton Environmental Services, Inc. of Seattle, Intel Corp., the UW Campus Environmental Health and Safety Division, and Washington Department of Labor and Industries.

Academic awards were received by three students in the program this year: Tamia Boyer was granted a scholarship by the Pacific Northwest Section of the American Industrial Hygiene Association. Ms. Boyer also holds a two-year Industrial Hygiene Fellowship from the Oak Ridge Institute for Science and Engineering. Carrie Carrel and Douglas Moody received scholarships from the American Industrial Hygiene Association Foundation.

For the coming academic year, the Department has received 26 applications to the MS program in IH. Ten have been accepted and seven of the accepted persons have indicated their intent to enroll as of this date. There will thus be at least seven entering for the fall quarter, and as many as ten. The average combined GRE score (sum of the three standard components) was above 1913 for those accepted, as compared to the minimum of 1500 established by the Admissions Committee of the Department. The trend in this average continues upward over time. The mean GPA of the entering students was 3.55.

Current and Past Training: Research Training

July 1, 1991 - June 30, 1996:

In December of 1994 the first Ph.D. in the program was granted. Dr. Katherine Teschke, CIH, holds the BA in Economics from Trent University, Ontario and the MPH in Industrial

Hygiene from the University of California, Berkeley. She is currently Associate Professor of Health Care and Epidemiology at the University of British Columbia, where she plays a key role in the graduate program in Occupational Hygiene. She is an active collaborator with members of the UW faculty on several projects and serves as a point of contact for important interaction between the two programs. There are five Ph.D. students presently in the program, of which two completed the General Examination during the five year period. Both of these research trainees are expected to complete the requirement for the degree within the next twelve months. The remaining doctoral students are in their first year of study, and have not yet selected a research supervisor or project. These decisions are scheduled to be made before July 1 of this year.

The principal faculty have also increased the level of research funding available for the support of research trainees, highlighted by the participation of Drs. Morgan and Kalman as project directors in the Department's Program Project under the NIEHS Superfund Basic Research Program. This and other major research grants provide support for both MS and Ph.D. student projects. Indeed, it is now the policy of the IH program faculty that every research grant application to be submitted shall include a request for financial support for at least one graduate student in the program.

ADMISSIONS STATISTICS

Academic Year/ Program	Applications Reviewed	Number Accepted	GPA	GRE	Number Enrolled	GPA	GRE
1992-93, Ph.D.	5	1	3.7	2030	1	3.7	2030
1993-94, Ph.D.	9	2	3.62	2005	1	3.78	1880
1994-95, Ph.D.	10	4	3.54	1870	3	3.70	1890
1995-96, Ph.D.	16	3	3.72	2083	1	3.89	2280

Progress Report

July 1, 1995 - June 30, 1996

There are presently five doctoral students enrolled in the program. The doctoral students are Cheryl Luschei, Chen-Sheng Lu, Shu Kwang Chen, Peregrin Spielholz, and Marie Martin. Ms. Luschei is developing a modified air sampling pump intended to collect gas and vapor samples at a flow rate proportional to the worker's pulmonary ventilation rate, as a more representative measure of personal exposure. Her work is funded in part by a grant from NIOSH, and is directed by Dr. Yost. Mr. Lu has completed his experimental work in a project on salivary sampling of the pesticide atrazine, as a convenient method for biological monitoring of worker exposure in agriculture. He has one research publication in press, and is planning to defend his dissertation within the next six months.

The remaining three doctoral students are nearing completion of their first year of graduate study. Mr. Spielholz has been supported by a faculty research grant. Ms. Chen is not eligible for NIOSH support due to her non-resident alien status, and has been funded by a research grant under Dr. Yost. Ms. Martin has a National Defense Science and Engineering Grant fellowship from the US Department of Energy, which will cover her first three years of graduate study.

OCCUPATIONAL HEALTH NURSING

Theses and Special Projects (from current 5 year funding period):

Kitty Carmichael (1993)	Occupational Stress among Home Care Nurses
Michelle Dickson (1993)	Employment Attitudes of Native Americans
Lisa Geiger (1993)	A Worksite Program on Menopause
Mary Johann (1993)	The Political Process and Occupational Health Care
Gwen Lundberg (1993)	Child Labor: Student Perceptions of the Effects of Employment on Aca Achievement and Health
Mary Griffin (1993)	Development of Coding System for Occupational Injury
Esther Moring (1993)	Health Status Indicators of Hazardous Waste Workers
Marjorie Slagle (1993)	Noise Induced Hearing Loss at the Naval Shipyards
Stephanie Sun (1993)	Breast Cancer Detection Beliefs of Working Women
Noreen Olson (1994)	Workplace Violence: A Manual for Prevention
Charles Shifren (1994)	Early-Return-To-Work Program for the City of Seattle
Sheridan Ivy (1994)	Job Task Analysis Recommendations for a Municipal Worksite
Laura LaFevers (1994)	Occupational Health in Thailand
Leslie Vietmeier (1994)	Barriers to Immunizing Children in Employed Families
Pam Boni (1995)	Asthma and the Perimenopausal Female: Implications to OHNs
Christine Hayes (1995)	Occupational Stress Among Police Officers
Pamela Hussey (1995)	RNs as Case Managers in Workers Compensation Systems
Linda Marriott (1995)	Common Occupational Illnesses: A Nurse Practitioner Syllabus
Jeannie Viges (1995)	Carpal Tunnel Syndrome: An OHN Perspective

Current and Past Training

Since the first student was admitted to the program in 1978, 91 trainees have completed the requirements for their degree. Three of these were Ph.D. in Nursing Science trainees, 61 were in the administration pathway (MN), and 27 were in the nurse practitioner program.

Academic Training

A total of 20 students have completed the requirements for the Master of Nursing degree since the current funding period began, including 13 in the administration pathway and 7 from the nurse practitioner program. It is anticipated that an additional five administration and two nurse practitioner students will complete the program in 1996. There are currently seventeen students participating in the program, 12 administration/management, 3 nurse practitioner, and two Ph.D. students.

Current Positions of trainees who graduated during this funding period:

Kitty Carmichael (1993)	Bearcreek Clinic, Redmond, WA
Michelle Dickson (1993)	OHNP, Puget Sound Health Center, Seattle
Lisa Geiger (1993)	OHNP, Seattle/King County Health Department. Seattle
Mary Johann (1993)	OHNP, Redmond Family Health. Redmond, WA
Lisa Libassi (1993)	Unknown
Gwen Lundberg (1993)	OHN, Port of Seattle, Seattle
Mary Griffin (1993)	OHN, J C Penney, Reno, NV
Esther Moring (1993)	PH Educator for Community Health Workers, Tanzania, Afri
Marjorie Slagle (1993)	OHN, USPHS, Federal Occupational Health
Stephanie Sun (1993)	OHN, Fred Hutchinson Cancer Research Center, Seattle
Noreen Olson (1994)	OHN, Kenworth Truck Co, Seattle
Charles Shifren (1994)	OHN Case Manager, Washington Dept. Labor and Industries
Sheridan Ivy (1994)	USPHS, Federal Occupational Health, Seattle
Laura LaFevers (1994)	W. Coast Community Clinic, Copalis, WA
Leslie Vietmeier (1994)	OHNP, Medalia-Ballinger, Mountlake Terrace, WA
Pam Boni (1995)	Seeking employment
Christine Hayes (1995)	Overlake Hospital, Bellevue, WA (Seeking OHN employmen

Pamela Hussey (1995)	OHN Case Manager, Loyola University, Chicago, Illinois
Linda Marriott (1995)	OHNP, Medalia-Providence Health Center
Jeannie Viges (1995)	OHN Contractor, US Dept. of Labor, Anchorage, Alaska

Research Training

Two Ph.D. in Nursing Science trainees have completed the requirements for their degree during this period. Dr. Donna Berry's (1992) research was entitled "The Return to Work Experience of Persons with Cancer". Dr. Berry has presented her research at several national conferences and has received 2 awards for her work including the ONS/Excellence in Cancer Nursing Research and the ONS/Quality of Life Award; she also has two articles based on this work in refereed journals. Dr. Berry is currently a Research Assistant Professor at the University of Washington. Dr. Ann Fetrick's (1994) dissertation was entitled "Return to Work Intentions and Health Status of Postpartum Women." Dr. Fetrick has presented papers on her research at several national conferences including Western Society for Research in Nursing, Transcultural Nursing Society, and the International Conference on Family Nursing. Dr. Fetrick is an Assistant Professor in the Department of Community Health Nursing, Indiana University where she has successfully incorporated OHN content into course curriculum. There are currently two Ph.D. trainees in the program; Catherine Connon is completing her second year of the program, Sally O'Neil her third.

Progress Report:

July 1, 1995 to June 30, 1996

Current trainees: The following number of students are currently enrolled and funded:

8 full-time MN administration trainees
3 full-time nurse practitioner trainees
2 full-time Ph.D. in Nursing Science trainees

Additionally, there are 4 MN trainees enrolled in the program who are part-time and unfunded.

Curriculum developments: OHN trainees in the administration pathway complete a minimum of 62-65 quarter credits; trainees in the nurse practitioner pathway complete a total of 71-74 credits. The Occupational Medicine course (ENVH572) was added as a course requirement in 1995.

Program Enhancement: This program is enhanced by the multiple and diverse accomplishments of students and graduates. For example, the many international activities including the participation of international faculty in OHN courses and trainees overseas' experiences have expanded students' understanding and perspectives on international occupational safety and health issues. OHN trainees are encouraged actively guided in their scholarly pursuits and are encouraged to be disseminate their research findings. At least six trainees have been honored with national awards this past year. Several have published articles and presented papers or poster sessions at national conferences. Graduates of this program have assumed numerous leadership roles in their worksites and their professional associations upon graduation.

OCCUPATIONAL MEDICINE

Program Leadership and Faculty:

Because of the continuing shortage of faculty members and physicians trained in OEM, the program continues to focus on training physicians for teaching, research, and clinical medicine.

From 1987 - 1994 Dr. Linda Rosenstock served as the director of the Occupational and Environmental Medicine Program (OEMP) and Occupational Medicine Residency Training Program. When Dr. Rosenstock left in 1994 to become the Director of the National Institute for Occupational Safety and Health, Dr. Scott Barnhart assumed the Directorship of the program and residency. Because of the challenges of health care reform and a need to develop a more diversified clinical and research program, the program has expanded the number of faculty positions by three. In addition to the core faculty (Drs. Omenn, Checkoway, Barnhart, Franklin, Daniell, Keifer, and Brodkin), the program has hired two faculty as clinician-teachers. These clinician-teachers will place a greater emphasis on the quality and quantity of their teaching and clinical practice. Dr. Jeff Burgess has assumed a clinician-teacher position where he directs the Center of Excellence for Chemically Related Illness, and also serves as the associate medical director for the Poison Control Center. Dr. Jeff Thompson is the second newly recruited faculty member, and in his capacity as a full time faculty member serves as the medical director of Weyerhaeuser Corporation. To expand the program's expertise in musculoskeletal disease, Dr. Stanley Bigos has also tentatively agreed to assume a more active clinical role in the program, pending acceptance of a final business plan. Discussions are under way for him to transfer his clinical practice to the Occupational and Environmental Medicine Clinic. It is anticipated that this will be successfully concluded by January 1, 1997. As this merger is completed the program anticipates recruiting a faculty member with clinical, teaching, and research expertise in the area of upper extremity musculoskeletal illness and injury. The program currently has an active faculty search underway to recruit a physician with an interest in the primary prevention of occupational illness and injuries. Over 20 well qualified applicants have applied. During this period, two faculty have left (Dr. Castorina joined the State Department of Health, Dr. Wilson retired), and Dr. Rosenstock remains on leave.

Program Direction: **Scott Barnhart, M.D., M.P.H.**, is the Director of the Occupational and Environmental Health Program and the Occupational Medicine Residency (Board Certified Occupational Medicine, Internal Medicine, Pulmonary Critical Care Medicine). He is an Associate Professor in both the Department of Medicine and the Department of Environmental Health. He has active research programs in the areas of the natural history of asbestos-related lung disease, using controlled human exposure, the effects of irritants such as toluene and other VOC's on airway inflammation, the development of population-based approaches to occupational health services at the Department of Energy Hanford Nuclear Weapons Site, and risk assessments of occupational hazards at the Hanford Site. He is active nationally and internationally in the field of occupational medicine. He is on the American Thoracic Society's Task Force on Respiratory Protection and the Safety and Occupational Health Study Section of the National Institutes of Health. He co-directed a course in occupational and environmental health at Burapha University, Chon Buri Thailand (May 1996), and will conduct a course at the National Institute for Occupational and Environmental Health, Hanoi, Vietnam (March 1997).

Curriculum: In response to the Summary Statement critique that while the program was much improved, there was a lack of balance with respect to the emphasis on prevention in the practicum phase. The curriculum has undergone substantial review and revision. The course requirements for the masters in public health have been reviewed by the Curriculum

Committee and also the Residency Advisory Committee. The program has continued to have a two hour weekly conference, during which clinical cases are reviewed, work in progress for residents and faculty are reviewed, and major topics in occupational and environmental health are discussed in a seminar format. This complements the weekly departmental seminar series, which is an activity of each program and where one seminar per month serves as occupational medicine grand rounds. Primary and secondary prevention are emphasized in three key ways. First, the practicum experience for the residents has been substantially revised, and is undergoing further revisions. As was identified in earlier reviews of the program, the practicum experiences were given less emphasis relative to academic course work, research, and clinical activities. In response, Dr. Barnhart presented the Residency Advisory Committee with a recommendation that the available practicum options be expanded and more closely tied to learning objectives which involve meaningful responsibility on the part of the resident. This has led to a broader range of options, and moved the resident from the position of an observer to a position of a active participant in the evaluation of occupational safety and health problems at the stage where primary and secondary prevention can be effected. The current practicum sites include The Boeing Corporation, The National Oceanic and Atmospheric Administration, Hanford Environmental Health Foundation, Department of Labor and Industries, Poison Control Center, and Group Health Cooperative's Occupational Medicine Clinic. The latter two sites were established within the past 18 months, and the Program plans a practicum site with Weyerhaeuser to be implemented by the end of 1996.

Second, the program has greatly amplified the use of physician faculty and the programs certified industrial hygienist to focus on worksite evaluations and consultation. This multidisciplinary team approach is a unique service, and is an important resource for training students in primary and secondary prevention. Residents frequently accompany faculty and/or the industrial hygienist on site visits and the results of site visits are discussed in the clinic case conference.

Third, the program has successfully competed for research funding directed at primary and secondary prevention at the Hanford Nuclear Weapons Complex.

The OEMP faculty are now much more involved with teaching courses in the DEH; Dr. Checkoway continues to teach Occupational Epidemiology; Dr. Brodkin now teaches Occupational Medicine (ENVH 572), and Drs. Barnhart and Daniell have both taught the environmental health survey course (ENVH 511) in the past year. The Occupational Medicine course has been completely revised incorporating participation of non-physician students, and is now mandatory for occupational health nurses. Finally, the survey course (ENVH 511) has broadened multidisciplinary student access to OEMP faculty.

In addition, the program in conjunction with industrial hygiene and toxicology, has developed and implemented curricula to provide occupational and environmental training to foreign health professionals. Using funding from the Fogarty Center, the program in April 1996 organized a study tour in Seattle for 30 physicians from Thailand in Seattle. In May of 1996 the program will conduct a one week short course in primary and secondary prevention of occupational and environmental health in Thailand, and courses are planned for Central America and Vietnam in late 1996 and early 1997. Finally, the OEMP with the Department of Health Care and Epidemiology at the University of British Columbia held its 9th annual conference on Occupational Epidemiology. The conference is designed to provide students in occupational medicine, toxicology, and industrial hygiene an opportunity to present their research before faculty form occupational medicine, industrial hygiene, toxicology, epidemiology and biostatistics.

Clinical Practice: Market forces in health care have presented substantial challenges to the OEMP's clinical activities. The Workers' Compensation system and health care in general have begun to move towards managed care jeopardizing the Program's access to the patient populations usually served by the clinic at Harborview Medical Center. Recognizing these changes and the vital need for broadening the scope of primary, secondary, and tertiary prevention activities of the program for the purposes of teaching, research, and clinical care, the program has launched several initiatives. In order to gain a better understanding of the practice of occupational medicine within large companies, and to increase access for teaching and research, the program has established a contracted with Weyerhaeuser to provide it with medical director services. The OEMP, through Dr. Jeff Thompson, serving as Weyerhaeuser's chief medical director, provides consultation on questions ranging from public health strategies to reduce occupational illness and injuries to development of ADA policies. A practicum site at Weyerhaeuser is now being developed.

Recognizing the growing need to treat patients with chemically-related illnesses more efficaciously, the OEMP competed for designation by the state of Washington's Departments of Labor and Industry and Health to become the sole designated Center of Excellence for Chemically-Related Illness. The Center provides a multidisciplinary approach to a wide range of clinical cases, from acute poisonings to multiple chemical sensitivity syndrome. A requirement of the Center was to offer worksite occupational medicine and industrial hygiene evaluations. These worksite consultation referrals are growing rapidly, and are now averaging three to four per month. The Center offers an opportunity to build depth in clinical evaluation of patients with chemically-related illness, offers residents an opportunity to be more involved in worksite evaluations, provides a unique clinical service to the region, and complements joint OEMP FRCG research consultation activity. This latter collaboration has been especially productive in the evaluation of pesticide exposures and related health effects. As identified by the ERC Advisory Committee, the program should seek to broaden activities in the Washington, Alaska, Montana, and Idaho regions. The Center of Excellence provides services in a farmworkers' clinic in Toppenish (Eastern Washington), and has developed linkages with a second clinic in Spokane, thus beginning a process of expanding the geographical distribution of activities. Residents are required to participate in the care of these patients, other referred diagnostic patients, and rotate through a medical surveillance clinic.

Clinical Training-Occupational and Environmental Health: The residents also have an opportunity to work closely with members of the field research and consultation group in the area of primary and secondary prevention, as well as research projects directed at investigating strategies to reduce occupational illness and injuries. Residents spend one half day per week in Occupational and Environmental Medicine Clinic during their first year, and two half days per week during their second year. Residents also have the opportunity to participate in the Spine Resource Clinic of Dr. Bigos.

The Occupational Medicine curriculum leads to a Masters in Public Health (M.P.H.) degree, and qualification for board certification in occupational medicine. Residents are required to complete an acceptable research thesis for the M.P.H. degree.

Within six months of joining the residency program residents are required to fill out a work plan. This work plan details the academic, clinical, and research plan for the two year course of study. Residents are required to present works in progress before the faculty and students of the program.

The ERC provides students with an important opportunity for multidisciplinary research. Examples of multidisciplinary research include evaluation of glycophorin A as a biomarker of low dose radiation exposure, which involves faculty from Toxicology and Occupational

Medicine; evaluation of the effect of toluene to cause airway inflammation (involves faculty from Occupational Medicine and Toxicology); and evaluation of host susceptibility in environmentally acquired lung disease (involves Occupational Medicine and Toxicology faculty) and evaluation of hard metal lung disease (involves Occupational Medicine and Industrial Hygiene faculty).

Admission of Candidates:

During the past five years the OEMP has continued to require graduation from United States schools or equivalent, and strong preference has been given to those who have completed primary care specialty training, particularly in internal medicine. During the last two years however, while preference has been given to those with primary care training, the program has recognized that there are many able candidates who may wish to focus on primary and secondary prevention in occupational health. In exceptional cases, candidates who clearly could derive substantial benefit from the program even though they lack the three years of primary care training have been offered admission. For example, this summer Dr. Suchard, who has an interest in the occupational health problem of nuclear industry workers, will enter the residency. His prior training involving a single year of internship and M.P.H. degree make him well-suited to enter the program to obtain a degree in toxicology and to complete the residency.

In the past five years all residents have completed primary care training in advance of joining the Occupational and Environmental Medicine Program. There have been approximately one hundred applicants during this period. Of those, twelve have been offered positions and begun training. Recruitment efforts have included direct solicitations to primary care residency programs, regularly placed advertisements in journals, including the Journal of Occupational Medicine, and participating in Career Day presentations to General Internal Medicine Residents, as well as joint activities with residency directors across the United States.

Because of the substantial investment in each candidate, the program has aggressively pursued attracting very strong candidates who will benefit the most from the opportunities offered at the University of Washington. The award this past year of two Occupational Physician Scholarship Fund scholarships (the most of any institution) to new residents in the Occupational and Environmental Medicine Residency underscores the success of these recruitment efforts.

Training Facilities and Resources:

The clinical component of the training program is centered around regularly scheduled diagnostic and surveillance outpatient clinics at Harborview Medical Center, one of two teaching hospitals of the University of Washington. Since 1988, the Occupational and Environmental Medicine Program has had dedicated clinic space for four half-days at Harborview Medical Center. Referral sources are varied, as are the range of hazardous exposures and conditions. A computerized database has been in place since the clinic's inception, and is used for administrative and research purposes. The Occupational and Environmental Medicine Clinic with its general, musculoskeletal, diagnostic, and surveillance clinics now evaluates about 1600 patients per year. Training in the Occupational and Environmental Medicine Clinic is also provided to students of medicine, industrial hygiene, occupational health nursing, residents in internal medicine and family medicine, and fellows in respiratory diseases.

The Center of Excellence for Chemically Related Illness presents the OEMP faculty staff and residents with a unique opportunity to provide a wide range of services directed at

primary, secondary, and tertiary prevention. The Center of Excellence has a clinical component that includes patient care and worksite evaluations by both physicians and industrial hygienists, a research component including a registry of all patients, and a public education component. In the process of opening the Center in 1995, the residents were involved in the development of the protocols and data collection instruments to be used on all patients. These protocols and instruments formed the foundation of the Center's registry. The usefulness of the registry was evident two months after the Center opened when there was an accidental release of nitrogen dioxide and hydrogen fluoride gas at a local manufacturing facility. As a result of the release, over 100 individuals were transported to local hospitals, with the most seriously ill transported to Harborview Medical Center. The Center of Excellence worked closely with the Emergency Room to evaluate and arrange follow-up for the patients in the Program's clinic. This permitted the rapid and efficient evaluation of patients and prompt follow-up, within one to four days, of all patients needing further care. Within one week of the toxic release, the Center was able to analyze the standardized data collection forms, which included symptoms, diagnoses, and health status on all participants. This permitted a summary report to be generated, which described the clinical outcomes for use by clinicians caring for patients involved with the exposure. For the residents, the Center provides an opportunity to provide clinical care to a wide range of patients as well as learning how to use clinical epidemiology as a tool to provide better care.

In February 1996, the Center of Excellence for Chemically Related Illness also acquired a mobile medical laboratory. The mobile medical laboratory has already been used to evaluate a serious indoor air quality problem at a large regional airport. This van should prove to be an excellent site for training residents in the provision of occupational health services off site ranging from investigations of clusters of occupational illness to the conduct of medical surveillance.

Program Challenges and Limitations:

In general, the past five years have been highly successful in meeting the stated goals of the prior submission. Nonetheless, there are several challenges which have been identified. These challenges include the need to provide a broader range of teaching and research opportunities to trainees that emphasize primary, secondary, and tertiary provision of occupational health services, and the need to insure a clinical base in the rapidly evolving medical care market place.

The rapidly emerging medical marketplace is challenging all academic medical centers, as they seek to provide clinical care while meeting the important missions of teaching and research. Recognizing that the Occupational Medicine Clinic could not successfully compete against stand-alone for-profit occupational health services, the program has sought to enhance the clinical program by emphasizing its strengths, and to direct those strengths in ways that emphasize the training and research opportunities of the residents. The Center of Excellence for Chemically Related Illness has opened the door to providing a range of occupational health services with some unique elements, including the occupational medicine/industrial hygiene worksite evaluations and consultations, the incorporation of a registry to promote a population based approach, and the development of a public education component that serves as a resource to both the general public and state policy makers. In addition, as medical director of Weyerhaeuser the program is participating in the development, implementation, and evaluation of the occupational health policy of a large diversified multinational corporation. These activities have resulted in a stable clinical population and a diverse set of training opportunities for residents.

OCCUPATIONAL SAFETY

Background

In 1995, the Northwest Center for Occupational Health and Safety received NIOSH funding to support a program area in Occupational Safety. The Occupational Safety Program evolved from the Industrial Hygiene Program and represents a cooperative effort among the School of Public Health and Community Medicine, the College of Engineering, and the College of Letters and Science. The students receive course work and faculty mentoring from the Departments of Environmental Health, Industrial Engineering Program within the Department of Mechanical Engineering, and the Department of Psychology.

Since the program's inception we have added affiliate faculty to the Department of Environmental Health to provide additional support for our courses, continuing education, community outreach, and student thesis research that is specifically linked to occupational safety. Students are provided course offerings and research and applied training that is required for award of an M.S. in either Environmental Health or an M.S. in Engineering. Engineering graduate students must be admitted to the College of Engineering graduate program and then must meet course requirements for both the Occupational Safety Program and their engineering masters degree program.

Thus far, students in the industrial engineering program have been able to design graduate program plans that enable completion of a masters degree, with thesis, during a two-year time frame. This is made possible by cross-listing and joint approval of environmental health and industrial engineering graduate courses that are related to occupational safety and industrial engineering. The Department of Psychology provides advanced graduate course work in the field of engineering psychology. Students in the Occupational Safety Program who wish to continue graduate studies in occupational safety beyond the M.S. degree have the option to pursue doctoral programs in industrial hygiene or in industrial engineering. Those students tailor their doctoral core and elective courses toward the field of occupational safety.

Professor Steven Wiker directs the Occupational Safety Program within the ERC. He: a) serves as the point of contact for students inquiring about the program, b) provides information about the program to students and the community at large, c) organizes and maintains the safety curriculum, d) serves as liaison between the departments of industrial engineering and psychology, and e) advises safety graduate students during their first year before they elect a faculty advisor. He reports activities and represents this area of faculty, students, and curricula issues to the ERC director and appropriate departmental committees. Professor Wiker also serves as the faculty advisor to the University of Washington's Student Chapter of the American Society of Safety Engineers.

The safety program offers/provides didactic foundation for masters students pursuing careers in safety engineering, technology, and program administration. The program is specifically designed to educate and train professionals at a masters-level in safety. Courses such as ENVH 560 Organizing and Administrating Industrial Safety, ENVH 562 Technical Aspects of Safety, ENVH 566 Ergonomics, and 569 Biomechanics are:

a) cross-listed with industrial engineering to augment their graduate program in human factors and industrial engineering, and

b) serve as elective courses for students in the industrial hygiene, technology, occupational health nursing, and occupational medicine programs.

In addition, the safety program enables students in all ERC program areas to study quantitative decision analysis, systems safety and reliability, human factors engineering, and industrial and experimental psychology. These courses are consistently valued by safety professionals who are tasked with reduction of human-error based accidents, quantitative

analysis of system safety and reliability, and objective and quantitative defense of decisions that are related to selection, design, or modification of systems, equipment, or practices that lead to safer and more reliable operations.

Current and Past Training

The program has been in operation for just over one year. The training record is thus summarized in the following annual progress report.

Progress Report

Graduates:

- **Patrice Miner** entered the program in 1993 and completed her course work and thesis requirements for award of the masters degree August of 1995. Her thesis topic, entitled, "Haptic perception of graphics by computer users who are blind: Effects of resolution, limb movement and image design," was specifically aimed at increasing access to graphic-based computer operating systems and software applications. The research also provided direct guidance for developers of remote touch systems that are intended to enhance dexterous operation of remote manipulators that are used in hostile and unsafe environments. Dr. Wiker served as her committee chair, with Dr. Barfield and Dr. Baker as committee members. Ms. Miner is now working as a consultant to Microsoft Corporation.

- **Larry Shaw**, B.S. Safety, California Statue University at Fresno. Mr. Shaw, an industrial hygiene student, completed a masters thesis addressing the impact of an orthotic garment, a derivative of a back belt, on manual materials handling safety, within the ergonomics and safety laboratory. Dr. Wiker served as his thesis chair, and Drs. Morgan and Baker served as committee members. Larry is now employed by the state Occupational Safety and Health program in Salt Lake City, Utah. Larry's training and education in hygiene and safety was a collaborative effort between the safety and hygiene program faculty.

CONTINUING EDUCATION/OUTREACH

Faculty Commitment/Breadth / Faculty Reputation/Strength

Progress Report

During the past five years 36 regular faculty, staff and students from all programs in the Department of Environmental Health have taught or served as course directors in the Continuing Education program. In addition, several of the Department's adjunct, clinical and affiliate faculty members have taught in Continuing Education courses. Faculty in the School of Nursing have participated in CE courses as well as faculty, fellows and staff from the Occupational and Environmental Medicine program.

An additional 20 faculty from other Departments at the University of Washington, including those in the School of Public Health, School of Medicine, Graduate School of Public Affairs, College of Engineering and School of Social Work, have spoken in courses. Over 300 additional speakers came from other universities, government agencies, private industry, labor unions, and professional and trade associations during the last five years. (See Appendix E for a complete list.)

Faculty have come from 28 other colleges and universities throughout the country, including Washington State University, Oregon Health Sciences University, UC Berkeley, the University of Michigan, Mt. Sinai School of Medicine, and the University of British Columbia. Speakers have represented over 14 clinics, hospitals and medical centers, such as the University of Washington and Harborview Medical Centers, San Francisco General Hospital, Yakima Valley Farmworkers Clinic, and the Washington Poison Center.

The more than 12 federal agencies sending speakers have included NIOSH, OSHA, EPA, NOAA, the U.S. Coast Guard, and ATSDR. Faculty have represented over 16 state agencies, such as the Washington Departments of Health, Labor and Industries, and Ecology, Oregon/OSHA, and the Idaho Office of Environmental Health/Department of Health and Welfare. Speakers have come from more than 20 city and county agencies, including King and Pierce County Departments of Emergency Management, Seattle/King County Health Department, City of Spokane, City of Portland, and numerous school districts and fire departments.

Over 18 unions have sent speakers, including the Communication Workers of America, the Ironworkers, the American Postal Workers Union, the United Auto Workers, the Service Employees International Union, the United Brotherhood of Carpenters, and the Washington State Labor Council. Presenters have represented more than eighteen companies, including Boeing, Hewlett Packard, Weyerhaeuser, the Westinghouse Hanford Company, and numerous law firms and insurance companies. Professional and trade associations sending speakers have included the National Association of Home Builders, the American Forest and Paper Association, the National Safety Council, the Evergreen Safety Council, and the American Academy of Industrial Hygiene.

It is obvious that the faculty who teach in the CE program include leaders in the field of occupational safety and health within the Pacific Northwest, throughout the United States and even internationally.

Courses Offered by Specialty Area

Progress Report

The Northwest Center for Occupational Health and Safety is nationally recognized for the quality and variety of its continuing education programs, which continue to meet national and international as well as regional needs. One hundred eighteen courses were given during the last five years to about 7800 participants. (See Table 1 for a complete list of courses.) Most courses were interdisciplinary in nature, with many physicians, industrial hygienists, nurses and safety professionals in the audience, which makes it difficult to divide them by specialty area. Courses usually contain a mix of introductory and advanced topics.

Following are examples of courses of special interest to each of the four core disciplines.

Courses of special appeal to industrial hygienists included the following:

Asbestos Identification
Advanced Asbestos Identification
Sampling and Evaluating Airborne Asbestos Dust
Quantitative Asbestos Analysis
Industrial Ventilation
Advanced Ventilation Design
Laboratory Ventilation
Health Effects of Noise Exposure

Occupational Noise and Vibration
Occupational and Environmental Lead Exposure
Occupational Reproductive Hazards
ELF Electric and Magnetic Fields
Sampling Strategy and Instrumentation
Indoor Radon
Indoor Air Quality
Legal Aspects of Occupational Exposure

Courses for safety and ergonomic professionals included the following:

Fall Prevention
Legal Aspects of Safety and Health
Health and Safety in the Fish Processing Industry
Today's Safety and Health Professional
Ergonomics for Managers
Office Ergonomics
Introduction to Industrial Hygiene
Ergonomics and Control of Workplace Hazards
Introduction to Ergonomics
Regional Conference on Ergonomics, Safety and Health in Construction
Worker Health and Safety Training
Confined Space Management

Courses of special interest to occupational health nurses included the following:

ADA and the Workplace: OHN Update
Workers Compensation
Spirometry Training for Worker Screening
Occupational Hazards to Health Care Workers
Managing Occupational Health and Safety Programs: OHN Update
Stress in the Workplace
Emergency Response in the Workplace

Courses of special interest to physicians included the following:

Advances in Occupational and Environmental Medicine
Child Labor
Pesticide Medicine
Pesticide Medicine: Are Children at Risk?
Agricultural Health and Safety
Occupational and Environmental Neurotoxicology
Scientists in the Courtroom

Examples of courses meeting regional and national needs:

Lead Exposure at Firing Ranges is one of a series of courses directed toward people without formal training in occupational safety and health. Investigations by the Department's Field Research and Consultation Group revealed that several firing ranges in Washington had unacceptable levels of lead exposure. Because they did not have the resources to visit each firing range in the state, the Field Group worked with the Continuing Education program to present a course that provided an overview of lead exposure at firing ranges and discussed methods to reduce lead levels. Brochures were distributed at local firing ranges and the

course was offered at a very low fee and held in the evening to make it easier for people to attend.

An innovative course has been developed called *Scientists in the Courtroom: The Role of the Expert Witness.* This course is typically held in a courtroom at the University of Washington Law School and attempts to remove some of the mystery of being an expert witness. The process of agreeing to be an expert witness, giving a deposition, providing expert testimony and being cross-examined is covered. A keynote address on the Carnegie Commission report and recent Supreme Court decisions has provided a national perspective. Prominent local judges and attorneys participate in a mock trial to demonstrate the legal process.

During the biennial *Conference on Occupational Hazards to Health Care Workers,* many well known speakers provide comprehensive assessments of chemical, physical, biological and psychosocial risks for workers in diverse health care settings. Occupational exposures to health care workers have received increased attention since the HIV/AIDS and TB epidemics began posing special concerns. Practical information on preventing hazards and developing effective health and safety programs are included in this program. Participants are able to attend workshops on specific topics, where they have opportunities to interact with faculty and other attendees.

Progress Report -- Profile of Trainees

During 1991-96, attendees came from 17 states, the District of Columbia, the Yukon Territories, British Columbia, Alberta, Ontario and Quebec. The majority came from Washington (about 79%) and Oregon (10%), with the rest from the less populated states of Idaho and Alaska and from throughout the United States. In response to recommendations from the Northwest Center's ERC Advisory Committee and comments from our last on-site review, we have increased the number of courses presented outside the Puget Sound area. We presented courses in Bellingham, Everett, North Bend, Bellevue, Tacoma, and Vancouver, all in Western Washington; five courses in Eastern Washington; five in Oregon; one in Alaska; and one in Idaho. This has made training more accessible to safety and health professionals in other areas of our region.

During the last five years about 43% of attendees worked for federal, state and local governments, 24% worked for service industries, including medical, educational and legal services, and 11% worked for manufacturing industries. The remainder worked for a variety of companies, including small businesses and the transportation and communications industries.

Attendees included the four core professions, with about 23% (1816) industrial hygienists, 18% (1374) safety professionals, 12% (956) nurses and 8% (648) physicians. Nearly 40% of the attendees were not trained occupational safety and health professionals. They were administrators, engineers, environmental health professionals, attorneys, physical therapists, and others with some responsibility for occupational safety and health. Our courses are often the only way they can obtain occupational safety and health information and training.

NIOSH grant funds and revenue from well attended regular programs help subsidize outreach efforts in less populated areas, such as Alaska, and have enabled us to offer scholarships to attendees whose employers lack training funds, worker representatives, and students. This enables us to provide occupational safety and health training to the broadest possible audience. Attendees permitted to come free include students, staff and faculty of the Department of Environmental Health, the Harborview Occupational Medicine Clinic, and the

Occupational Health Nursing Program, UW School of Nursing; employees of the Washington State Department of Labor and Industries; and employees of the University's Environmental Health and Safety Department.

Progress Report -- Collaborative and Regional Efforts

The Northwest Center works closely with national and regional associations, agencies and other educational institutions to offer continuing education courses. A program presented annually at the Northwest Occupational Health Conference is developed by an advisory committee including representatives of the Northwest Center and the Northwest occupational health nursing, occupational medicine, and industrial hygiene associations. Another course is presented annually with the Washington Governor's Industrial Safety and Health Conference.

In order to increase participation in our CE program by occupational health nurses, as recommended in the October 1991 On-Site Review, we have met with representatives of the Washington Association of Occupational Health Nurses to determine their needs for continuing education, and to collaborate with them on the development of CE courses. As a result we have worked jointly on our annual Occupational Health Nursing Update, including the recent "Occupational Health in a Managed Care Environment" and the upcoming "Health and Safety Programs in the Workplace."

During the past five years, we have co-sponsored programs with such organizations as the Oregon Risk Management Division, the Associated General Contractors of Anchorage, and the Idaho State Office of Environmental Health/Department of Health and Welfare. In addition, we worked with a consortium including the Center to Protect Workers' Rights, the Washington Building & Construction Trades Council, and the Associated General Contractors of Washington, to present a Regional Conference on Ergonomics, Safety & Health in Construction.

A special effort has been made to involve regional organizations and audiences in planning continuing education programs. For example, an Idaho meeting was held with representatives of the College of Health Science, Boise State University; the Environmental Studies Department of the University of Idaho; the Idaho Environmental Health Association; and the Office of Environmental Health/Division of Health/, to explore development of continuing education programs in Idaho. Coordination with area industrial hygienists, physicians, nurses, and environmental health organizations was begun to facilitate co-sponsorship of programs.

During 1995, the Northwest Center's Industrial Hygiene, Safety and Continuing Education program directors, along with Department Chair Gerald van Belle, met with Anthony Veltri of the Safety and Environmental Management Studies Program, Oregon State University. They explored ways in which Dr. Veltri's expertise in the economic and management areas of occupational health and safety programs could complement our graduate curriculum and continuing education programs, leading to joint ventures.

Continuing Education Program Manager Jan Schwert met with personnel from the Center for Disease Prevention and Epidemiology, Oregon Health Division/Department of Human Resources, to plan future CE programs in Oregon. In addition, we recently collaborated with the Oregon Risk Management Division and the City of Portland Bureau of Risk Management to develop and produce a very well received continuing education program on office ergonomics.

To develop continuing education courses in Alaska, including a general industrial hygiene sampling course held last March in Anchorage, Ms. Schwert collaborated with Tim Bundy of Labor Standards and Safety, DOL/OSHA; Mahrit Kassion of Education and Training/OSHA; and Cheryl Yates of Environmental Health Sciences-Alaska.

Progress Report -- July 1, 1995 - June 30, 1996

Trainees

During the past year about 1500 trainees attended 28 Continuing Education courses. About 44% came from government agencies, 32% from service industries and 11% from manufacturing industries.

Among the four core professions, industrial hygiene had the most attendees with 25% (378), safety had 13% (192), nursing had 13% (194), and medicine had 9% (137). There were 27 engineers, 19 epidemiologists, and 17 toxicologists among the participants, in keeping with NIOSH's emphasis on providing safety and health training to these professionals. There were also 29 worker representatives.

In addition to courses held in the Seattle area, courses were held in Everett, Yakima, and Vancouver, Washington, as well as three courses in Portland, Oregon and one in Anchorage, Alaska. This additional effort to hold courses outside the Seattle area was in response to recommendations of our ERC Advisory Committee and of the NIOSH site visitors.

Courses, 7/1/95 - 6/30/96

The courses held during 1995-96 covered a number of issues important in the Pacific Northwest and nationally. "The Changing Workplace: "Effective Measures to Cope with Job Stress" was held in conjunction with the Washington Governor's Industrial Safety and Health Conference. Job stress is a problem that has achieved increased recognition in recent years. It is also one that safety and health professionals are generally not trained to deal with. This course included a number of scenarios that were enacted to illustrate different causes of workplace stress. There were discussions of how to recognize the problem, how to identify and evaluate health effects, and strategies for reinventing the workplace. The majority of the attendees at the course were safety professionals, industrial hygienists, nurses and worker representatives.

An innovative and important multidisciplinary course was one on "New Ways of Organizing Data: Geographical Information Systems (GIS)." This was intended to help researchers and practitioners learn how to use modern computer tools to understand the relationship between the incidence of disease and a variety of factors, including harmful exposures and socio-economic conditions within specific geographic areas.

The Pesticide Medicine course has been presented annually in cooperation with the State Department of Health to assist health care professionals in understanding and complying with new state regulations on reporting of pesticide-related illness. It was also designed to help them increase their knowledge of pesticide toxicology, learn the signs and symptoms of pesticide poisoning, and become familiar with pesticide information and consultation resources in the Northwest. The course was held in Eastern Washington this year, and speakers included a physician and toxicologist from the Department of Environmental Health; physicians from the Wenatchee Valley Clinic, the California Pesticide Regulation Department, and the Washington Poison Center; and representatives from the State Health Department.

There were three ergonomics courses presented this year. One was on the Ergonomics of Occupational Hand-Arm and Whole-Body Vibration, taught by Don Wasserman, who developed the NIOSH 596 course. A second one was Introduction to Industrial Ergonomics, taught in conjunction with the University of Michigan Center for Occupational Health and Safety Engineering. This is an excellent example of cooperation among the Educational Resource Centers. A third course on Applied Ergonomics in the Office Setting was presented in Portland at the request of a member of the ERC Advisory Committee, who used her experience and contacts at the Oregon Risk Management Division and the Portland Bureau of Risk Management to help develop the program. It was subtitled "Work Station Boot Camp" because it was a hands-on course where attendees learned how to modify the office environment to prevent musculoskeletal injuries.

Another course designed to meet current needs of occupational safety and health professionals was Occupational Health in a Managed Care Environment. The speakers presented an overview of national trends in case management and managed care and discussed how to provide high quality, cost-effective services within this emerging system.

Outreach Progress Report and Future Plans for Each Program Area

Progress Report

The Northwest Center has greatly increased its emphasis on outreach within the last five years. To demonstrate the importance of outreach, Gerald van Belle created the position of Assistant Chair for Community Outreach within the Department and appointed Sharon Morris to that position. She is responsible for building bridges between the scientific knowledge that resides in the Department of Environmental Health and the occupational and environmental health needs of the citizens of the state and the region.

The purpose of outreach at the Northwest Center is twofold: to assist other institutions and agencies by providing curriculum materials and consultation for course development, and to increase awareness and understanding of occupational safety and health issues throughout the region. As this section will illustrate, faculty of the Northwest Center have engaged in many outreach activities consistent with the following five-year outreach goals:

- To work closely with faculty of the College of Engineering to develop joint teaching of courses, both in our program and in industrial and environmental engineering.

Faculty in the Industrial Hygiene Program and the Field Consultation and Research Group have worked with the College of Engineering to develop and present lectures to Engineering students. Members of the Occupational Medicine faculty have given presentations to various engineering groups.

- To provide short courses and lectures on occupational medicine to medical students and physicians trained in family practice, internal medicine and other specialties.

About 120 physicians each year attend short courses presented by the Northwest Center's Continuing Education program. In addition the faculty of the Occupational and Environmental Medicine Program have been successful in introducing some occupational medicine content into the medical school curriculum.

- To assure that occupational health content is included in the undergraduate curriculum in nursing programs at the University of Washington, other undergraduate programs in the Department of Environmental Health, and other universities in the region.

Faculty of the occupational health nursing program give regular lectures in the undergraduate nursing program at the University of Washington and other nursing schools in the region.

- To provide consultations and courses on occupational safety and health to labor and management groups in Region X.

This report lists numerous illustrative examples of the presentations, consultations and courses provided to labor and management groups as well as other non-occupational safety and health audiences in the region.

HAZARDOUS SUBSTANCE TRAINING

Faculty Reputation and Strength

The Department has an active research program studying the remediation of hazardous waste. It is one of the first four institutions awarded a Program Project research grant to study toxic effects of waste chemicals under Phase I funding of the NIEHS Superfund Basic Research Program. Under a supplement to this program, the Department added ecological, engineering and biomedical projects. The Department has also conducted research and assessed health risks at active and inactive waste sites, including Gas Works Park, the Kent Highlands Landfill, the Asarco Smelter and the Midway Landfill.

John C. Kissel, PhD, Assistant Professor has served on the Advisory Committee to oversee hazardous substances CE programs. His interests are human exposure assessment, solid and hazardous waste management practice, and design of water and waste water treatment processes. He teaches a course on hazardous waste in the Department of Environmental Health's regular academic program. Hazardous Waste Management (ENVH 446) is an introductory course for upper level undergraduates and first year M.S. students. Course content includes characterization of hazardous wastes, introduction to pertinent federal and state regulations, discussion of the significance of hazardous waste and related facilities with respect to human and environmental health, and description of waste management options at pre- and post-generation stages.

Dr. Gilbert S. Omenn, Dean of the School of Public Health and Community Medicine and Professor of Environmental Health, also provides leadership to this program by encouraging participation in hazardous substances training by members of the Department of Environmental Health faculty. Dr. Omenn is Chairman of the Scientific Advisory Board of the Agency for Toxic Substances and Disease Registry, Chairman and Board Member of the Technical Advisory Board of Clean Sites, Inc., Chairman of the NRC/NAS Board on Environmental Studies and Toxicology, Chairman of the Scientific Advisory Board of the Washington State Department of Ecology, and Chairman of the Rohm and Haas Environmental Advisory Council.

John Malool, MS, from the New York/New Jersey NIOSH Educational Resource Center, has been an important member of the faculty teaching in the hazardous substance continuing education program since 1993. John is a highly rated instructor with many years of hazardous waste site experience with the federal government as well as incident response experience as Chief of Operations of a Hazmat Unit.

The School of Public Health and Community Medicine and the Department of Environmental Health are very committed to the Hazardous Substances Training Continuing

Education Program. The Dean, Department Chair, Director of the Northwest Center, regular and affiliate faculty members and students all participate in the programs.

In addition to Departmental faculty and consultants, there are many other well qualified speakers who have taught in individual courses during 1991-96. The following is a list of those faculty:

Dale Arnold, City of Spokane Environmental Programs
Brett Bastian, Moses Lake Fire Department
Enrico Baroga, Washington Department of Transportation
J. Thomas Benston, Tacoma Public Works Department
Sgt. Lee Bowling, Washington State Patrol-Spokane
Lt. Lonnie Brackins, Washington State Patrol
John Butler, Department of Ecology
William L. Carberry, Ecology and Environment
Ed Carolan, Redmond Fire Department
James D. Catalano, CIH, Department of Labor and Industries
Bud Cave, Clark County Public Works
LCDR Thomas J. Chuba, US Coast Guard
LTJG Chris Curatilo, US Coast Guard
Joe Darcy, PhD, CIH, Joe Darcy Associates
Jeff Dill, Department of Ecology (Spokane)
Mary Evans, National Oceanic and Atmospheric Administration
Mike Fajer, MST, CIH, Oregon OSHA
James Everts, US Environmental Protection Agency
Chris Field, US Environmental Protection Agency
Anne Foote-Soiza, Department of Labor and Industries
Bill Freutel, US Environmental Protection Agency
Dave Godel, Tidewater Environmental Services
Tom Griffith, Clark County Emergency Services
Lyn Gross, City of Bellevue
Robert B. Harper, Washington Department of Ecology
Eric Heinitz, Department of Ecology
Mike Helbock, Bellevue Fire Department
Waddell Hill, Pierce County Fire Department
Ron Holcomb, Department of Ecology
Paul Honeywell, Vancouver Fire Department
Dean Ikeda, OSHA
Dave Kalman, UW Department of Environmental Health
Chuck Kleeberg, Drainage & Waste Water Utility, City of Seattle and Seattle/King County Health Department
Ron Langley, Department of Ecology
Mark Layman, Department of Ecology (Yakima)
Mark Levin, MPH, CIH, Occupational Health and Safety Services
Scott Lowers, Chelan County Department of Emergency Management
Mark MacIntyre, US Environmental Protection Agency
John Malool, New York/New Jersey ERC
Leigh Mascola, Southwest Washington Health District
Chuck Mitchell, Redmond Fire Department
Daniel Moran, Seattle/King County Health Department
John Moran, BS, Laborers' National Health and Safety Fund
Jim Oberlander, Department of Ecology
Paul S. O'Brien, Washington Department of Ecology
LT. Jim Peschel, U.S. Coast Guard

LT. Craig Peterson, US Coast Guard
Stanley M. Pier, UW Department of Environmental Health
Doug Pierce, Department of Transportation
Sgt. Chris Powell, Washington State Patrol-Spokane
LCDR Len Radziwanowicz, US Coast Guard
Mitch Rosen, MS, University of Medicine & Dentistry of New Jersey
Ted Silvestri, Yakima Health District
Terry Simmonds, Department of Transportation
Karen Stout-Abariotes, CIH, Department of Labor and Industries
Rich Tokarzewski, King County Office of Emergency Management
Greg Thomas, Agency for Toxic Substances and Disease Registry
Frank Westrum, Washington Department of Health
Doug Whybark, Emergency Response, Boeing Defense & Space Group

Coordination with Agencies

Because the audience for the NIOSH-funded hazardous substances courses is federal, state and local health and environmental agency personnel, close coordination with those agencies is essential. This interaction is ensured through an advisory committee comprised of key agency representatives. The following is a list of current Hazardous Substance Training Advisory Committee members:

Nir Barnea, NOAA/HAZMAT, Seattle
Jeffrey Burgess, MD, Harborview Medical Center, Seattle
John Butler, Washington Department of Ecology
Mary Evans, NOAA/HAZMAT, Seattle
Chris Field, US Environmental Protection Agency
Dean Ikeda, US Occupational Safety and Health Administration
Carl Osaki, Seattle/King County Department of Public Health
LCDR Jim Peschel, US Coast Guard, Seattle
Doug Pierce, Washington Department of Transportation
Janine Rees, Department of Labor and Industries, Seattle
Karen Stout-Abariotes, Department of Labor and Industries, Spokane

Advisory Committee members from EPA, OSHA, NOAA and the Coast Guard are in a position to advise us of regional as well as state needs. Advisory Committee members have continued to stay directly involved as courses have been developed and presented. A subgroup of the Advisory Committee has been actively involved in the development and teaching of the Managing Hazardous Materials Events course and has helped adapt that program to meet the needs of local attendees wherever the course has been offered.

Summary of Courses

Since 1988, when the Northwest Center for Occupational Health and Safety first offered training under this grant program, hazardous substance courses have been made available to employees of federal, state, and local government agencies in Washington, Oregon or Alaska. Four of these, the Hazardous Waste Annual Refresher , Supervising Hazardous Waste Operations, Hazardous Materials Transportation, and Safety and Health in Confined Spaces, are required by federal and state regulations. The Managing Hazardous Materials Events course is a unique program which focuses on the need for coordination among agencies involved in incidents (see page 133). The home study course is available to anyone in the region.

Since 1991, more than 900 people have been trained in these courses, including 119 industrial hygienists, 106 safety professionals, three nurses and two physicians. About 90% percent of participants have come from federal, state and local government agencies, which is our intended target audience. Courses have been held in Washington, Oregon and Alaska, with about 90 percent of participants coming from Washington. Since Washington has the majority of the waste sites in the region, there is a greater need for training in this state. There is also less demand for our courses in other states because several consulting groups offer similar courses.

Following are the courses taught in 1991-1996. Supervising Hazardous Waste Operations was taught six times, the Hazardous Waste Annual Refresher was taught 18 times, and Managing Hazards Materials Events (Hazardous Waste Incident Response) was taught five times during this period. In addition, the new Confined Spaces and Hazardous Materials Transportation courses were each taught once.

Supervising Hazardous Waste Operations

This advanced course for on-site managers and supervisors is required by federal and state regulations.

Hazardous Waste Annual Refresher

This eight-hour course is intended for government employees and others in the target population who have already taken the 40-hour course. EPA requires that hazardous waste inspectors take at least eight hours of refresher training annually to maintain their certification under EPA Order 1440.2. OSHA also requires that workers at CERCLA facilities, major RCRA cleanups, or similar sites, as well as workers at treatment, storage and disposal facilities, have eight hours of refresher training annually.

Managing Hazardous Materials Events

The former Hazardous Waste Incident Response course is now called Managing Hazardous Materials Events. It provides advanced training in inter-agency coordination. Instead of focusing on the technical aspects of cleaning up incidents, this course is for public officials who generally provide back-up information, resources or other assistance in support of first responders. Because we could not identify a course with this perspective, we had to develop a new curriculum. One and a half days are spent learning the principles of an incident command system and coordination with other agencies during incident response. Case studies on the second day and a scenario enacted on the third day enable participants to practice on realistic events. A typical scenario might involve a transportation accident with personal injuries, a fire and a hazardous material release onto the highway or into the water. Participants work together in teams to use their collective knowledge to protect workers, the public, and the environment.

Hazardous Materials Transportation

Safety and Health in Confined Spaces

Home Study Course

This course is intended to meet the needs of public health and environmental health officials who are unable to participate in direct training courses. The program

is a graduate level course for practitioners and could be taken for graduate credit, if approved by the university involved, or for continuing education units. Course content includes: history of hazardous substance issues; regulations, roles and responsibilities; handling and disposing of hazardous wastes; risk assessment and principles of toxicology; protecting the worker at hazardous waste sites; and responding to emergencies.

HAZARDOUS SUBSTANCE ACADEMIC TRAINING

For several years, this ERC has offered continuing education courses in special aspects of hazardous substance management, and the Department of Environmental Health has offered regular courses in hazardous waste management, which many industrial hygiene students have taken as electives. Since February, 1993, supplemental funds have been made available from NIOSH to support for trainees in the MS program in Industrial Hygiene & Safety, who desire to specialize in hazardous substance management while earning their degree. This supplement has enhanced the programs of the overall ERC by providing a greater stimulus for Department of Environmental Health faculty to develop and improve course offerings in this area, and by making it possible for the IH&S program of the ERC to recruit additional students with a stated interest in applying the techniques of industrial hygiene and safety to problems at hazardous waste sites.

There is a clear need for hazardous substance training in the Pacific Northwest, especially in Washington, which has over 40 sites on the EPA National Priorities List, earning it the dubious distinction of being among the ten states having the most sites. Other states in Region X include Oregon with seven sites, Idaho with six, and Alaska with two. The Northwest Center is the only ERC serving this region.

Recent legislation, especially the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires training for laborers and professional supervisors who are potentially exposed to hazardous substances at waste sites, treatment, storage and disposal sites or in responding to spills. This requirement, which is enforced by federal and state OSHA programs, has generated a large demand for training and education. The OSHA-state plan states (including Washington, Oregon and Alaska) must issue regulations as effective as the OSHA standards to cover state and local government employees in the state. The Environmental Protection Agency (EPA) is required to promulgate standards identical to OSHA's to cover state and local government employees in states without approved state plans (such as Idaho). Federal employees are covered under the Federal Employee Occupational Safety and Health Program. All of these employees may be involved with hazardous waste assessment and clean-up operations in their capacity as supervisors, inspectors, evaluators or investigators for their respective agencies.

The Department of Environmental Health has had a Continuing Education program since before the ERC was funded in 1977. Since 1984, the Northwest Center has offered annual training courses on health and safety at hazardous waste sites for occupational and environmental safety and health professionals. Courses have been offered since 1988 under the current training grant from NIOSH.

The Department also has an active research program in hazardous waste. It is one of nine institutions awarded a Program Project research grant to study toxic effects of waste chemicals under the NIEHS Superfund basic research program. The Department has also conducted research and assessed health risks at active and inactive waste sites, including Gas Works Park, the Kent Highlands Landfill, the ASARCO Smelter and the Midway Landfill.

In addition, the Department currently operates a Master of Science program in Environmental Health Technology, whose goal is to educate students in the techniques for identifying, quantifying and characterizing the mechanisms of human exposure to harmful agents in air, water and soil, with special emphasis on drinking water, food, waste water and hazardous wastes. Students in this program with particular interest in hazardous substance management presently elect numerous courses in the industrial hygiene and safety program, and many graduates of the Technology program become certified industrial hygienists as they pursue their careers. We propose in this application to build upon this natural connection between the two programs in the Department of Environmental Health, by encouraging students in the Industrial Hygiene & Safety program to specialize in Hazardous Substance Management while completing the graduation requirements in industrial hygiene. They will choose a substantial number of courses from the offerings of the Environmental Health Technology program in hazardous substance management. Support for this specialty option is essential if an adequate number of qualified students is to be attracted to it.

E. Current and Past Training

Since its inception in February 1993, the Hazardous Substance Specialty Option has provided support to nine MS students. Six have graduated, and three are making satisfactory progress toward completing the degree requirements.

The program graduates are listed below, together with the titles of their MS Thesis research projects, faculty supervisor, and current employer if known.

Campbell, Dennis P., M.S. June, 1993. Landfill gas composition database: a tool for predicting environmental impacts. Preceptor: David Kalman. Current Position: Environmental Health Specialist, Washington State Department of Health, Olympia.

Duff, Robert M. M.S. August 1993. In vitro dermal uptake of soil contaminants: effects of soil loading and air flow. Preceptor: John Kissel. Current Position: Hazardous Materials Manager, New Hampshire Division of Public Health Services, Bureau of Health Risk Assessment, Concord, NH.

Gundermann, Carla. Analysis of open path FTIR background collection and generation methods under controlled temporal conditions. June 1994. M. Yost. Current position: Hazardous Materials Specialist, Seattle-King County Health Department, Kent, WA.

O'Barr, Kevin . Measurements of office building ventilation performance in relation to complaints of indoor air quality. June 1994. M. Morgan. Current position: Environmental Specialist, Prezant & Associates, Seattle, WA.

Lowenthal, Deborah. M.S. June 1995. Pulmonary function changes in children exposed to wood smoke during the winter heating season. Preceptor: Jane Q. Koenig.

Yuknavage, Katherine. M.S. June 1995. Effect of organophosphate pesticide (OP) dermal contamination on cholinesterase activity in fingerstick specimens. Preceptor: Richard Fenske.

Six courses are offered annually in specialized aspects of Hazardous Substances Management by the Department faculty. They are taken by a large number of students from a number of academic programs on campus, including Environmental Health, Environmental Engineering, Fisheries and Public Affairs.

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