CDC

CENTERS FOR DISEASE CONTROL
AND PREVENTION

NIOSH
1992 PROJECTS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

1992 PROJECTS

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PREFACE

This year we are celebrating a highly significant event, the 500th anniversary of the epic voyage of Christopher Columbus. The feat accomplished by Columbus, which made his name immortal, was a bold but very logical next step in the course of history. From the European perspective, it resulted in the "discovery" of the existence of something enormously important--The Western Hemisphere. Of course, the hemisphere not only existed but was well populated by Native Americans with advanced cultures. But Columbus brought this reality to global awareness for the first time. The new awareness ended the Middle Ages and opened the modern era of global commerce, communication, science and technology. It is fitting that we mark the 500th anniversary of such an achievement.

In a sense, as we approach the end of this 20th century, our world in occupational health is not unlike the world in which Columbus found himself. We stand with one foot in a "medieval age" where workers daily are killed, maimed, and stricken with occupational diseases in large numbers. We have had this experience for centuries. Yet, this loss of life is highly inconsistent with our present state of scientific and technologic development because most occupational injuries and diseases can be readily prevented using already existing knowledge. We know how to prevent them. Therefore, with our other foot we stand in a "modern age" where it is no longer necessary for workers to have to risk their lives in order to make a living.

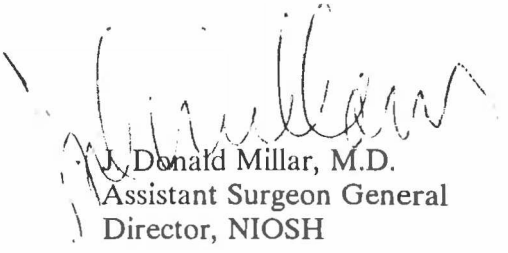
Viewing his voyage in 1492, we can briefly summarize what Columbus did: he mastered the existing relevant knowledge about the world (despite modern myths to the contrary, Columbus and all other educated people in Europe knew that the world was round, an idea which came from the Greeks); from this knowledge he concluded that in a round world, it must be possible to reach the Indies by sailing West; acting on this conclusion, he set the goal of finding a route to the Indies by sailing West; he set specific objectives which, if met, would bring him to the goal; he acquired three ships, the Santa Maria, the Pinta, and Niña by which to meet his objectives; he used the best available navigational tools and, while underway, continually assessed his position and corrected his course daily to assure the most efficient passage; he exercised a deep faith in God and felt specifically "called" to his mission; he persisted despite formidable obstacles and strong opposition from many sides including his crew; and to all who wanted to quit, he kept saying, "Sail on."

In the achievement of this man are lessons to be learned by us who work in occupational health. We have a goal, established in the Occupational Safety and Health Act of 1970, to "assure safe and healthful working conditions for every working man and woman." From existing knowledge, we know how to move toward the goal by preventing work-related diseases and injuries. We also have "ships," or vehicles by which to move toward our objectives, vehicles such as information, intervention, and research. We have available a navigational tool to assist in assessing our progress, surveillance, and it enables us to make ongoing corrections as we move toward our goal. Through analysis of surveillance data, both of health effects and environmental hazards in the workplace, we can proceed to our goal of prevention by the most efficient route.

May I suggest that the highest priority for the development of occupational safety and health in the coming years is the development of surveillance. We need the capacity to know where we are. Surveillance is our compass and our sextant, and we must assure that it is the best "navigational instrument" that can be developed. Without it, we will do something that Columbus did not do, we will become "lost at sea," unable to ascertain our position, or to reliably move toward our destination.

What do we need in order to bring on the "modern era" in occupational safety and health? As I see it, we need three things: a lasting commitment to reach our goal of "safe and healthful working conditions for every working man and woman;" a lasting faith in the nobility of our mission that sustains us despite all the difficult problems that face us; and a lasting determination to persist and endure the hardships of the voyage until its conclusion.

The health of the nation's workers is vital to the well-being of the country, and all of the efforts of this Institute are directed toward the protection and preservation of good health for American workers. The FY 1992 projects reflect the many areas of scientific research, surveillance, and related studies in which NIOSH is working. We know where we are going, and believe in what we are doing.



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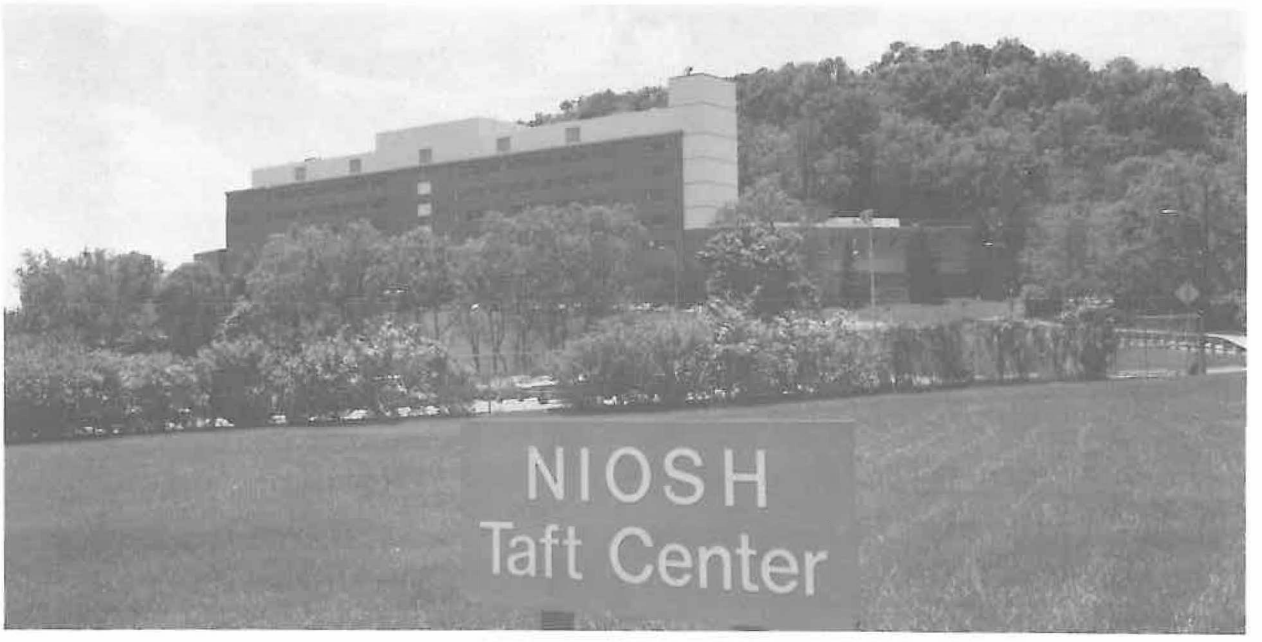

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INTRODUCTION

The project plans of the Institute, as illustrated by projects contained herein, are descriptive of a system that is in transition. We can also expect that next year's project plans will be further representative of that transition. The transition referenced represents a philosophical and operational movement of the Institute toward a newly defined vision.

For some time now, the leaders of NIOSH have sought an examination and reaffirmation of the mandate and challenge described in the Occupational Safety and Health Act, "to assure safe and healthful working conditions for working men and women." It is with that guiding principle in mind that the vision of the Institute is under examination.

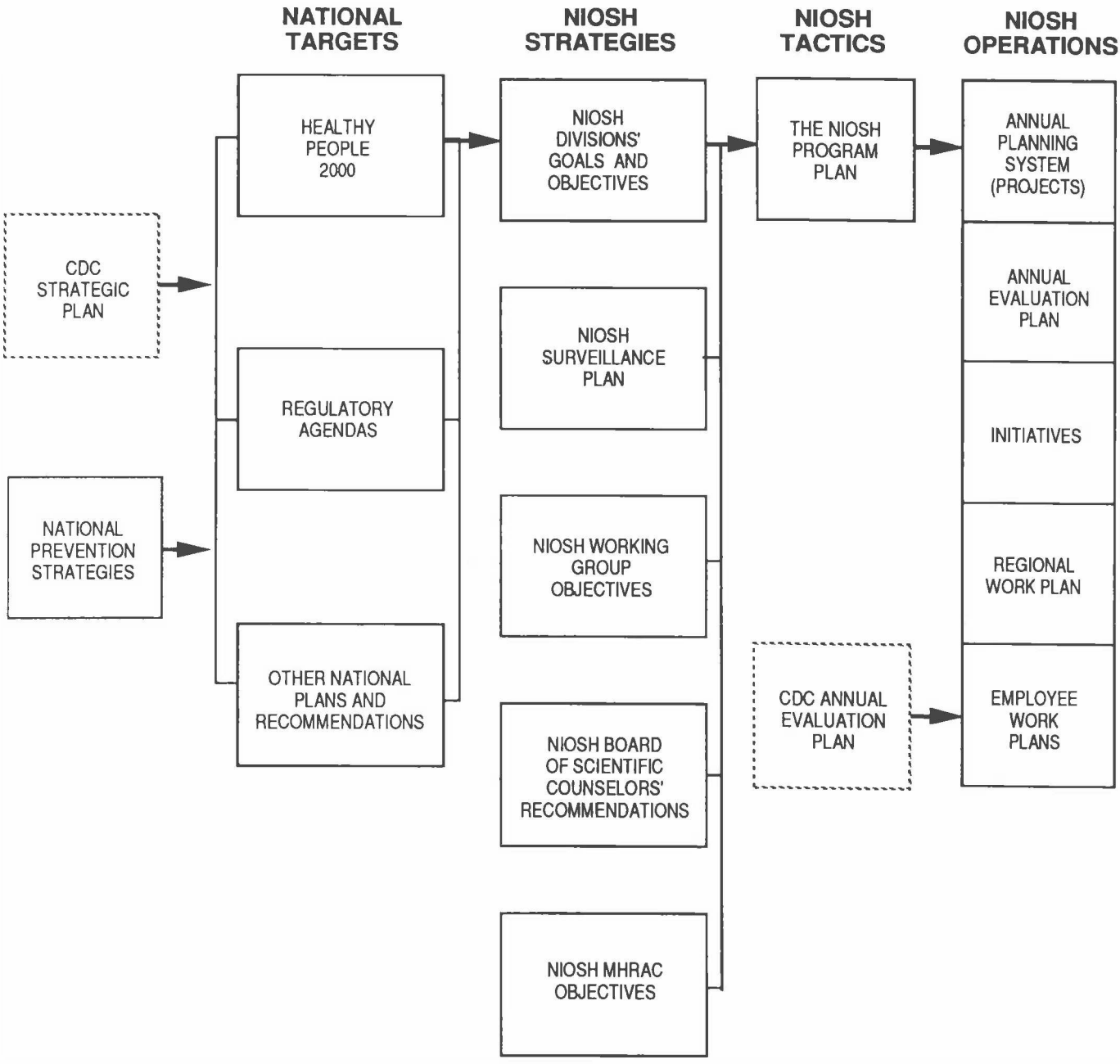
Since 1981, the plans, projects, management systems, and operations of NIOSH have been directed toward preventing occupational safety and health problems as embodied in the national strategies for the prevention of the "Ten Leading Work-Related Diseases and Injuries." It is important to know that nearly ten years after the development of the strategies, they are relevant, and they offer the best strategic approach to fulfillment of the doctrines of the Act.

With the strategies, and other questions of research, the Director of the Institute implemented an approach to study, validate, modify, or redesign, if needed, the vision statement of the Institute. That study began on September 16-18, 1992, in Chantilly, Virginia, when senior management staff of the Institute participated in the NIOSH Vision Retreat. It was conducted by a specialist in visioning and the enhancement of strategic design toward improvement of program quality. The products of the 2 1/2 days were (1) a vision statement for the Institute which is currently under review, (2) a commitment of the senior management staff to learn and implement the principles of total quality management (TQM), and (3) an acceptance, commitment, and pledge on the part of the senior management team to operate the scientific and service programs of the Institute toward that new vision.

A further premise of that meeting was the beginning of the formulation of a strategic approach to link the philosophical vision of the Institute and the individual research and service projects. We anticipate that this will be the new plan or planning system for the Institute. Over the next few years, several key program architectural decisions will be forthcoming. First, there will be a need for a description of what program goals will have to be instituted in order for our vision to be realized. It goes without saying that some structural decisions will be needed in order to segregate the Institute's goals into those that are disease and injury specific, those that are technology specific, and those that may be industry or occupation specific.

Next, in order to direct the Institute resources toward accomplishment of those goals, it is essential that very specific medium- and long-range objectives be defined. An evaluation structure must be created to allow for the directing, analysis, and final evaluation of program plans, both at the process and outcome levels. It is from these goals and objectives, and with a clear understanding of the organizational relationship and scientific talents within NIOSH, that this program will be developed. The enormity of the task cannot be overemphasized. However, with the sure and certain anticipation of the major changes in the American workplace and work force in the next 20 years, the ability to predict and prevent is critical. It is in this light that we look forward to reexamination of the Institute's vision and its mission, and therefrom, develop a system and philosophy guided by the promise of the Occupational Safety and Health Act.

NIOSH PLANNING FORMAT
FY 1992



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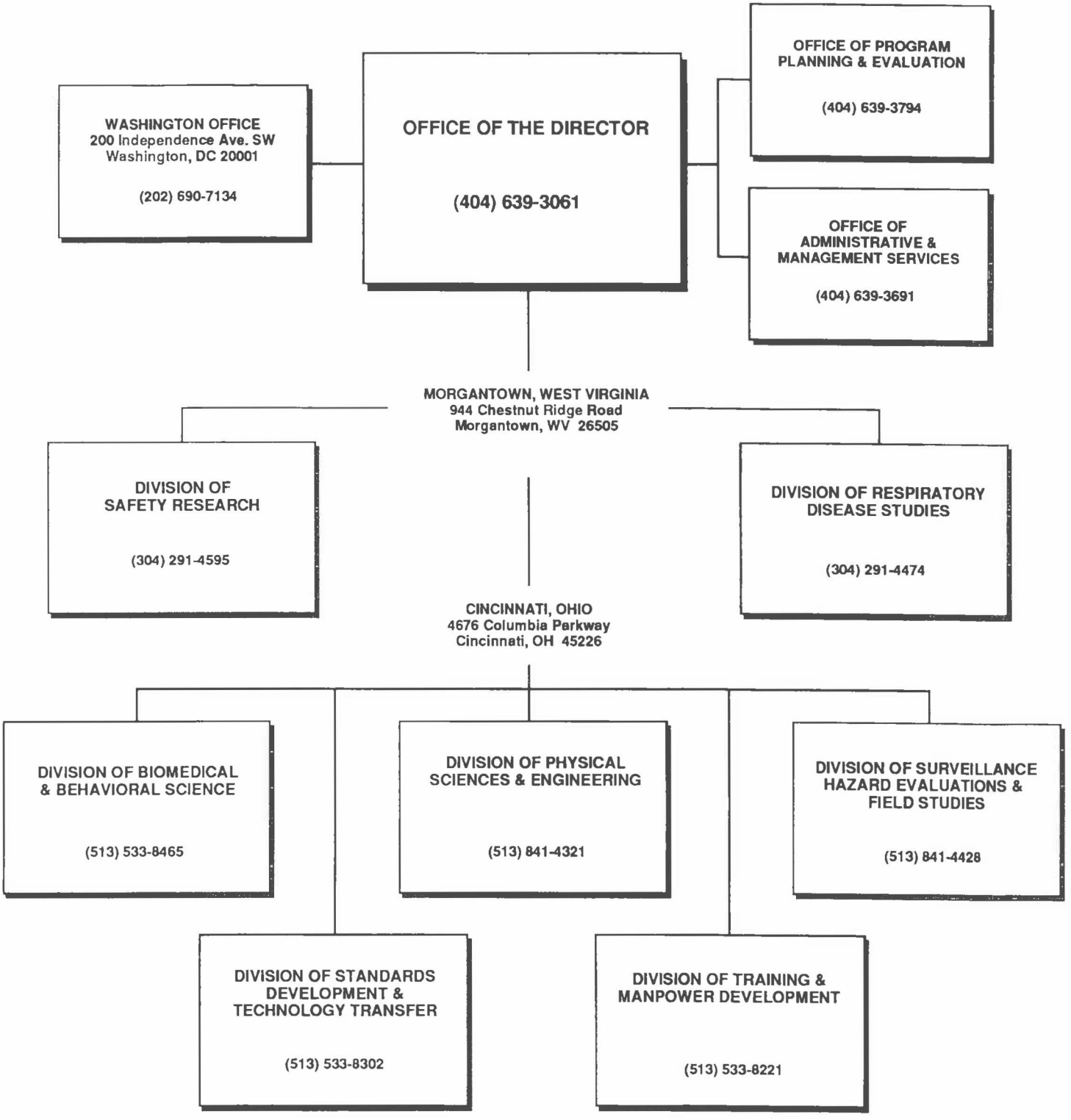

JULY 1992

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE

The Division of Biomedical and Behavioral Science (DBBS) plans and conducts laboratory research and worksite studies in the disciplines of toxicology, behavioral science, ergonomics, and physical agents to determine safety and health consequences of occupational exposures. DBBS investigates health and safety problems resulting from new and existing occupational environments, and develops biological monitoring and diagnostic procedures to improve the health, safety performance, functional capacity, and life expectancy of workers. Consultation and research data necessary to develop criteria for workplace exposure standards are furnished as part of these activities.

DBBS investigates the neurobehavioral and physiological effects resulting from exposure to chemical and physical agents found in the work environment as well as the psychological and biomechanical strains induced by stressful job demands. The research studies assess physical and biomechanical work capacity, neurobehavioral function, and psychological tolerance to stressful occupational conditions, as influenced by demographic, experiential, biological, and environmental factors. Interventions and control procedures are developed and evaluated for their efficacy in addressing job stress and strain, safety performance, and health outcomes (e.g., musculoskeletal disorders).

DBBS conducts research on the effects of exposure to physical agents such as noise and non-ionizing radiation in the workplace. Studies are designed to delineate adverse effects such as functional loss (e.g., hearing impairment) mechanisms of injury and exposure factors that are of consequence. Investigations undertaken include instrumentation and methods development, as well as studies characterizing and relating exposure factors to biological and performance changes in animal and human populations.

The DBBS toxicology program focuses on contemporary research issues of occupational concern with a major emphasis on developing assays for biomarkers of exposure, effects, and host susceptibility as well as methods for determining functional impairment resulting from exposure to chemical or physical agents, and/or psychological or biomechanical stressors. Approaches include applications of cellular biology, biochemistry, immunochemistry, and pharmacokinetics. *In vivo* experimental animal and *in vitro* human and animal tissue culture systems are utilized to answer fundamental toxicology questions which relate to dose-response effects and mechanisms of toxic agent actions. The ultimate product of such studies is the development of biomarkers which can be utilized in workplace studies to indicate extent of exposure to occupational hazards, effects of such exposure, and as early indicators of the potential for developing the disease/toxicity associated with exposure.

The Division of Biomedical and Behavioral Science is located at the Robert A. Taft Laboratory, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Janet C. Haartz, Ph.D., telephone (513) 533-8465.

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING

The Division of Physical Sciences and Engineering (DPSE) conducts worksite and laboratory research to develop procedures and equipment for the control and measurement of occupational safety and health hazards. DPSE also provides assistance to the industrial hygiene community in operating a quality control reference program for industrial hygiene laboratories.

DPSE conducts a control technology assessment and research program to prevent occupational disease and injury before they occur by assisting employers, including smaller businesses, in better design and operation of the workplace. This work involves identification and evaluation of effective engineering controls and work practices used in a variety of processes and industries. The division promotes the transfer and widespread application of these preventive engineering control measures. It also provides engineering expertise in formulating effective workplace standards.

DPSE conducts research to establish performance requirements for direct reading, area, and personal instrumentation used in the evaluation and prevention of exposures to hazardous levels of chemical and physical agents. The division also provides consultation for the development of criteria and standards on monitoring strategies, instrumentation, and controls.

DPSE conducts research to develop and improve methods for analysis of toxic substances found in the workplace. Also, DPSE provides analytical chemistry support to the Institute's laboratory research and field investigation programs, including routine measurement of samples by established methods, special measurement of complex samples, and short-term development of methods. This analytical research and support involves the use of state-of-the-art analytical instrumentation such as high resolution gas chromatography, gas chromatography-mass spectrometry, high performance liquid and ion chromatography, and Fourier Transform Infrared Spectroscopy (FTIR). In addition, DPSE provides consultation in analytical chemistry to all elements of NIOSH, and to other government agencies, recommending appropriate sampling and analytical methods.

Quality of the nation's workplace environment analytical data is assessed through the Proficiency Analytical Testing (PAT) Program. DPSE (working with the American Industrial Hygiene Association) determines the analytical competence of participating laboratories, and assists the laboratories in improving analytical performance. The division also encourages and supports development and promulgation of national guidelines for accreditation of industrial hygiene laboratory facilities; selects and develops standard reference materials for use in the measurement of industrial hygiene hazards, and provides for quality assurance in the analysis of the Institute's laboratory and field programs and contract laboratories.

The Division of Physical Sciences and Engineering is located at the Alice Hamilton Laboratory, 5555 Ridge Avenue, Cincinnati, Ohio 45213. The Division Director is Philip J. Bierbaum, telephone (513) 841-4321.

DIVISION OF RESPIRATORY DISEASE STUDIES

The Division of Respiratory Disease Studies (DRDS) is a multidisciplinary center for research and public health activities directed toward prevention of occupational respiratory diseases. Epidemiologic, environmental, clinical, and laboratory research techniques are used to investigate the causes of disease and to recommend regulatory changes to diminish the burden of occupational lung disease.

DRDS conducts epidemiologic studies to assess workers' risks of disease from exposures at mines, mills, and other industrial, construction, and agricultural workplaces. Workplace exposure data from regulatory agencies are reviewed and comprehensive industrial hygiene investigations are conducted at targeted worksites to characterize employee exposure to hazardous chemical, physical and biological agents. Clinical studies are performed to evaluate the respiratory effects of occupational exposure, to clarify the mechanisms of human response, and to develop and refine clinical techniques for investigating occupational respiratory diseases. DRDS alerts government agencies to potentially hazardous workplace exposure and disease patterns and recommends specific actions.

DRDS administers the National Coal Workers' X-ray Surveillance Program and the National Coal Workers' Autopsy Study under the *Federal Mine Safety and Health Act of 1969,* as amended in 1977. Mandated program activities include certification of x-ray facilities, mine plan approvals, B-reader examinations, and coordination of processing, storage, and retrieval of files and records from medical examinations. Data is analyzed for trends in the prevalence of miners' lung diseases.

DRDS conducts basic and applied research in biochemistry, physiology, immunology, pathology, microbiology, pharmacology, and aerosol physics to evaluate the hazards of biologic and chemical agents, to clarify mechanisms of disease caused by these agents, and to develop early markers of respiratory disease. Investigators identify animal models for occupational respiratory disease research, develop and test new laboratory techniques for evaluating the effects of hazardous agents, and characterize hazardous physical and chemical properties of respirable particles.

The division responds to requests from individual workers, unions and employers to investigate exposures and potential health problems at numerous worksites. During these health hazard evaluations, industrial hygienists, physicians, nurses, medical technicians, and epidemiologists evaluate reported problems and disseminate findings and recommended strategies for reducing exposure.

DRDS provides epidemiologic, clinical, and laboratory research training and experience in occupational respiratory diseases by sponsoring positions in the Centers for Disease Control Epidemic Intelligence Service, the NIOSH Pulmonary Medicine Fellowship Program, the National Research Council's Resident Research Associateship Program, and through DRDS electives for occupational medicine residents and West Virginia University graduate students.

The Division of Respiratory Disease Studies is located at 944 Chestnut Ridge Road, Morgantown, West Virginia 26505-2888. The Division Director is Gregory R. Wagner, M.D., telephone (304) 291-4474.

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER

The Division of Standards Development and Technology Transfer (DSDTT) develops, from available scientific and technical information, documents containing criteria for recommended occupational safety and health standards, policy statements, and technical and scientific information relevant to a variety of occupational safety and health issues. DSDTT coordinates and delivers the Institute's testimony at U. S. Department of Labor hearings on proposed standards to support scientific and technical considerations. Annually, the division prepares, revises and publishes the legislatively mandated toxic substances lists (RTECS). DSDTT manages and staffs the Institute's printing authority, docket office, archive activity, libraries, the 1-800 toll free information service, and a clearinghouse for receiving, storing, retrieving, and disseminating technical information on occupational safety and health. The division responds to internal and public requests for technical information with searches of library resources and computer databases.

DSDTT compiles and analyzes the results of research and investigations pertaining to selected occupational safety and health hazards for the purpose of preparing recommended standards. These recommendations include workplace exposure limits, requirements for medical examinations for workers, labeling, engineering controls, personal protective equipment and clothing, employee notification of hazards, safe work practices, sanitation, environmental monitoring, and record keeping. To compliment this decision process, quantitative risk assessments are performed. The division also prepares reviews of potential workplace hazards when critical new evidence on a particular hazard becomes available. These reviews take the form of updated Criteria Documents, Current Intelligence Bulletins, or Alerts.

DSDTT analyzes information on the exposure of workers to safety and health hazards by assessing the adequacy of the research and data to establish priorities. The division identifies those agents, occupations, or industries that pose an unacceptable safety and health hazard, and prioritizes those substances, processes, or industries for which document development or Institute research should be developed or revisited. An information profile containing current data on worker numbers and exposure, hazard type and severity, possibility of intervention, current regulatory status, and other data is developed to assist in the decision making process.

The division establishes and maintains liaison with government and non-governmental sources to coordinate, obtain, and distribute technical data. This includes the governments of Sweden, Germany, Canada, and Australia; the EEC; and international programs such as the WHO International Program on Chemical Safety. Major national governmental liaison include relationships with the Interagency Testing Committee, ONE Committee (OSHA, NIOSH, EPA and MSHA), NIEHS/NTP, National Technical Information Service, Government Printing Office, Air Force, National Oceanographic Atmospheric Administration, and the National Library of Medicine.

The Division of Standards Development and Technology Transfer is located at the Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Richard W. Niemeier, Ph.D., telephone (513) 533-8302.

DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES

The Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS) conducts surveillance of the nation's work force and workplaces to assess the magnitude and extent of job-related illnesses, exposures, and hazardous agents. DSHEFS conducts legislatively mandated health hazard evaluations at the request of unions, employers, or employees. The division also conducts mandated industrywide epidemiologic and industrial hygiene research programs including longitudinal record studies, clinical/environmental field studies, and industrial hygiene surveys. DSHEFS provides technical assistance on occupational safety and health problems to federal, state and local agencies, and other technical groups. The most recent addition to the division's responsibilities is the management and conduct of analytic epidemiologic studies of workers at the Department of Energy (DOE) facilities. This responsibility was transferred from DOE to NIOSH via a Memorandum of Understanding between DOE and DHHS signed in December 1990.

Surveillance systems are used for the early detection and continuous assessment of the type and frequency of occupational disease, disability, and death. Surveillance systems are also used for determining potential exposures to hazardous agents and for evaluating the effectiveness of intervention efforts. DSHEFS surveillance activities have adapted existing surveys and data sources from federal, state, and local agencies, labor, industry, physicians, and medical centers for use as components of a surveillance system. The agriculture and construction industries currently receive special emphasis. DSHEFS provides coordination within and outside NIOSH collaborating with DRDS, DSR, and other divisions in the development and implementation of occupational health surveillance programs. DSHEFS also facilities coordination among NIOSH health and safety surveillance activities, and directs the development of a program for state-based surveillance, intervention, and prevention.

The industrywide studies program (1) identifies the occupational causes of disease in the working population and their offspring, and determines the incidence and prevalence of acute and chronic effects of work-related exposures; (2) conducts intervention studies to reduce occupational disease in working populations and their offspring; (3) provides information on the extent of exposure to agents of interest in the workplace; and (4) develops, disseminates, and evaluates risk communications for subjects of epidemiologic studies.

The health hazard evaluations and technical assistance (HETA) program responds to requests from employers, employees, employee representatives, and federal, state, and local agencies. This program is mandated by Section 20(a)(6) of the *Occupational Safety and Health Act* and implemented by regulations at 42 CFR 85. The typical HETA response to a request for assistance results in an evaluation of whether chemical, physical, biological, or other agents are hazardous as used or found in the workplace. Recommendations are then made for control procedures, improved work practices, and medical programs to reduce exposure levels and prevent adverse health effects. The results of individual evaluations may trigger wider studies of similar exposures in other settings or may stimulate recommendations for implementation or modification of health standards.

The Division of Surveillance, Hazard Evaluations, and Field Studies is located at the Alice Hamilton Laboratory, 5555 Ridge Avenue, Cincinnati, Ohio 45213. The Division Director is Lawrence J. Fine, M.D., telephone (513) 841-4428.

DIVISION OF SAFETY RESEARCH

The Division of Safety Research (DSR) serves as the focal point for the Institute's occupational injury research and prevention program. The division also operates the federal respirator and coal mine dust personal sampler unit (CMDPSU) testing and certification programs, and conducts research to provide criteria for improving respirators and other personal protective equipment and devices.

Occupational Injury Research. DSR collects, analyzes, interprets, and summarizes occupational injury and fatality data to identify worker populations at high risk of occupational injury, and monitor occupational injury trends. DSR investigates selected traumatic injuries and fatalities to identify potential causal factors and prevention strategies. Laboratory and field investigations are conducted to identify and evaluate existing prevention techniques and technology, and develop and evaluate new prevention techniques. As worker protection strategies are formulated, DSR conducts applied field intervention trials and demonstration projects to determine their technical efficacy and practical applicability. DSR develops technical criteria to support recommendations for occupational safety standards, and develops, implements, and evaluates the impact of risk communication efforts. DSR also provides technical assistance in solving safety problems which require expertise in industrial and system safety engineering, ergonomics, industrial hygiene, and related disciplines.

Respirator and CMDPSU Certification and Research. DSR evaluates, certifies, and maintains official records on respirators and CMDPSU as required by the *Federal Mine Safety and Health Amendments Act of 1977*, and the *Occupational Safety and Health Act of 1970*. DSR continually reviews performance requirements, standards, and guidelines for certification. The division also develops new performance requirements and standards for respirators. To ensure that respirators continue to meet regulatory requirements, DSR conducts performance audits of certified respirators, and quality assurance audits of respirator manufacturing plants. Additionally, DSR investigates field problems associated with NIOSH-certified equipment; provides technical assistance to users on the selection, use, maintenance, and operation of certified equipment; conducts research to characterize respirator performance in the laboratory under simulated worksite conditions, and at worksite settings; conducts research to evaluate human physiological response to respirator and protective ensemble (i.e., protective clothing) wear under various conditions; and identifies and recommends needed research to the occupational safety and health community.

The Division of Safety Research is located at the Appalachian Laboratories for Occupational Safety and Health (ALOSH), 944 Chestnut Ridge Road, Morgantown, West Virginia 26505-2888. The Division Director is Thomas R. Bender, M.D., M.P.H., telephone (304) 291-4595.

DIVISION OF TRAINING AND MANPOWER DEVELOPMENT

The Division of Training and Manpower Development (DTMD) implements Section 21 of the *Occupational Safety and Health Act of 1970* which mandates the training and education functions. The educational resource development program assesses manpower needs for OSH practitioners and researchers on a nationwide basis. DTMD develops programs to increase the numbers and competence of the OSH professional and paraprofessional work force. To help meet the demand, DTMD administers a major training grant program to foster the development of academically based training programs for occupational physicians, occupational health nurses, industrial hygienists, toxicologists, epidemiologists, and safety professionals. DTMD also develops specific criteria for the selection of qualified organizations to conduct research training, graduate degree and continuing education, and outreach programs to expand the network of knowledgeable professionals in occupational safety and health.

The curriculum development program designs and produces course packages and other training materials for Institute-sponsored training programs, including those presented by in-house faculty as well as those conducted by universities and other outside training organizations. The continuing education program provides short-term technical training courses, including seminars, independent study packages, and specialized workshops to train-the-trainer to federal, state and local government, private industry, labor unions, and other organizations in the OSH field.

DTMD special emphasis projects have targeted primary care physicians (Project EPOCH), engineers (Project SHAPE), managers (Project Minerva), vocational education/and science teachers to include occupational safety and health knowledge in their formal program of study. The division establishes a collaborating relationship with the many professional societies and accrediting bodies to formalize the process of long-term commitment through professional networking.

The Division of Training and Manpower Development is located at the Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Thomas C. Purcell, Ph.D., telephone (513) 533-8221.

SUMMARIES

OF

NATIONAL PREVENTION STRATEGIES

Occupational Lung Diseases

Musculoskeletal Injuries

Occupational Cancers

Severe Occupational Traumatic Injuries

Occupational Cardiovascular Diseases

Disorders of Reproduction

Neurotoxic Disorders

Noise-Induced Hearing Loss

Dermatological Conditions

Psychological Disorders

SUMMARIES OF NATIONAL PREVENTION STRATEGIES

INTRODUCTION

In 1983, the National Institute for Occupational Safety and Health (NIOSH) published a suggested list of leading work-related diseases and injuries. Scientists at the Institute had developed this list as a guide for setting priorities and allocating resources within the Institute, and as a focal point for discussion among occupational health professionals throughout the country. NIOSH then undertook the preparation of proposed national strategies for the prevention of each condition on the list.

In May 1985, NIOSH and the Association of Schools of Public Health (ASPH) co-sponsored a national symposium for the in-depth evaluation of proposed strategies for the first five conditions: occupational lung diseases, musculoskeletal injuries, occupational cancers, severe occupational traumatic injuries, and occupational cardiovascular diseases. Under the direction of 51 expert panelists, the more than 450 symposium participants--representing academia, management, organized labor, professional associations, and voluntary organizations--discussed, revised, elaborated, and further developed the strategies.

In October of 1986, the second NIOSH National Symposium on the Prevention of Leading Work-Related Diseases and Injuries was convened. This symposium presented and modified the second five of the "ten leading work-related diseases and injuries." Like the first, it was a resounding success. These symposia provided an opportunity for discussion, modification, and input to the strategies that were developed by NIOSH. We now have the first "national" plan to eliminate, by preventing, negative health effects of work. These strategies generally include four parts: definitions, description of the nature of the problem, depiction of the preventive measures that can now be taken, and depiction of the knowledge required to move forward. The specific content of these strategies is diverse, reflecting the many professionals whose ideas are there; however, the attempt to emphasize "basics" undergirds each.

At these symposia, a new national vision was introduced--a vision that unsafe working conditions are no longer tolerable and that clear and understandable steps can be taken to prevent the leading occupational diseases and injuries. Throughout these National Prevention Strategies, common themes emerge: (1) An important component in each prevention strategy is surveillance. Surveillance is needed to accurately estimate the incidence of the disorder, to identify the population at risk, to direct the most effective preventive measures where they are needed, and to measure the impact of intervention. (2) The strategies also focus on scientific research. Research is needed to develop the specific knowledge and understanding on which prevention depends. (3) Another integral component is training. Effective communication through education, technology transfer, the dissemination of information, and training is required to reach the full potential of prevention. Well-trained workers, knowledgeable managers, and fully informed occupational safety and health professionals are essential elements in any prevention program. (4) Finally, the strategies emphasize the importance of applying and adapting existing knowledge to prevent occupational diseases and injuries. Research results are

only effective in preventing such conditions if they are applied in the workplace. Useful information is already available, and ways must be found to target and apply it where it will do the most good.

Out of the symposia and the subsequent voluminous exchange between NIOSH and the participants came the National Strategies for the Prevention of Work-Related Diseases and Injuries. They have been published and widely disseminated, and are designed to serve as working documents to guide NIOSH, other agencies, business, labor, and academia to work more cohesively toward providing for safe and healthful working conditions.

OCCUPATIONAL LUNG DISEASES

The lung is both a target organ and a portal of entry for toxic substances. The likelihood of toxic exposure to the lung can be high; for example, an estimated 1.2 million U.S. workers are potentially exposed each year to silica dust alone. Although occupational lung disease is caused by the inhalation of toxic substances in the work environment, the association between occupational exposure and lung disease is not always apparent or simple. The occurrence of multiple or mixed exposures, the non-specificity of symptoms, the relatively long latency for these diseases, and the independent or synergistic effects of cigarette smoking may all confound the recognition of occupational factors in lung disease.

Classifying lung disease by the type of occupational exposure that leads to it permits rapid identification of toxicants and the application of available control technology. Major types of exposure include inorganic dusts (silica, asbestos, coal dust), organic and metallic dusts (cotton, grain, metallic salts, antibiotics), gases and fumes (nitrogen, methane, ammonia, phosgene), viable aerosols (bacteria, viruses), and respiratory carcinogens (arsenic, chromium, coke oven emissions). Four occupational lung diseases that are deemed preventable are asbestosis (caused by exposure to asbestos), byssinosis (cotton dust), silicosis (silica), and coal workers' pneumoconiosis (coal dust). These have been targeted in the 1990 objectives of the U.S. Public Health Service for elimination of new cases among workers newly exposed after 1985 (USDHHS, 1980). These diseases and their causative agents will be cited as examples in the following prevention strategy. Methods for their control may be adapted for most other occupational lung diseases.

Disease descriptions

The asbestos-related diseases include nonmalignant fibrogenic effects on the lung parenchyma and pleural plaques as well as malignant neoplasms of the lung and the serosal linings of the chest and abdomen (mesothelioma). The latency is $\geq$15 years for asbestosis and 20-40 years for malignancies. Synergistic effects of smoking increase the risk of lung cancer.

Byssinosis includes both acute (reversible) and chronic lung disease. The effects may be due to specific causal agents in the dust of certain varieties of cotton or other vegetable fibers.

Silicosis may be acute or chronic (nodular pulmonary fibrosis) and affects workers in foundries, stone quarries, sand and gravel operations, and mines. Latency is long, and disease progresses even after exposure ends.

Coal workers' pneumoconiosis (CWP) shows a clear dose-response relationship to coal-dust exposure. Enforcing lower dust standards in both Great Britain and the United States has reduced the incidence of this disease. When workers with early, simple CWP are identified, serious disabling disease may be prevented by transferring the workers to lower-dust environments.

Implementing what we know

Surveillance: Environmental surveillance of hazardous agents is needed to identify occupations, industries, and worksites with potential for high incidence of occupational respiratory disease (e.g., asbestos-removal operations, industries using cottons with high levels of endotoxins, and ground silica). Current environmental surveillance should continue, and activities for prevention should be targeted to the locations identified. Disease surveillance of workers

is also important and can help determine pre-existing conditions (reduced ventilatory function), early development of disease (simple CWP), or hypersusceptibility to given agents (acute reactions to cotton dusts). Interventions, such as reducing further exposure, should focus on the affected workers.

Substitution: Hazardous agents can often be replaced by less hazardous and noncarcinogenic substitutes. Cottons that cause less acute responses in humans (e.g., high-grades, blends, or washed cottons and synthetic substitutes) can be used; and silica can be banned as an abrasive blasting material, with nontoxic materials substituted.

Control: Technology is already available to control many hazardous exposures through engineering design and automation, ventilation, and isolation. Although silica exposures above legal limits are still occurring, control can nearly always be achieved through engineering or substitution once exposure is recognized. Personal protective devices (e.g., respirators), however, should not be considered primary protection mechanisms because they rely on human intervention and may not provide the level of protection determined in the laboratory.

Incentives and Regulation: Economic incentives, such as lower insurance premiums, will often stimulate the adoption of control measures. More often, regulatory enforcement is needed for effective control of exposure levels. The permissible exposure limit for asbestos should be reduced, as recommended by NIOSH, to the lowest measurable level--100,000 fibers/m^3, and OSHA should require a dust-control and monitoring plan before any work involving asbestos exposure begins. Present silica standards range from 33 ug/m^3 to 98 ug/m^3 and should be unified. The 1970 coal dust standard (2 mg/m^3 with medical monitoring) appears to reduce the incidence of CWP, and the authority of federal inspectors to shut down coal mines where hazards are severe may help to enforce compliance.

Education: Both the Mine Safety and Health Act and the Occupational Safety and Health Act place responsibility on employers to provide safe, healthful workplaces. Workers should be told about hazardous exposures and available control measures, and then workers and managers should cooperate to control exposures through technology transfer, changes in work practices, implementation goals, and periodic assessment. Technical information already available should be used to increase awareness of work-related lung problems and to produce clear, easily understood texts on control for small as well as large-scale operations. Educational programs targeted to engineers, managers, occupational health professionals (including primary care physicians), and workers should cover the nature of the work environment and how to assess and control work exposures. State and local health departments can provide expertise and leadership for these programs. Although workers' compensation provides financial relief after exposures occur, awareness is needed before exposure through adequate warnings and product labeling.

Tobacco smoking may have additive and/or synergistic effects on the development of lung disease, both for smokers and for others exposed to tobacco smoke. Labor management policies are needed for smoking in the workplace, and appropriate state legislation on smoking in public places could also be used to limit workplace smoking.

What knowledge do we need?

Research: Several research needs have been suggested. Substitute agents should be tested to determine their toxicity before they are used. Studies should determine whether serious effects result from episodic,

low-level exposures to pulmonary irritants and whether long-term effects follow acute responses. Workers exposed to asbestos should be studied to determine dose-response relationships, the effects of intermittent and short-term high exposures, the pathogenicity of various asbestos fibers (e.g., "short" fibers) and asbestos substitutes, and the significance of pleural changes and pleural plaques. Studies should also identify the fiber-release potential of in-place asbestos materials, the relative risks and benefits of asbestos removal, and the effectiveness of removal practices. The relationship in cotton workers of acute responses and chronic respiratory disease can be clarified if normal annual decrements in lung function are determined. Research on exposure to silica should include dose-response relationships, particularly at low levels and for mixed dusts containing silica. Analysis of current MSHA and OSHA environmental data on exposure to silica will help identify hazardous industries, locations, and specific processes. The carcinogenic properties of quartz also need study. The problem of hypersensitivity pneumonitis and the relationship between smoking and diffuse lung fibrosis should be investigated. Host risk factors (e.g., smoking and atopy) must also be examined.

Hazard Detection and Disease Diagnosis: Better methods are needed to measure airborne concentrations of hazardous substances and to enhance environmental surveillance, especially for mixed dusts in underground and surface coal mines. More sensitive techniques must be developed for screening workers to recognize early signs of disease (particularly at the cellular level) and to predict susceptibility to lung diseases. An operational definition of silicosis will help standardize diagnosis and reporting.

Incentives and Regulation: Incentives and educational materials should be available to encourage the efficient use of strategies for controlling exposures. The mandate for medical surveillance in the current Cotton Dust Standard should be reassessed to determine whether new recommendations from NIOSH are needed. Results of long-term studies on the adverse health effects of dust exposure (including nonpneumoconiotic lung diseases, such as bronchitis and emphysema) will help in setting total dust regulations for both coal mining and general industry. Data on the relative causality of exposures to carcinogens and on exposure-response measurements will help in setting effective exposure standards.

Control: When the exact etiologic agent(s) of byssinosis are identified, their removal by cultivating or processing cotton can be facilitated, and effective controls and exposure standards can be developed. Changes in mining techniques necessitate that mine planning and the design and installation of new equipment be based on forecasting and predictive techniques, such as predictive models. For example, the increased use of longwall mining, the continuous use of mining equipment, and the increased rates at which coal is broken all require new approaches to control. The characteristics of respirable dust will need to be correlated with coal seam and mining methods; and new technology implement intermittent dust sources.

Summary

This prevention strategy cannot succeed on the basis of any one element alone; all must be addressed to prevent occupational lung diseases. Thus, although problem areas can be identified by environmental and medical surveillance, follow-up and elimination or reduction of exposure are also needed. Surveillance must be coupled with exposure control (e.g., work practices, automation, ventilation, incentive systems, strict enforcement of exposure standards) and other important elements described here. Health promotion and development of workplace smoking policies, while not always directly related to occupational exposures, are additional important elements.

MUSCULOSKELETAL INJURIES

Musculoskeletal injuries include both acute and chronic injury to the muscles, tendons, ligaments, nerves, joints, bones, and supporting vasculature. These injuries may be sprains, strains, inflammations, irritations, and dislocations. In the medical literature, this broad class of physical symptoms or complaints is collectively referred to as wear-and-tear disorders, overuse injuries, osteoarthrosis, degenerative joint diseases, chronic microtraumas, and cumulative trauma disorders.

To find preventive measures for these injuries, it is helpful to identify contributing elements and to look at these elements in the four main categories outlined by the Canadian Health Fields Model.

Environmental Hazards: A workplace hazard to the musculoskeletal system is called a *traumatogen*, or a source of biomechanical stress that results when job demands exceed the worker's strength or endurance.

Human Biologic Factors: Innate qualities, such as physical size, strength, range of motion, work endurance, and the integrity of the musculoskeletal system, influence a worker's ability to perform a job safely.

Behavioral or Lifestyle Factors: Such factors as insufficient sleep or recovery from exertion, job dissatisfaction, obesity or lack of adequate physical fitness, unhealthy diet, and substance abuse may increase a worker's risk of musculoskeletal strain or injury.

Inadequacies in Health Care Systems: A lack of medical knowledge or of appropriate training in the etiology, diagnosis, and treatment of musculoskeletal problems may result in inadequate health care.

Much remains to be learned about the causes of work-related musculoskeletal injuries. Because few of these injuries are accepted as coming only from work, the workplace hazard must often be identified to define an occupational injury. High physical stress can frequently be traced to ordinary work activities, including repetitive or sustained lifting, bending, twisting, climbing, reaching, gripping, pinching, rubbing, kneeling, and squatting, as well as vibration from equipment. Sometimes these activities are performed in awkward postures and involve high forces.

Scope of the National Problem

Although present surveillance systems are inadequate and estimates of the national problem may not be accurate, awareness is growing that these injuries result in significant human suffering, loss of productivity, and economic burden to the country. High risk industries include manufacturing, construction, and food processing. In the 1977 Health Interview Survey of the National Center for Health Statistics, musculoskeletal injuries ranked first in frequency among health problems that affect the quality of life. They are the leading cause of disability in the working years, affect 19 million persons annually, and involve nearly half the workforce at some time in their working life. The frequency and impact of these disorders are expected to increase in the future, and some increases are already evident with modern office technology. Although this equipment is designed to reduce physical labor, it often generates new, pervasive, and even more insidious sources of biomechanical stress.

Potential for Prevention and Control

An important first step in preventing musculoskeletal injuries is identifying their causes, but this is often difficult because of the many complex etiologic factors, long latency, effects of aging, and lack of standardized diagnostic criteria. Many biomechanical hazards, however, could be eliminated if knowledge already available were put to use (e.g., redesigning work processes or tools to impose less biomechanical stress). A management concept of "working smarter is better than working harder" will maintain better production levels than a demanding work schedule, since it reduces time lost due to work injuries. And, finally, cooperation on common prevention problems can be fostered among key professionals from different backgrounds (e.g., engineers and health care personnel) by dispensing and applying accumulated knowledge.

Tactical Areas of a Prevention Strategy

The present, inadequate surveillance systems do not separate chronic from acute musculoskeletal injuries nor do they have standard terminology for defining such conditions. New systems of both health and hazard surveillance are needed to identify occupations with a high incidence of musculoskeletal injuries and to define types and ranges of work-related biomechanical stresses. Multi-level data bases for the country, the states, and local areas will increase awareness within the medical community of the benefits of prevention and thereby help implement a prevention strategy.

Health professionals, engineers, and scientists must cooperate in using surveillance and clinical data to identify causes and effects from the interacting variables that produce musculoskeletal injuries. For example, (1) low back pain results from interacting job factors (e.g., load weight, location, and frequency of materials handling) and personal factors (age, gender, strength, fatigue, postural stress, trauma, emotional stresses, degenerative changes, congenital defects, physical fitness, and body awareness); (2) biomechanical analyses of hand and arm motions, repetition rates, amounts of force, and postural factors have helped identify stresses leading to carpal tunnel syndrome and tenosynovitis; and (3) injuries to lower extremities, mainly the knee, result from repetitive loading, constant kneeling, squatting, and contact with specialized tools. New evaluation and laboratory techniques are now available but more are needed to clarify the stress patterns.

The three approaches for controlling risk factors are redesigning jobs or tools, training workers, and selecting workers for specific jobs. (1) The use of ergonomics to design new jobs and tools is better than personal protective equipment or safe work practices, but this is still an undeveloped science, and research is needed on anatomic, mechanical, physical, and human factors. While initial costs and complications of overlapping stresses have prevented widespread use of ergonomics, the high costs of workers' compensation and rising insurance premiums may make ergonomics attractive for reducing medical costs and lost time from injuries and for increasing worker productivity. (2) The preventive value of training programs that teach employees specific work practices for safety and hygiene has been difficult to evaluate. Current programs seek to increase worker awareness of hazards and to help them participate in hazard control through problem-solving techniques. (3) Screening employees for specific jobs is difficult because of the wide variety of job demands and the range of individual physical capacities. Radiologic screening for back problems, although largely discredited, is still widely used and may pose a radiation

hazard. Thus, ergonomics is the preferred approach, with employee selection and training as secondary elements.

Because awareness is essential for implementing any prevention strategy, information should be disseminated to help change attitudes and behavior of both management and workers, especially in the many small businesses that employ 25 or fewer workers. To accomplish this, the Educational Resource Centers (ERCs), medical schools, and schools of business can provide personnel trained in ergonomics for service at regional levels and can produce guides for users to prevent and control cumulative trauma. Modern technology for disseminating public service messages should also be explored.

Action plan

The knowledge and skills to implement many of the recommendations below are now available; others must await future advances. For now, the availability of trained health professionals and their degree of cooperation will determine progress in combating musculoskeletal problems in the workplace.

Committee: A multidisciplinary National Committee for Occupational Musculoskeletal Disorders should be established with representatives from industry, labor, academia, professional groups, and government. It could function as an advisory body to prevent musculoskeletal injuries by coordinating national efforts in research, training, and prevention and by promoting clinical and scientific consensus on definitions, diagnostic criteria, surveillance terms, and criteria for the outcomes of these injuries.

Training: More clinical personnel should be trained in the etiology of musculoskeletal disorders, and, with the help of the National Research Council's National Academy of Engineers and others, design engineers could be trained in biomechanics and ergonomics. Workers should be trained to participate in the redesign of jobs, tools, and workstations. Young investigators could be encouraged through post-doctoral grants and research assistantships to seek advanced training in preventing musculoskeletal injuries.

Surveillance and Research: Innovative surveillance systems must be developed with cooperating federal, state, and local officials to improve the understanding of the nature, extent, and magnitude of musculoskeletal problems. Longitudinal studies, evaluations of ergonomic hazards, and assessments of health effects of new emerging technologies (robots, electronic office operations) are needed. Grants from NIOSH and the National Science Foundation can promote research on etiology and prevention and on the relationship of certain job tasks to resultant injuries or disorders.

Coordinating Group Activities: State and local health agencies, universities, and community health groups could, through a grant mechanism, evaluate workplaces to identify traumatogens, determine the efficacy of proposed countermeasures and prevention strategies, and conduct demonstration studies in select, high-risk industries. The Institute of Industrial Engineers, industrial hygiene organizations, equipment manufacturers, and others could develop and test means for controlling cumulative trauma. The proposed National Committee could help coordinate activities of OSHA, MSHA, AIHA, and state and industry groups to formulate guidelines for ergonomic control and could encourage standard-setting groups, such as the American National Standards Institute, to develop consensus standards. The Committee could also evaluate the benefits of a national ordinance or generic standard for controlling biomechanical hazards, similar to the Swedish ordinance regulating work postures and working movements (Danielson, et al, 1983).

Dissemination: The DHHS Office of Disease Prevention and Health Promotion along with local and regional health agencies could convey the true costs of musculoskeletal injury (in terms of economics and human suffering) to public and professional health societies through an awareness program. A model for dissemination should identify target groups, the types of messages needed, effective media, procedures for evaluating the effectiveness of information programs, and overall marketing plans for dissemination. The proposed National Committee could promote an interchange of information on basic research through symposia and workshops; a national clearinghouse of information could be established; and the results of worksite studies should be published in trade and management magazines. Labor and management should explore new ways of informing workers, especially those in small businesses and industries, of the causes, risk factors, prevention, and treatment of occupational musculoskeletal disorders. The occupational health nurse must be recognized as a first-line link between worker and health professionals, and worker-participation programs, such as the Ergonomic Task Force, should be employed to help introduce ergonomic changes.

OCCUPATIONAL CANCERS

Cancers induced by occupational exposures usually occur decades after the exposures take place. Most observed associations between exposure and occupational cancer involve tumors of a common type, such as lung cancer. Specific cancers sometimes occur in such a high fraction of workers that the work-related association is inescapable. In 1775, Sir Percivall Pott first identified an excess risk of cancer in an occupational group--cancer of the scrotum in chimney sweeps. This led to the first demonstrated prevention of cancer development in workers by interrupting the interactions of agent, environment, and host that take place as a result of workplace exposures. Since then, several other occupations have been shown to pose an increased risk of cancer, and, in the 20th century, other specific carcinogens have been identified as well.

Three health actions for prevention, outlined in the 1979 Surgeon General's Report on Health Promotion and Disease Prevention (USDHEW, 1979), can be applied to work-related exposures to carcinogens: *health protection* (activities to reduce exposure, such as redesigning the job), *health promotion* (helping workers develop and improve behaviors for good health, such as stopping the use of tobacco with its additive or synergistic effects on workplace exposures), and *health services* (although less satisfactory than the above, early detection may permit treatment and even cure of some cancers).

Scope of the problem

Conservative estimates attribute 17,000 cancer deaths each year to workplace exposures. Although over 100,000 workers are potentially exposed to the 21 chemicals now regulated by OSHA as carcinogens (NIOSH, 1978), adding the agents OSHA is currently considering for regulation and those recommended by NIOSH for control as carcinogens increases the total of potentially exposed workers to 3-9 million. Since such exposures are neither ubiquitous nor homogeneous but affect distinct populations to varying degrees, the cancer rates in specific populations may be substantially higher than expected.

Preventive actions

This strategy presents a continuum of potentially effective techniques for preventing occupational cancer, including what can be done now and what additional knowledge is needed.

Identifying and evaluating carcinogens: Epidemiologists, toxicologists, industrial hygienists, and safety engineers should coordinate efforts in research on carcinogens. Increased support for such research will help improve methods in epidemiology, toxicology, industrial hygiene, and screening. A committee of government, industry, labor, and academic experts should prepare a list of agents that warrant toxicologic and epidemiologic study and set priorities for research.

Setting standards: The most familiar mechanism for setting standards is through NIOSH recommendations to OSHA, which then promulgates standards. NIOSH can also provide technical assistance to MSHA, state governments, companies, and insurance carriers for setting standards. Additional recommendations come from such voluntary groups as the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association. To avoid the time needed to regulate carcinogens on an agent-by-agent basis, OSHA has promulgated a carcinogen policy that will help clear the backlog of unregulated carcinogens. More effort is needed to identify carcinogens in the workplace and to

disseminate information to all potentially exposed groups, such as by a broad hazard communication standard. Some gaps in information must still be filled before priorities for epidemiologic and toxicologic studies can be set.

Elimination and substitution: When the risks of using an agent in the workplace exceed the benefits, the most effective way to eliminate exposure is to eliminate the agent. More detailed information is needed on the carcinogenic properties of agents currently used in the workplace and their possible substitutes. Lists of potential carcinogens, substitutes, and replacements should be developed and broadly disseminated.

Control technology: Engineering controls that enclose a system or provide ventilation are preferable to personal protective devices or work practices because they are perceived as less likely to fail. Studies should evaluate the effectiveness of control technologies and should identify examples of effective controls for specific agents. Information from these studies could be disseminated by a national clearinghouse, especially to small businesses.

Personal protective devices: Personal protective devices are necessary when the use of a carcinogen is essential and engineering controls are neither available nor adequate. Devices must be matched to specific agents because exposure may take place through inhalation, ingestion, or skin absorption. Some devices may even introduce hazards by interfering with vision, dexterity, or worker comfort. NIOSH should continue to certify respirators and alert users to possible failures or defects. A clearinghouse could be established to disseminate state-of-the-art information on personal protective devices.

Environmental monitoring: Environmental monitoring measures the amount of a carcinogen in the workplace, assesses the adequacy of engineering controls, and determines the need for personal protective devices. Validated strategies for such monitoring are needed, and NIOSH, MSHA, OSHA, industry, and others should press for better and more precise analytic methods that are as accurate in the field as the laboratory. NIOSH should continue to assure the accuracy of laboratory testing, and a surveillance system should be developed to collect, evaluate, and disseminate the results of environmental monitoring.

Biologic monitoring: Both the inherent biologic characteristics of individuals and the absorption of specific carcinogens can be determined by biologic monitoring. The efficacy of current methods must be assessed under field conditions and new methods developed where necessary. The value of new and current methods for determining the individual enzymatic constitution of workers and predicting carcinogenic risk must be measured. The proficiency of commercial laboratories that perform biologic testing should be ascertained. Surveying the results of current biologic monitoring will help identify worksites where exposures to carcinogens occur.

Medical screening: Evaluating the efficacy of such medical screening techniques as urinary and sputum cytology will enhance early detection of occupational cancers and thus permit treatment and awareness of risk. State-of-the-art information should also be updated and disseminated in NIOSH recommendations and in OSHA and MSHA regulations. We need to know the effectiveness of medical screening techniques and subsequent therapy and more effective methods of identifying populations with past exposure to carcinogens.

Health promotion: As an adjunct to the overall prevention strategy, health promotion can help eliminate personal behaviors--such as smoking--that may act

synergistically with workplace exposures. Professional organizations, like the American Occupational Medical Association, the American Association of Occupational Health Nurses, and the American Industrial Hygiene Association, can be enlisted to help sensitize the health care establishment to specialized needs of certain occupational populations. Interaction between occupational exposures and personal health behaviors must be more clearly delineated.

Therapeutic health care and rehabilitation: Although the field of clinical oncology has burgeoned, training of personnel has lagged. Efforts by NIOSH, professional organizations, and the National Cancer Institute (NCI) are needed to increase educational materials, training programs, and certification for physicians and nurses in the field of occupational cancer. Placing experienced personnel in state and local agencies would increase awareness. Information from attempts at medical intervention is needed to assess the adequacy of early detection, therapy, and risk-reduction techniques. Identifying populations with increased risk of cancer or past exposures to carcinogens, particularly in small firms or those not covered by regulation, will help ensure timely application of diagnostic and therapeutic services.

Surveillance of disease: Because most cancers have such a long latency, surveillance of current disease may not identify current exposures. Nevertheless, some cancers may be sentinel health events that identify populations in need of medical intervention. Surveillance schemes should be evaluated for effectiveness. Acute illnesses, such as chrome dermatitis, may signal current exposures to carcinogens. Experienced personnel in local and state agencies can encourage interest in cancer detection, reporting, and prevention. Record systems, such as those collected by the Internal Revenue Service, the Social Security Administration, and Workers' Compensation, may aid epidemiologists.

Surveillance of exposure: The long latency also makes difficult the directing of society's resources to workplaces with the greatest potential for exposure to carcinogens. Although data collected in OSHA and MSHA compliance programs may help identify the extent and level of exposure to both regulated and unregulated carcinogens, better systems of surveillance are needed.

Compliance activities: OSHA conducts some inspections in response to requests and others targeted to "high-risk" industries, based on high infraction rates. OSHA's current policy should be evaluated to determine whether it adequately covers all potentially exposed workers. A national system should also target inspections to plants using regulated or suspected carcinogens, since the effects of exposure will not be manifest for 20-40 years.

Education of workers and managers: NIOSH, OSHA, MSHA, NCI, and others should strengthen their educational programs for workers and employers. A broad hazard communication standard could be effective in promoting worker awareness. The value of behavioral approaches and job-design factors in controlling cancer in the workplace should be established.

Free-market forces for prevention: Economic incentives, such as ensuring coverage by the insurance industry and compensation for victims of occupationally induced cancer, will help to encourage measures that prevent such cancers. The difficulty of establishing a causal relationship between exposure and disease must, of course, be overcome.

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

Severe occupational traumatic injuries, including those sustained in work-related motor vehicle accidents, comprise such serious and disabling injuries as amputations, fractures, severe lacerations, eye losses, acute poisonings, and burns and may result in worker deaths. Accidents, in general, and the adverse effects that result from them are the leading cause of loss of potential productive years of life in this country. The National Institute for Occupational Safety and Health (NIOSH) estimates that at least 10 million persons suffer traumatic injuries on the job each year; about three million (30 percent) injuries are severe, and at least 10,000 are fatal (CDC, 1984). Occupational injuries in 1983 resulted in 80 million lost workdays and an estimated $33.4 billion in wage, insurance, medical, and administrative costs. These figures may even underestimate the total costs to industry and do not include the immeasurable toll in human suffering. Although rates of occupational fatalities and disabling injuries have fallen since the early 1970s, due partly to a growing workforce, the actual numbers have declined slowly, if at all, since 1945.

Intervention

Traditional approaches to preventing traumatic injuries or reducing their severity include removing hazards, placing barriers between hazards and workers, screening workers before employment, analyzing job hazards, improving job and tool design, complying with regulatory and consensus standards, and training workers to avoid hazards. The following strategy will take a dual approach, discussing the actions that can be taken immediately and then the long-term efforts for the future.

Epidemiology

In efforts to study the etiology of workplace injuries and fatalities, the discipline of epidemiology can serve as a common thread by helping to identify high-risk exposures and factors, evaluate both potential risk factors and appropriate control strategies, and assess progress in the control of traumatic injuries. As a key component in the epidemiologic process, surveillance must be applied both as an initial activity to establish baseline information and as a continuing activity to characterize how the national occupational safety experience is changing. Four basic aspects of occupational trauma must be considered: the task, the working environment, the machine, and the worker; modification of any one of these will affect the whole system. An overriding consideration must always be the needs of employers who manage these complex industrial systems.

What can we implement now?

Evaluation of effective safety programs has established that the most important component is management's commitment from the top down. Management accepts responsibility for tying all elements of the workplace together so that the interactions of task, environment, machine, and worker, as well as the energy releases associated with these interactions, can occur with the least possible unforeseen interruption.

Task-oriented strategies: Although safe work practices for hazardous operations and control methods for energy sources are available, failure to use them is responsible for a large number of occupational injuries and deaths. Employers are either unaware of hazards and control strategies or unable or unwilling to implement them. Job-hazard analysis plus timely reassessment or monitoring can help employers anticipate

rather than react to hazards and should have a major impact on reducing national injury and death rates.

Environment-oriented strategies: While the physical environment of the workplace is the most obvious and the most amenable to change, the psychosocial and political/economic environments warrant further study for their impact on injuries. Over the past 50 years, studies of illumination, temperature, noise, vibration, relative humidity, and the layout and condition of the facility have resulted in guidelines to control these potential physical stressors. Failure to apply the guidelines results from cost constraints, inadequate dissemination of information, and improper management of safety programs. Prevention programs in the private sector have demonstrated trauma reductions and should be encouraged in other companies.

Machine-oriented strategies: The various forms of energy associated with machines, if not adequately controlled, can result in traumatic injuries to workers. Regulatory and consensus standards now exist to protect workers from interaction with industrial machines. Many of these standards propose placing barriers between the worker and the energy sources, such as guards on moving parts of machinery or protective equipment worn by the workers. Manufacturers are now producing safer and more functional machines, and procurement procedures should require the purchase of machinery that meets current standards.

Human-oriented strategies: The worker is the most complex entity in the workplace system and, as the employer's most valuable resource, should be carefully nurtured and protected. Effective information dissemination, education, and training of workers can have an immediate positive impact on the incidence of work-related injuries and deaths. As soon as hazards are identified, known intervention methods should be applied and workers should be supplied with the tools and knowledge to avoid traumatic injuries.

Knowledgeable, well-trained workers can avoid injury even during hazardous work, while untrained, uninformed workers can be injured under almost risk-free conditions. Thus, training is an integral component of trauma prevention. Although safety training begins in childhood, most job safety is learned on the job. Some regulatory agencies require training, but the degree and level of training vary widely. Model training programs could ensure more uniform and basic training in hazard awareness and trauma control. Employees in high-risk occupations should be the primary targets for such training, and retraining in different occupations will be important for workers who suffer permanent disabling injuries at work.

What knowledge do we need?

For management to select and operate safety programs efficiently, they must have access to cost-effective, scientifically proven methods that reduce injuries.

Task-oriented strategies: Although established countermeasures for occupational injuries may represent the best judgment of the trauma control community, they have not, through rigorous scientific studies, been demonstrated to be effective. Such measures would be more readily accepted if their effectiveness and cost benefit were known.

Environment oriented strategies: The influence of certain physical agents on the incidence of occupational traumatic injuries should be more carefully defined. The psychosocial environment, as it influences the perception of hazard and risk taking, is amenable to modification through advertising, information dissemination, and social interaction. Messages through the mass media should be specific, supportable, and persuasive enough to alter public

perception so that occupational traumatic injuries and deaths are no longer considered either morally acceptable events or "chance" occurrences that are beyond human control.

Changes in the workforce and workplace, e.g., increasing numbers of women and of certain ethnic minorities and the increased use of computers and automated or programmable machines (robots), present unique and dynamic challenges for the prevention of traumatic injuries. Past failures to anticipate potential hazards of "new" technologies must not be repeated. New techniques for recognizing, analyzing, and mitigating hazards and for managing risk are emerging and should be nurtured, perhaps by establishing a center for research into the non-mechanistic arena of safety.

Increasing attention is being paid to the complex economic forces that influence the incidence of occupational traumatic injury and fatality. This is evident from the creation of a Workers' Compensation Research Institute and from analyses of the economic incentives and disincentives associated with workers' compensation. Employers are beginning to recognize the negative economic impact of traumatic injuries in lost workdays, high medical costs, loss of productivity, and increased insurance rates and liability claims. Data specific for industry and occupation would be helpful in these areas. Studies should be undertaken of the cost relationships of compensation, disability, and product liability insurance from the perspective of occupational trauma.

Machine-oriented strategies: Although present safety concepts involve barriers around hazardous machine parts, workers continue to experience injuries. Further studies are needed on the efficacy of these barriers and on the motivational and behavioral factors involved in their use. Standards for machine safety should be re-evaluated, and the technical basis for each standard should be understood by users. As faster and more efficient machines are developed, care must be taken to design safe methods of feeding and removing stock from the machine and to limit the speed within human tolerances.

Human-oriented strategies: As the workforce ages, traumatic injuries may increase because older workers are slower to react, have reduced ranges of motion, and are less tolerant of environmental changes such as extreme heat or cold. Although older workers are more cautious, the decreasing supply of younger workers may force the older ones to remain longer in high-risk jobs, thus increasing exposure to the hazards of traumatic injury.

Technology can be viewed on four levels: (1) workers supply both power and control, (2) tools supply power, and workers control it, (3) both power and information are supplied, and workers direct; and (4) power, control, and information are supplied in self-monitoring systems, and workers only intervene if something goes wrong. As technology progresses toward levels 3 and 4, and as service jobs become more prominent, training will become increasingly important. The adequacy of training policies and practices will require constant evaluation.

Little research has been directed to the relationship of human behavior to safe work activity, e.g., why workers circumvent safety devices or ignore safety rules when rescuing others. Most studies have focused on economic factors, but more attention to motivational issues is needed. Management should find ways to enlist the interest and cooperation of workers so that workers, unions, and management can work together to better understand and overcome hazards inherent in the workplace. The impact of such cooperation, e.g., quality circles in the automobile industry, needs further evaluation.

The roles of alcohol and drug abuse are well known in highway trauma but less understood in occupational settings. The work-related effect of these substances and their possible interaction with chemicals in the workplace require further study. NIOSH should cooperate with agencies that have responsibilities in areas of personal behavior and substance abuse and should increase their awareness of worker needs.

Risk-taking, a fundamental quality of the American spirit, is rewarded in society and the workplace, but must be tempered when it contributes to occupational trauma. Other aspects of human behavior, such as reactions to major life events (death, divorce, financial troubles), may also impact occupational safety. The increasing availability of employee counselors reflects the value employers are placing on the mental well-being of workers.

Rehabilitation of severely injured workers, while not preventive, can mitigate the severity of trauma by reducing prolonged disability, loss of income, and the impaired quality of life. Such evidence of management's commitment to employee well-being lends credibility to its prevention-oriented programs. Better techniques for diagnosis of injuries are needed, and sufficient time must be allowed to ensure the mental, psychological, and physical conditioning of workers for return to the workplace.

Recommendations

What can be done now: Model programs can be developed for successful prevention of occupational trauma and implemented through a workplace-specific, self-evaluation approach. Self evaluation involves the work force in anticipating and identifying hazards, developing and discriminating among existing controls, and tailoring the tools to a specific industry. Such evaluation should be voluntary and focused on high-risk industries and specific worker populations that may be high risk and/or neglected by regulations.

Research on the prevention of occupational trauma, especially interdisciplinary research, should be stimulated by such means as national grant programs. The results of these and similar studies must be easily accessible, perhaps through broadened information centers, and should be available in both hard copy and through electronic access. A knowledge of injury-control methods should be brought to the attention of educational institutions, professional societies, accreditation bodies, and state and local agencies so that educational institutions will be influenced to adopt trauma-control courses or modules into their curricula. Education and training models for specialists, managers, supervisors, and workers should include techniques for identifying, evaluating, and controlling hazards, and ranking the consequences of hazards; guidelines for selecting training materials and methods; and methods for evaluating training and post-training management.

Enforcement agencies should use their resources and authority to ensure that appropriate safeguards are installed and used, especially on mechanical power presses. All guards should be integral, non-removable parts of the machine design, and workers and managers alike should clearly understand the hazard posed by the machine and the value of the guard. Existing occupational consensus standards and codes should be reevaluated and a technical basis established for each so that new information can be easily incorporated as it emerges. The results of product liability litigation should be monitored for their influence on product designers and to identify potential increased risk to workers. Findings should be widely disseminated to responsible groups.

Longer term actions: Surveillance of occupational traumatic injury is currently limited by the inadequacies and the redundancies of existing documentation and reporting systems. A national surveillance system is needed that will include information on products, engineering controls, personal protective equipment, job title and tasks, worker characteristics (training, experience, and shift factors), compliance with standards, and location of accident--in short, the optimal elements to fulfill all current and anticipated uses of such data. All possible sources must be tapped, including reports from hospitals, medical examiners, and accident investigations. Until such a system is developed, existing systems can be expanded and the collection of industry-specific data can be explored. In addition, ways might be found to release--for trauma-control research--data that are currently protected by the Privacy Act, while still protecting the sensitive nature of the data.

Epidemiologic studies are needed to describe the magnitude and characteristics of specific traumatic injuries and to evaluate the efficacy of specific prevention measures. These studies can reduce current information gaps, such as incorrect statistics on traumatic injury, unsubstantiated conclusions about what influences the risk of injury (training, worker behavior, experience, supervision), and data on the feasibility and success of prevention measures.

The continuing toll of occupational injuries suggests that current programs are not working, perhaps because resources are not available or because the personnel involved are not familiar with specific problems in specific industries. A possible solution to be explored is the formation of private, nonprofit, industry-specific associations for research (not regulatory) purposes (e.g., the Construction Safety Association of Ontario). Existing national programs could help promulgate regulations, develop scientific methods, and generate research tools for the associations.

Chemicals, medications, and other substances, encountered through both personal use and workplace exposure, may increase the risk of traumatic injury. These hazards must be identified, workers should be screened for susceptibility to them, and effective employee assistance programs should be made available nationwide.

OCCUPATIONAL CARDIOVASCULAR DISEASES

Cardiovascular diseases, e.g., ischemic heart disease and hypertensive, cerebrovascular, and peripheral vascular diseases are the leading cause of disability and death in the United States, accounting for almost a million deaths (986,000) in 1984 (NCHS, 1986). Direct and indirect economic costs amounted to approximately $102.4 billion in 1983. The 34 percent decline in coronary heart disease since 1972 demonstrates the potential effectiveness of programs directed at risk factors for such diseases. Coronary heart disease, hypertension, and related entities are included in this prevention strategy because of their high incidence, whereas the less common arrhythmias, cardiomyopathies, and other forms are more directly related to specific occupational exposures. These latter conditions are given specific emphasis here because of their vulnerability to intervention in the workplace.

Risks and the workplace

Millions of workers are currently exposed to work-related factors; chemical, physical, and psychosocial, associated with increased risk of cardiovascular disease. Many personal risk factors are also known. Some personal factors are unalterable, e.g., age, gender, and family history; others are alterable, e.g., cigarette smoking, dietary intake, hypertension, excessive alcohol intake, obesity, diabetes, inadequate physical activity, and behavioral pattern. Preventive programs directed at the alterable risk factors are effective in reducing the occurrence of cardiovascular disease, and the workplace is an excellent site for disseminating messages and programs designed to change these personal risk factors. Where possible, this strategy will combine the two approaches: preventing work-related risk factors and enhancing the prevention of personal risk factors.

Cardiotoxic exposures in the workplace: Several chemical and physical agents--such as carbon disulfide, carbon monoxide, halogenated hydrocarbons, nitroglycerine, heat, and noise--are known to increase the risk of cardiovascular disease. In addition, nearly 1,500 chemicals have been identified with possible cardiovascular effects. The complexity of the disease process, the long latency, and the diversity of workplace exposures during a given lifetime make the study of relationships between occupational exposures and cardiovascular disease difficult.

Reducing exposures to known cardiotoxins requires identifying the exposures, communicating with exposed workers, complying with current exposure criteria, implementing control technology and environmental control programs, improving monitoring, developing protective equipment, and adopting new or improved exposure standards. Ideally, these environmental efforts should be combined at the worksite with efforts to reduce such personal risks as smoking, elevated blood cholesterol, elevated blood pressure, and sedentary lifestyle. Individual situations, however, must dictate the balance between these two approaches.

Better medical, epidemiologic, and toxicologic studies will be needed to determine the specific effects of chemical and physical agents on the cardiovascular system and the interaction of these agents with personal lifestyle factors. An epidemiologic group for cardiovascular disease could be formed within NIOSH to help focus that agency's studies and to coordinate a program with outside groups; coordination with the National Heart, Lung, and Blood Institute will be particularly important. New methods must be developed to screen chemical substances, delineate mechanisms of toxicity, monitor

exposures, and assess the value of training, education, and information dissemination.

Psychosocial factors: Studies showing an association of work-related psychosocial factors with increased risk of cardiovascular disease have linked specific factors to specific manifestations of disease. Inconsistent results from some of these studies may be due to slightly different methodologies and to lack of control for other risk factors. Further research is sorely needed to determine the specific underlying factors that cause increased risk of cardiovascular disease, to assess workplace psychosocial factors, to determine the job-related stress of new technologies, and to evaluate the effectiveness of programs designed to correct the problems.

Health promotion: Even for occupational and industrial groups with increased risk primarily from personal factors, the prevention of cardiovascular disease related to these factors is a worthy goal. The workplace is a highly attractive site for delivering health promotion and employee assistance programs. Success of such programs will require union and management cooperation, employee involvement, adequate allocation of resources, control at the local level, attention to ethical issues, confidentiality of medical information, and voluntary participation. These programs should be made increasingly available, especially to high risk groups. Structured follow-up and evaluations should be included to assess the overall effectiveness of the efforts.

Summary

Although our knowledge of the relationship between workplace exposures and cardiovascular disease is incomplete, the morbidity and mortality resulting from cardiovascular disease in this country is extensive. Important steps should be taken now to help reduce this toll.

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DISORDERS OF REPRODUCTION

Since antiquity, certain chemical and physical agents have been recognized as having detrimental effects on human reproduction. For example, the effect of industrial lead poisoning in inducing abortions was noted by the Romans and again in the first decade of this century (6). Evidence from more recent laboratory studies and clinical investigations indicates that a wide range of microbiologic, physical, and chemical agents, such as Brucella, rubella, ionizing and nonionizing radiation, heat and vibration, tobacco, alcohol, and certain drugs, can adversely affect reproductive outcomes. At least 50 chemicals--including heavy metals, such as lead and cadmium glycol ethers, organohalide pesticides, organic solvents, and chemical intermediates, such as styrene and vinyl chloride--in widespread use in industry have been shown to produce impairment of reproductive functions in animals (7).

Until recently, the potential hazards to human reproduction posed by occupational exposures received little attention. However, adverse effects after thalidomide exposure in the 1960s and the occurrence in 1970 of methylmercury poisoning among residents of Minamata, Japan, dramatically demonstrated the teratogenic potential of chemical exposures. Those events and the increasing entry of women into the workforce focused greater attention on the potential hazards to female reproductive functions of occupational exposures. In the late 1970s, the demonstration of sterility among male workers exposed to dibromochloropropane was described; this drew attention to the concomitant potential for hazards to male reproductive function (8).

Occupational exposures can produce a wide range of adverse effects on reproduction. The effects of parental exposure before conception to agents toxic to reproductive functions may be evident as reduced fertility, unsuccessful fertilization or implantation, or an abnormal fetus. Maternal exposure after conception may result in death of the fetus or structural and functional abnormalities in the newborn. Other possible adverse outcomes include spontaneous abortions (both early and late), major and minor birth defects, perinatal death, low birth weight, altered sex ratio, developmental or behavioral disabilities, and transplacental exposure to carcinogen (9-11).

Estimates of the prevalence of adverse reproductive outcomes indicate that these events occur with considerable frequency in the U.S. population. For example, an estimated 560,000 infant deaths, spontaneous abortions, and stillbirths occur each year. The March of Dimes estimates that 200,000 live infants with some type of birth defect--benign or disabling--are born in the United States each year (9). The causes of most of these adverse outcomes are unknown. For example, 6-30 percent of the infertile couples have no recognized anatomic or physiologic abnormalities to account for the infertility (10); neither the etiology of sperm abnormalities nor the cause of sister-chromatid exchange in spontaneous abortions has been established (11,12). The causes for as many as 65-70 percent of the birth defects are not known (13).

Maternal Exposures: Studies of occupational reproductive hazards to date have consisted mainly of epidemiologic surveys of pregnancy outcomes following maternal exposures. Such studies have shown increased rates of spontaneous abortions among laboratory and chemical workers (14,15) and among workers exposed to lead (16), ethylene oxide (17), and anesthetic gases (18,19). Studies of adverse outcomes of pregnancy, however, are subject to several methodologic limitations. For example, the detection of rare outcomes,

such as birth defects, requires the study of several thousand pregnancies, and retrospective studies are subject to problems of recall and misclassification, both of reproductive events and of exposures (20,21). The timing, duration, and frequency of exposure before and during pregnancy may critically affect reproductive outcomes (22). For example, exposure to ionizing radiation during the first trimester may result in microcephaly and mental retardation, and exposure during the third trimester may produce low birth weight and neonatal death (11). Other studies have been limited by the selection of inadequate comparison groups or the failure to examine the influence of other factors, such as alcohol and tobacco consumption or maternal age, that affect reproductive outcomes.

Paternal Exposures: Since azoospermia (absence of living spermatozoa in the semen) and oligospermia (subnormal concentration of spermatozoa) were reported in 1977 among workers exposed to dibromochloropropane (8), at least 14 studies have examined the quality of semen in workers exposed to lead, carbon disulfide, anesthetic gases, ionizing radiation, toluenediamine, dinitrotoluene, carbaryl, and several other pesticides (10). Adverse effects on the quality of semen were reported in workers exposed to lead or ionizing radiation. In other studies, e.g., of exposures to ethylene dibromide, results were inconclusive because of problems in design of the study or inadequate numbers of participants (10). CDC recently used data collected by the Metropolitan Atlanta Congenital Defects Program to examine the risk of serious structural birth defects among the children of male Vietnam veterans; no statistically excessive risks were noted (23). In general, relatively few studies have been conducted of reproductive outcomes associated with paternal exposures (9).

Extent of potential exposures: Estimates have been made of the number of workers potentially exposed to selected agents known or suspected to be toxic to reproductive function. NIOSH estimates that approximately 200,000 workers are potentially exposed to various glycol ethers (24), several of which exhibit marked testicular toxicity in animals (25). An estimated 9 million workers are exposed to radiofrequency- microwave radiation (26), which has been shown to cause embryonic death and impaired fertility in animals but which has yet to be studied adequately in humans. NIOSH has estimated that approximately 50,000 personnel in hospital operating rooms are potentially exposed to waste anesthetic gases, and 139,000 hospital and other industrial workers may be exposed to ethylene oxide (24); both agents have been linked to an increased risk of spontaneous abortions in humans.

The extent to which occupational exposures in American workers produce adverse reproductive outcomes is largely unknown. However, the information presented here suggests that the problem is both widespread and serious. Epidemiologic and toxicologic research into the reproductive effects of occupational exposures is in its infancy. There is a continuing effort to elucidate the etiology of adverse reproductive outcomes, such as fetal chromosomal abnormalities or abnormal spermatogenesis and to develop improved animal models for screening agents for possible mutagenic and toxic effects related to human reproduction. Registries for the surveillance of outcomes of reproduction, such as CDC's Birth Defects Monitoring Program (9), and improved methodologies developed to evaluate such parameters as

quality of semen (12) and outcomes of pregnancy (20), will permit further identification of specific occupational hazards to reproduction. When such hazards are identified and controlled in the workplace, the prevention of reproductive disorders in the population as a whole will be substantially improved.

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NEUROTOXIC DISORDERS

Diseases of the nervous system resulting from toxic exposures in the workplace were known as early as the first century A.D., when Pliny identified palsy as a manifestation of lead poisoning among workers exposed to lead dust (7). In 1557, Jean Fernel linked gingival pigmentation, tremor, and behavioral changes to occupational mercury poisoning (8); in the nineteenth century, Delpech recognized rubber processing as the cause of the bizarre psychoses occurring among French workers who manufactured condoms and balloons in small cottage industries. Later, carbon disulfide was implicated as the specific neurotoxic agent (9).

Industrial hygiene practices have improved in the twentieth century, and some animal models of neurotoxic disease have been developed. In addition, workers who become ill often draw attention to outbreaks of neurotoxic diseases. Despite the prior identification of acrylamide as neurotoxic in animals, its neurotoxicity in humans was first recognized in the 1950s, when several Japanese workers involved in a pilot production project developed peripheral neuropathy (10). During the 1960s and early 1970s, dozens of cases of neuropathy occurred among Japanese and Italian workers exposed to solutions containing n-hexane during the manufacturing of shoes (11). Subsequently, high doses of n-hexane were found to be neurotoxic in exposed animals. In the past 15 years alone, outbreaks of serious human neurotoxicity occurred among workers exposed to three substances not previously known to be neurotoxic: the chlorinated hydrocarbon, chlordecone, which caused opsoclonus, tremor, disturbances of gait, and changes in personality (12); and two hexacarbons, methyl-n-butyl ketone and 2-t-butylazo-2-hydroxy-5-methylhexane, both of which caused a predominantly peripheral neuropathy (13,14).

Nature of Neurotoxic Disorders:
Neurotoxic disorders are on the NIOSH list of Ten Leading Work-Related Diseases and Injuries (1) because of their potential severity--as exemplified by the neurotoxicity of chlordecone--and because of the large number of workers potentially at risk. A conservative estimate of the workers exposed full time to one or more neurotoxic agents is 7.7 million (15). The number of potentially neurotoxic chemicals found in the workplace exceeds 850.

Clinically, symptoms and signs of neurotoxicity can be diverse. Depending on the intensity of exposure, the molecular configuration of the agent, and the mechanism of toxicity, either central or peripheral neurologic effects may predominate. Most neurotoxic chemicals, however, affect both the central and peripheral nervous systems. Because the symptoms of peripheral neuropathy are more specific and the nerves themselves more directly accessible to precise diagnostic examinations, the effects of neurotoxic agents on the peripheral nervous system are usually more easily identified than effects on the central nervous system (CNS). Early symptoms of peripheral neuropathy may include numbness, tingling, or pain in the feet or hands. As the disease progresses, clumsiness or incoordination due to both sensory and motor changes may develop. Production workers may find their ability to do usual work partially or fully impaired. Chemicals used extensively in industry, which cause peripheral neuropathy when present in sufficiently high and persistent concentrations, include: lead, n-hexane, acrylamide, carbon disulfide, mercury, and methyl bromide (17,18). Several chemicals are known to cause selective impairment of cranial-nerve function, including dysfunction of the fifth cranial nerve (trichloroethylene) (18).

The effects of neurotoxic agents on the CNS present a far wider range of disturbances (16,18,19). At times, the most striking effects are changes in mood and personality (20). High levels of exposure to manganese or carbon disulfide produce psychoses and suicidal tendencies. Delusions and hallucinations may result from exposure to high concentrations of solvents, such as methylene chloride. Manifestations of cognitive dysfunction, such as reduced attention span, lack of alertness, and memory loss, are prominent neurotoxic effects that may occur in addition to personality changes after exposure to many solvents and to asphyxiants, such as carbon monoxide. Other neurologic effects occur under certain restricted conditions of exposure to unique chemical substances.

Although research into the neurobehavioral effects of industrial chemicals is relatively new, early results suggest that occupational neurotoxicity may be a larger problem than previously suspected. Sensitive methods for evaluating subtle losses in cognitive function have only recently been applied to the evaluation of exposed workers. Because of the complexity of the nervous system and the variety of potentially neurotoxic exposures, the true scope of this health hazard in the workplace is unknown.

Studies of the neurotoxicity of workplace chemicals demonstrate the problems encountered in recognizing occupational disease in general. Despite occasional large and dramatic outbreaks of neurotoxic disorders, such as those mentioned above, more often small numbers of workers in many workplaces are chronically exposed to neurotoxic agents that subtly and slowly alter nervous-system functions. Several neurotoxic syndromes mimic diseases of nonoccupational and "idiopathic" etiology, e.g., the toxic axonopathy associated with exposure to various metals and solvents, the parkinsonian syndrome of chronic intoxication with manganese, and the organic brain syndrome of chronic solvent intoxication. Because of these similarities to other nonoccupational diseases, such cases are frequently not identified as occupational in origin. In addition, many physicians are not trained to take an adequate occupational medical history (21). For these reasons, the prevalence of occupational neurologic disease is unknown, and important causal relationships between chemicals and disease remain obscure.

The prevention of neurotoxicity among workers will require strategies such as those suggested in the 1990 Objectives for improving the nation's health (22), developed by the U.S. Public Health Service: (1) analyses of structural analogues of known neurotoxic agents in an effort to predict the neurotoxicity of untested chemicals; (2) continuing search for animal models of disease; (3) ongoing research in establishing an acceptable human exposure level for identified neurotoxic agents; (4) epidemiologic evaluations of suspected neurotoxicity; (5) development of simple screening tools for use on asymptomatic populations exposed to known neurotoxic agents; and (6) premanufacturing and premarket testing of new chemicals as required by the Toxic Substances Control Act (23). As in the prevention of other work-related diseases, however, the most direct and effective method for preventing neurotoxic illness will continue to be the environmental control of exposures to neurotoxic chemicals. Such efforts as the substitution of less toxic substances where possible, engineering controls, teaching appropriate work practices, and educating workers about the potential neurotoxicity of chemicals will aid a comprehensive prevention effort.

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NOISE-INDUCED HEARING LOSS

Occupational deafness was first documented among metalworkers in the sixteenth century (8). Since then, workers have experienced excessive hearing loss in many occupations associated with noise. Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss higher than that resulting from the natural aging process; this is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.

While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4,000 hertz (Hz, or cycles per second) in the hearing range of 20 Hz to 20,000 Hz and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized.

Such impairment is usually severe enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2,000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components. As a result, an average hearing threshold (lowest audible sound level) at separate frequencies of 1,000 Hz, 2,000 Hz, and 3,000 Hz is used widely to define material impairment caused by noise (10,11). Recent estimates by the Occupational Safety and Health Administration (OSHA) indicate that about 9,400,000 U.S. production workers (7,900,000 active and 1,500,000 retired) either now work or have worked in industrial locations where noise-exposure levels are 80 decibels (dBA) or higher. This estimate includes most noisy workplaces in the United States, except agricultural, mining, construction, transportation, and government (11). At exposure levels below 80 decibels (weighted to the approximate response of the human ear), an increased risk of hearing loss caused by occupational noise has not been found. Based on the average hearing threshold level at 1,000 Hz, 2,000 Hz, and 3,000 Hz, OSHA estimates that 1,624,000 (17 percent) production workers have at least mild hearing loss resulting from their occupational noise exposures; 1,060,000 (11 percent) have material hearing impairment; and 473,000 (5 percent) have moderate to severe impairment (11). These estimates generally agree with NIOSH survey findings, which indicate that one-fourth of persons 55 years of age or older who have been exposed over their working lifetime to an average of about 90 dBA have developed a material hearing impairment caused by occupational noise exposure (10,12). An estimated $835 million will be paid in workers' compensation claims for occupational hearing impairment for the 10-year period 1978-1987 (13).

Occupational noise-induced loss of hearing is preventable. In its 1990 Objectives for the Nation, the U.S. Public Health Service set an objective that "By 1990, the prevalence of occupational noise-induced hearing loss should be reduced to 415,000 cases" (14). This objective relates to the number of cases of hearing loss that result in moderate to severe impairment. However, it is important to note that if the number of moderate to severe impairments is reduced, the number of mild hearing loss and of material impairments would be reduced proportionately. OSHA has estimated that

within 10 years, the number of cases of noise-induced hearing impairment can be reduced by 20 percent if all workers exposed to noise levels higher than 85 dBA wear personal hearing protectors (earplugs or muffs) and receive on the average a 15 dBA noise reduction (11). However, this estimate hinges on effective use of hearing protectors to an extent that has not yet been demonstrated for all workers. NIOSH field investigations of industrial workers who routinely use earplugs indicate average noise reduction ranging from 7 dBA to 20 dBA, depending on the type of plug used (15).

A noise-control/hearing-conservation program is the most important step in eliminating occupational hearing loss. Such a program must include:

1. Reduction of noise through engineering controls, and the purchase of new, noise-engineered equipment.
2. Proper fit of personal hearing-protection devices.
3. Education of workers and managers about certain characteristics of noise-induced loss of hearing.
4. Proper periodic audiometric testing and notification of workers who are developing hearing loss.
5. Visible commitment of management and workers to the program.

The joint efforts of management, labor, and health-care providers are needed to establish effective hearing-conservation programs in industry. All interested groups must work together to achieve the goal of protecting workers' hearing.

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DERMATOLOGICAL CONDITIONS

A worker's skin is directly exposed to the occupational environment and is susceptible to a large number of dermatological injuries and other conditions. Complete data on the extent and cost of dermatological injuries are not available; however, dermatological conditions other than injuries accounted for 37 percent of the 106,100 occupational illnesses recorded in 1983 in the Bureau of Labor Statistics (BLS) Annual Survey of Occupational Injuries and Illnesses (1). Results from the BLS Annual Survey for 1972-1976 indicated that 20-25 percent of all occupational dermatological conditions resulted in lost time from work (average 10-12 lost workdays) (2). Similar data based on workers' compensation claims have been reported from California and South Carolina (3,4). Assuming that only 2-10 percent of cases are actually reported, the annual cost of occupational dermatological conditions resulting from lost worker productivity, medical care, and disability payments may range between $222 million and $1 billion (5,6).

Because 10-15 percent of requests that NIOSH receives for health hazard evaluations involve skin complaints, and because the economic impact of work-related dermatological conditions is substantial, NIOSH has included dermatological conditions on its list of Ten Leading Work-Related Diseases and Injuries in the United States (7).

Dermatological Injuries: Dermatological injuries are usually described as the immediate adverse effects on skin that result from instantaneous trauma or brief exposure to toxic agents involving a single incident in the work environment (1). Skin injuries may constitute 23-35 percent of all injuries (8,9). Thus, based on 4,748,000 injuries of all types, and a full-time worker population of 74,750,000 for 1983 (1), an estimated 1,070,000-1,650,000 dermatological injuries may occur yearly, with an estimated annual rate of skin injury of 1.4-2.2 per 100 full-time workers. The highest percentage of skin injuries are due to lacerations/ punctures (82 percent), followed by burns (chemical and other) (14 percent) (8).

Other Dermatological Conditions: Other dermatological conditions, "illnesses of the skin," may also result from exposure to environmental factors or toxic agents associated with employment. However, they usually result from more sustained or cumulative exposures and involve longer intervals between exposure and occurrence of disease. These conditions include contact dermatitis, infection, acne, and skin cancer. Workers' compensation claims data from California suggest that 95 percent of these occupational skin conditions are either contact dermatitis (90 percent) or infections (5 percent) (3). Field investigations in the 1950s showed that at least 80 percent of occupational contact dermatitis cases may be caused by the irritating direct cytotoxic effects of causal agents rather than immunologically mediated allergic reactions (10). The highest number of other occupational skin conditions (23,017) in 1984 occurred in the manufacturing sector; the highest incidence rate (28.5/10,000 full-time workers) involved the combined agriculture/forestry/fishing division. The clinical course for occupational contact dermatitis is relatively poor. In three studies, complete resolution occurred in 25 percent of workers affected; 50 percent improved but had periodic recurrences; and 25 percent developed persistent dermatitis as severe as or worse than the original condition (11-13). Contact dermatitis often necessitates job changes or modifications. Despite these, however, complete resolution may occur in only a limited proportion of cases.

Prevention of Work-Related Dermatological Disorders: The most effective prevention measures are engineering controls that eliminate exposures of the skin to chemical, physical, or mechanical agents through isolation, containment, or redesign of industrial processes. Substitution of less toxic substances through chemical engineering may also be effective (14). Protective clothing should be selected on the basis of resistance to both chemical and physical hazards, as well as on the relative permeabilities to specific chemical exposures. Effective cleaning of skin and clothing is important, but workers should not wash vigorously or excessively with harsh soaps and detergents (15). Barrier creams have been suggested as alternatives, although their effectiveness has not yet been established (16). Prevention strategies should always include education of workers and management.

Expanded activities concerning occupational dermatological conditions include improved methods for surveillance of occupational skin disease and vigorous research in dermatotoxicology to identify preventable risk factors and facilitate effective interventions at early stages.

Reported by Div of Periodic Surveys and Supplementary Data Systems, Office of Occupational Health and Safety Statistics, Bureau of Labor Statistics, US Dept of Labor; Occupational Dermatology Activity, Industrywide Studies Br, Surveillance Br, Div of Surveillance, Hazard Evaluations, and Field Studies, Data Analysis Section, Div of Safety Research, National Institute for Occupational Safety and Health, CDC.

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PSYCHOLOGICAL DISORDERS

There is increasing evidence that an unsatisfactory work environment may contribute to psychological disorders. Studies have shown that factors contributing to an unsatisfactory work environment may include work overload, lack of control over one's work, nonsupportive supervisors or co-workers, limited job opportunities, role ambiguity or conflict, rotating shiftwork, and machine-paced work (1-4). Psychological disorders that can result from such factors may be classified as a) affective disturbances, e.g., anxiety, irritability, b) behavioral problems, e.g., substance abuse, sleep difficulties, c) psychiatric disorders, e.g., neuroses, and d) somatic complaints, e.g., headache, gastrointestinal symptoms. In addition to psychological disorders, stressful working conditions may have a systemic influence, possibly affecting the etiology and/or prognosis of other disease states, as suggested by recent studies of stress-related immunologic suppression (5).

Although databases currently available for determining the extent of work-related psychological disorders are limited, several indicators suggest that these problems impose substantial health and financial costs in the United States. A recent study in California showed that claims for the development of "work-related neuroses" more than doubled during 1980-1982; claims for all other disabling work-related injuries during the same period actually decreased by about one-tenth (6). A study of representative medical claims throughout the country showed that during 1980-1982 claims for "mental stress" that developed gradually, e.g., a chronic problem unrelated to a single traumatic incident or to any physical work-related disorder accounted for about 11 percent of all occupational disease claims (7). Average medical costs and indemnity payments in 1981-1982 for these forms of mental stress actually surpassed the average amounts for other occupational diseases (7). The American Psychiatric Association now lists occupational stress in its Diagnostic and Statistical Manual as a subcategory of the major diagnostic axis of "psychosocial stress" (8).

There are increasing data on the relationship between specific working conditions and psychological disorders. For example, in a questionnaire survey of over 2,000 workers in 23 different occupations, strong occupational differences were found in psychosocial job stressors and in somatic and affective complaints (1). Ratings of boring, repetitive job tasks and role ambiguity were more prominent among several classes of blue-collar workers, e.g., assembly-line workers, fork-lift truck drivers, and machine operators, than among white-collar professionals, e.g., professors and family physicians. The most satisfied occupational groups were physicians, professors, and white-collar supervisors. Groups experiencing the highest levels of job stressors and their resultant ill effects were assemblers and relief workers on machine-paced assembly lines. NIOSH investigators ranked 130 occupations by rate of admission to community mental health centers in Tennessee to determine the relative risk of psychological or stress-related disorders by occupation (9). Heading the list were jobs in health care, service occupations, and blue-collar factory work--which tend to be characterized by stress-producing conditions such as a lack of control over the job by the worker, repetitive work, shift work, and a responsibility for others. In other studies, workers on night and rotating shifts (including the health-care occupations) reported more disturbances of sleep, altered eating habits, and higher rates of visits to clinics, absences due to sickness, and on-the-job injuries than did those on fixed day shifts (10-12).

Work environments characterized by technological innovation have also been investigated; a major focus has been on office work influenced by the introduction of computers (13,14). Adverse working conditions, e.g., poorer physical environment, reduced job control, and social support tend to be reported more frequently by workers using new technology office equipment such as video display terminals. Some of these conditions have been linked to chronic stress-related disorders (4,15).

Worksite studies by NIOSH have revealed that job stresses may contribute to acute disturbances among groups of workers, including those termed "mass psychogenic illness" (16). The sudden appearance of symptoms, usually in response to some "trigger factor" such as a strange odor, may result in spread of the apparent "illness" throughout the plant, with symptoms such as headaches, dizziness, and nausea. Investigations often fail to detect specific physical or chemical causative agents. However, factors such as heavy work load, strained labor/management relations, and physical discomfort at work may be present and related to the reporting of symptoms.

Emerging trends in technology, the economy, and demographic characteristics of the work force may lead to increased risk for psychological disorders. For example, a 26 percent increase is projected for employment in the health services, an area that may be associated with elevated risk (9,17). Computers and robots are expected to affect 7 million factory jobs and 39 million office jobs (18). According to some forecasters (18), possible consequences may include job displacement, reduced skill requirements, and lower-paying jobs. It has been projected that in the next decade, nine of every ten new jobs will be in the service sector (19). Routine service jobs may not provide the compensation and benefits associated with the more traditional industrial and manufacturing jobs (18). Six of ten new jobs in the next decade will be filled by women (19), and dual job/home role demands and constrained occupational opportunities for women may result in an adverse impact on their mental health.

A prevention strategy for psychological disorders should take into account both the causal mechanisms and the factors that perpetuate these disorders. Work-related psychological disturbances are known to be influenced by both the physical and psychosocial characteristics of given job situations. Moreover, these factors operate in concert with factors unrelated to the job, such as life events; familial demands and support; and the traits, capacities, and needs of the workers themselves, e.g., personality, age, sex, experience/learning. The interaction of these variables is complex, and the relative influence of each is not thoroughly understood. Nevertheless, approaches to prevent work-related psychological disorders should still be taken using the information currently available.

Stress-reduction techniques, e.g., meditation, biofeedback, muscle relaxation, cognitive restructuring, and anxiety management have been taught to both blue- and white-collar workers in work-site training sessions. Follow-up studies have shown decreases in psychophysiologic activity, e.g., muscle tension and blood pressure levels, and reductions in subjective reports of anxiety, sleep disturbances, and other health complaints with each technique (20). However, improvement in all these parameters persisted less than 3 months after training ended.

Stress management treats only the symptoms of the problem--not the cause. Therefore, efforts to control risk factors at the worksite are also important. Some previously described suggestions for controlling worksite risk factors for psychological disorders are listed below (21). These suggestions appear to have merit for

reducing work-related psychological disorders, but further evaluation and study are needed for a complete understanding of their impact.

Work schedule: Design work schedules to avoid conflict with demands and responsibilities unrelated to the job. Schedules for rotating shifts should be stable and predictable, with rotation in a forward (day-to-night) direction.

Participation/control: Allow workers to provide input for decisions or actions affecting their jobs.

Workload: Ensure assignments are compatible with the capabilities and resources of the worker, and allow for recovery from especially demanding physical or mental tasks.

Content: Design tasks to provide meaning, stimulation, a sense of completeness, and an opportunity to use skills.

Roles: Define work roles and responsibilities clearly.

Social environment: Provide opportunities for social interaction, including emotional support and help directly related to one's job.

Future: Avoid ambiguity in matters of job security and career development.

In addition to evaluation of these suggested actions, efforts are needed to advance the understanding of work-related psychological disorders and of methods appropriate for their control, including:

1. Improving the systems for surveillance of psychological disorders in the work force as related to working conditions.
2. Improving research techniques for investigating stressful working conditions and their health consequences.
3. Improving training of occupational health professionals and workers in recognizing stressful workplace conditions and signs of worker stress and in effecting remedial measures.
4. Furthering the development of mental health components in occupational health and safety programs.

Reported by Div of Biomedical and Behavioral Science, National Institute for Occupational Safety and Health, CDC.

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NIOSH PROJECTS BY PROGRAM AREAS

Occupational Lung Diseases

Musculoskeletal Injuries

Occupational Cancers

Severe Occupational Traumatic Injuries

Occupational Cardiovascular Diseases

Disorders of Reproduction

Neurotoxic Disorders

Noise-Induced Hearing Loss

Dermatological Conditions

Psychological Disorders

Assistance Requests

Administration

Other

OCCUPATIONAL LUNG DISEASES

EVALUATION OF MESOTHELIOMA PRODUCTION BY ASBESTOS SUBSTITUTES

Purpose: This project will evaluate the toxicity/carcinogenicity of two modified chrysotile asbestos products which have been proposed as safe substitutes for asbestos through intrapleural implantation in rats. The toxicity/carcinogenicity of these substitute materials will be evaluated and compared to untreated asbestos materials.

DBBS, Richard A. Salomon
CAN 376 Dates: 10/84-09/92

CONTROL OF EXPOSURES DURING AUTO BODY REPAIR

Purpose: This project will document and/or develop, and disseminate appropriate control measures to protect workers from the health hazards of auto body repair.

DPSE, William A. Heitbrink
CAN 410 Dates: 10/90-09/93

ANALYTICAL METHODS FOR INORGANIC SUBSTANCES

Purpose: In response to needs arising from NIOSH prevention strategies, analytical methods for inorganic or organic substances in air or other matrices will be developed. Also, new analytical chemistry techniques will be evaluated for application to industrial hygiene sampling and analytical needs.

DPSE, Eugene R. Kennedy
CAN 413 Dates: 01/86-C

TECHNOLOGY TRANSFER FOR DPSE PROJECTS

Purpose: This project will transfer the technology developed in DPSE so that control and monitoring innovations are widely available for adoption and patentable discoveries are commercialized to ensure the widest possible usage.

DPSE, Theodore F. Schoenborn
CAN 416 Dates: 10/87-C

MANUFACTURING TECHNOLOGY HEALTH AND SAFETY CONSIDERATIONS

Purpose: This project will migrate health and safety considerations into manufacturing technology programs.

DPSE, Theodore F. Schoenborn
CAN 419 Dates: 10/91-09/94

APPLICATION OF PROCESS HAZARD ANALYSIS FOR AGRICULTURAL CHEMICALS

Purpose: This project will identify and recommend preventive measures for ammonia releases and pesticide exposures in agricultural applications.

DPSE, Amy A. Beasley
CAN 423 Dates: 10/89-09/93

HHE ANALYTICAL CHEMISTRY SUPPORT

Purpose: This project provides timely analytical chemistry services to the HHE program by assuring rapid turnaround of requests for sample analyses and method development. It is projected that 5,800 HHE field samples will be analyzed and 4 sampling/analytical methods will be developed or modified under this project during FY 1992.

DPSE, John L. Holtz
CAN 425 Dates: 10/85-C

MINING AND RESPIRATORY DISEASE RESEARCH ANALYTICAL SUPPORT

Purpose: This project will provide analytical chemistry support to mining investigations, respiratory disease studies, and safety research. Analytical chemistry support will be given to studies of fibrous minerals combined with other mineral dust. Analytical support will also be provided to general industry and mining HHEs in DRDS.

DPSE, Donald D. Dollberg
CAN 426 Dates: 10/84-C

PILOT STUDY: EVALUATION OF PROCESS CONTAINMENT FOR BIOAEROSOLS

Purpose: This project will identify improved methods of evaluating bioprocess containment and identify specific equipment for evaluation.

DPSE, Paul A. Jensen
CAN 429 Dates: 10/86-09/92

A NATIONAL CONSTRUCTION INDUSTRY CONTROL TECHNOLOGY DATABASE

Purpose: This project will evaluate the feasibility of a national database, potentially including physical, biological, chemical agents, and chronic trauma.

DPSE, James A. Gideon
CAN 434 Dates: 10/89-C

A METHOD FOR SAMPLING AND ANALYSIS OF INDOOR AIR FOR ORGANIC COMPOUNDS

Purpose: The sampling and analytical method developed will provide data on worker exposure to vapor-phase organic compounds found in indoor air. This data will be used by the industrial hygiene community to study health effects reported in exposed populations. Results of these studies will provide recommendations for exposure reduction.

DPSE, Eugene R. Kennedy
CAN 436 Dates: 10/89-12/92

ANALYTICAL METHODS FOR ORGANIC COMPOUNDS

Purpose: Analytical methods for organic and inorganic compounds in workplace air and other matrices of industrial hygiene interest will be developed. New analytical chemistry techniques will be evaluated for application to industrial hygiene problems. This will advance the state of the art of identifying and quantifying worker exposure to toxic chemicals.

DPSE, Robert A. Lunsford
CAN 437 Dates: 10/82-C

OCCUPATIONAL LUNG DISEASES

ANALYTICAL METHOD FOR TOTAL ISOCYANATE IN AIR

Purpose: An analytical method for total isocyanate group in workplace air will be developed. In addition to accurately measuring worker exposure, this method will enable the investigation of the importance that exposure to prepolymer isocyanate and polyurethane-bound isocyanate has on worker health.

DPSE, Robert P. Streicher
CAN 439 Dates: 10/89-09/93

METHODS FOR EVALUATING INDOOR AIR VENTILATION SYSTEMS

Purpose: This project will develop and document procedures to effectively evaluate building ventilation systems and to provide the necessary information to correct the problems.

DPSE, Mazen Y. Anastas
CAN 442 Dates: 10/88-09/91

EVALUATION OF TOXIC GAS MONITORS FOR INDOOR AND WORKPLACE AIR

Purpose: By conducting laboratory and field evaluations of portable instrumentation, the project will provide data and information on the application and maintenance of gas monitors in an indoor air or workplace monitoring situation.

DPSE, Jerome P. Smith
CAN 443 Dates: 10/89-09/92

REVISION OF THE NIOSH MANUAL OF ANALYTICAL METHODS

Purpose: This project provides a collection of current NIOSH analytical methods for use in health hazard evaluations, industry-wide studies, and control technology assessments.

DPSE, Peter M. Eller
CAN 445 Dates: 10/82-C

TECHNOLOGY TRANSFER FOR NIOSH PROJECTS

Purpose: This project will transfer the technology developed in NIOSH so that control and monitoring innovations are widely available for adoption and patentable discoveries are commercialized to ensure the widest possible usage.

DPSE, Theodore F. Schoenborn
CAN 446 Dates: 10/91-C

ANALYTICAL METHODS FOR ASBESTOS FIBERS

Purpose: The project will investigate methods 7400 and 7402 and suggest improvements if needed. Automated fiber counting and standard analytical techniques will be evaluated for interferences. Techniques for preparing specific size fractions of asbestos fibers will be evaluated.

DPSE, Paul A. Baron
CAN 448 Dates: 10/84-09/92

METHODS FOR DETERMINING VENTILATION EFFECTIVENESS IN BUILDINGS

Purpose: The methods to be developed on this project will provide investigators of indoor environmental problems with means to determine the adequacy of ventilation in all occupied spaces within a building and whether applicable ventilation standards are being met.

DPSE, Mazen Y. Anastas
CAN 452 Dates: 10/91-09/94

CONTROL OF AIR CONTAMINANTS DURING DYE WEIGH-OUT

Purpose: A ventilated work station will be designed, installed, and evaluated in a textile plant.

DPSE, Marjorie Edmonds
CAN 453 Dates: 10/91-09/93

PARTICLE SAMPLER PERFORMANCE TESTING

Purpose: This goal will be accomplished by producing sampler performance criteria and associated testing. Freedom from instrumentation specification will provide the flexibility necessary for the development of new samplers. Flexibility with no compromise of performance is expected because of new instrumentation available.

DPSE, David L. Bartley
CAN 455 Dates: 10/89-09/93

QUALITY ASSURANCE (EXTERNAL)

Purpose: NIOSH will continue to rate laboratories in the PAT program, a joint project of NIOSH and AIHA. Proficiency ratings are based on the analytical results reported for quality audit samples that include carcinogens (e.g., asbestos and benzene). In addition, laboratory performance will be documented in publications.

DPSE, Jensen H. Groff
CAN 458 Dates: 10/82-C

MAINTENANCE AND CALIBRATION

Purpose: This project will: (1) provide repair, calibration of field and direct-reading equipment (DPSE ECTB, DSHEFS IWSB, DTMD, and some state labs); (2) provide electronic repair & fabrication support for direct-reading and instrument development.

DPSE, Ronald Kovein
CAN 459 Dates: 10/82-C

SITE DEPENDENT ALLERGIC SENSITIZATION/OCCUPATIONAL ASTHMA

Purpose: Animals exposed to site selective oxidant gases will be sensitized to ovalbumin. The period of susceptibility to antigenic sensitization, importance of membrane integrity and antigen dose-response will be studied by measuring the animals' subsequent IGE levels and mast cell response.

DRDS, Paul D. Siegel
CAN 102 Dates: 10/91-10/94

OCCUPATIONAL LUNG DISEASES

PATHOLOGY ANALYSIS OF THE NCWAS AND EM SUPPORT

Purpose: The results obtained from the autopsy program will aid in evaluating the effectiveness of the coal mine dust standard. EM support will assist other DRDS investigations concerning the mechanisms of occupational lung disease.

DRDS, Val Vallyathan
CAN 105 Dates: 10/71-C

EFFECT OF SILICA EXPOSURE ON THE LUNG: BIOCHEM/PATH STUDIES

Purpose: Lung cells will be exposed to freshly cleaved or aged silica *in vitro* and *in vivo* and cellular reactions to these exposures will be compared to determine the relationship between surface characteristics of dust and its biological reactivity.

DRDS, Jane Ma
CAN 113 Dates: 10/89-09/93

ASSESSMENT OF THE CARCINOGENIC POTENTIAL OF SELECTED DUSTS

Purpose: The project will determine whether silica, talc, and man-made fibers can cause cell transformation and oncogene expression in mammalian cells.

DRDS, Tong-man Ong
CAN 116 Dates: 10/89-09/92

ANIMAL AND EXPOSURE FACILITY SUPPORT FOR DRDS

Purpose: This project provides animals to NIOSH researchers for the purposes of defining etiologic agents, animal models of ORD, pathogenetic and defense mechanisms and naturally-occurring variability in exposures which cause or influence occupational lung disease.

DRDS, Kenneth C. Weber
CAN 123 Dates: 10/80-C

VALIDATION STUDIES OF IN SITU ASSAY SYSTEMS IN OCCUPATIONAL SETTING

Purpose: This project will develop and characterize a biological assay system to provide methods for the detection and monitoring of genotoxic agents and potential carcinogens in the workplace environment, and for the detection and assessment of potential health hazards to workers.

DRDS, Tong-man Ong
CAN 124 Dates: 07/86-09/94

OXIDANT INJURY: PREDISPOSITION TO AGRICULTURAL OCCUPATIONAL ASTHMA

Purpose: Animals exposed to site selective oxidant gases will be sensitized to ovalbumin. The period of susceptibility to antigenic sensitization, importance of membrane integrity and antigen dose-response will be studied by measuring the animals' subsequent IGE levels and mast cell responses.

DRDS, Paul D. Siegel
CAN 126 Dates: 10/91-09/94

OCCUPATIONAL LUNG DISEASES

OCCUPATIONAL ASTHMA: EPITHELIUM MUSCLE INTERACTIONS

Purpose: This laboratory-based project will develop and utilize animal inhalation and *in vitro* models of pulmonary obstruction and airway hyperreactivity to characterize the toxicity and mechanism(s) of effect of agents which induce or exacerbate occupational asthma, and to evaluate/screen suspected agents for pulmonary toxicity.

DRDS, Jeffrey S. Fedan
CAN 127 Dates: 10/91-09/94

BIOLOGIC TOXICITY OF AGRICULTURAL DUSTS

Purpose: This project will assess the biologic toxicity of agricultural dusts collected by field investigators and correlate the results with mineral content and type with the prevalence of farmers' lung diseases in different geographic areas of the U.S.

DRDS, Val Vallyathan
CAN 128 Dates: 10/91-09/96

CENTERS FOR AGRICULTURAL RESEARCH, EDUCATION AND DISEASE AND INJURY

Purpose: The Centers' program, through cooperative agreement with several facilities, will expand existing programs and establish new model programs in agricultural health and safety.

DRDS, Stephen A. Olenchock
CAN 130 Dates: 10/89-02/93

DEVELOPMENT OF IMMUNOCHEMICAL ASSAYS-OCCUPATIONAL ASTHMA

Purpose: This project will develop new assays or modify known assays to determine chemicals and/or classes of chemicals in the workplace and to measure antibodies/antigens in biological tissues.

DRDS, Daniel M. Lewis
CAN 132 Dates: 10/91-03/95

NHANES III SUPPORT

Purpose: This project will provide support to the respiratory disease part of NHANES. Pulmonary function equipment will be maintained, training provided, and quality control performed to insure a uniform approach to data collection.

DRDS, John L. Hankinson
CAN 135 Dates: 10/87-09/95

MICROBIAL EXPOSURES IN AGRICULTURE

Purpose: This project will provide data on the quantitative and qualitative distribution of microorganisms in respirable dust associated with a variety of agricultural processes. Such data are needed to understand the mechanism of acute febrile illness associated with exposure, and to develop appropriate intervention strategies.

DRDS, Stephen A. Olenchock
CAN 147 Dates: 10/89-02/93

OCCUPATIONAL LUNG DISEASES

INFLAMMATORY AGENTS IN AGRICULTURAL DUSTS

Purpose: This project will evaluate the inflammatory potential of, and the inflammatory reaction to, selected agricultural dusts. This information will provide a basis for determining the types of dusts likely to produce pulmonary inflammation.

DRDS, Daniel M. Lewis
CAN 148 Dates: 10/89-09/92

ROLE OF FUNGAL SPORES IN ORGANIC DUST TOXIC SYNDROME (ODTS)

Purpose: This project will help to provide an understanding of the role of fungal spores in the etiology of ODTS through isolation of pure preparations of fungal spores, and through investigations of the effects of those spores on cellular components of the immune system.

DRDS, William G. Sorenson
CAN 150 Dates: 10/89-09/93

EMERGING TECHNOLOGY FOR RESPIRATORY DISEASE EVALUATIONS

Purpose: This project will refine current technologies and develop new tools to allow more efficient and sensitive detection of occupational respiratory disease. Field studies of airway responsiveness permit identification of risk factors for the sensitization of workers.

DRDS, John L. Hankinson
CAN 152 Dates: 10/88-C

EMERGING PROBLEMS IN ENVIRONMENTAL EXPOSURE ASSESSMENT

Purpose: Through collection of pilot data and assessment of the adequacy of historical data bases, the feasibility of doing full-scale research studies can be determined.

DRDS, Frank J. Hearl
CAN 158 Dates: 10/85-C

DEVELOPMENT OF BIOASSAYS: IDENTIFY HEALTH RISKS OF ASBESTOS SUBSTITUTES

Purpose: This project will develop *in vitro* and *in vivo* methodologies to evaluate the potential toxicity of asbestos and asbestos substitutes. Particles having different dimensions but identical chemistry will be tested to determine the importance of morphology on toxicity.

DRDS, Vincent Castranova
CAN 160 Dates: 10/89-09/92

SURVEILLANCE OF LUNG DISEASE AGENTS IN SMALL BUSINESSES

Purpose: This project will collect data on pottery shops, pottery shop workers and exposure to silica flour.

DRDS, Shib S. Bajpayee
CAN 162 Dates: 11/87-09/91

OCCUPATIONAL LUNG DISEASES

AGRICULTURAL DUST: ELUCIDATION DISEASE MECHANICS WITH ANIMAL MODEL, BIOMARKERS

Purpose: This project will help physicians to understand the time course of the cellular response, airway reactivity, and airway inflammation following exposure to selected agricultural dusts. Knowledge of these responses will aid in the prevention and treatment of lung diseases resulting from exposure to agricultural dusts.

DRDS, David G. Frazer
CAN 163 Dates: 10/89-09/92

AGRICULTURAL DUSTS: ANIMAL MODELS OF ASTHMA

Purpose: The animal model will mirror worker pulmonary response to grain and wood dust inhalation, as well as dust-induced airway hyper-reactivity. Animal responses will be compared to published human responses. The toxicities of the dusts will be assayed biologically with proven and new *in vitro* airways preparations.

DRDS, Jeffrey S. Fedan
CAN 165 Dates: 10/89-09/93

EFFECTIVE SILICA INDICES FOR RESPIRABLE MINERAL DUST

Purpose: This project will develop methods determining surface composition of respirable quartz distinguishing biologically available and unavailable quartz surface. It will identify initial interactions/properties of respired dusts, which distinguish the disease-inducing potential of insoluble respirable particles.

DRDS, William E. Wallace
CAN 167 Dates: 10/84-09/92

ENVIRONMENTAL HAZARD SURVEILLANCE

Purpose: This project will examine exposure data from a wide variety of occupations and industries, and investigate sectors which are associated with unexpectedly high exposures.

DRDS, Dennis W. Groce
CAN 173 Dates: 10/82-C

MODELLING OF EXPOSURE-RESPONSE STUDIES

Purpose: By identifying factors that most affect the potential power of a study, further studies can be better designed to obtain greater power with maximum efficiency.

DRDS, Paul Hewett
CAN 174 Dates: 10/91-09/94

TECHNICAL AND STATISTICAL SUPPORT

Purpose: This project will design and analyze data for other branches in DRDS. Under this project, statisticians will also give statistical advice to other investigators, review protocols and manuscripts, assist in writing manuscripts and final reports, and provide graphical outputs.

DRDS, William Miller
CAN 176 Dates: 10/89-C

OCCUPATIONAL LUNG DISEASES

RADIOLOGICAL/PATHOLOGICAL CORRELATION IN CWP

Purpose: The amount and type of pathological abnormality will be determined in lungs of a large number of autopsy cases. Correlation will be made between these findings and radiological abnormalities. The results will provide important information on the extent of pathological disease in coal miners in general.

DRDS, Michael D. Attfield
CAN 178 Dates: 10/89-09/93

MEASUREMENT OF VARIABILITY OF PARTICLE DEPOSITION

Purpose: To develop methods to identify sources of variability and quantify the magnitude of change that results in particle deposition.

DRDS, Michael A. McCawley
CAN 179 Dates: 10/91-09/94

MEDICAL FIELD TEAM TECHNICAL SUPPORT

Purpose: This project will provide technical support in the collection of data from actual work sites throughout the country to enable an accurate determination of the prevalence or progression of respiratory occupational health problems, and provide in-house technical support services.

DRDS, Gregory C. Spransy
CAN 182 Dates: 10/87-C

NATIONAL STUDY OF CWP AND RELATED RESEARCH

Purpose: This continuation project includes a number of tasks and studies dealing with specific questions or hypotheses relating to lung disease in coal miners. As these questions are answered, new tasks will be added as necessary until the outstanding problems are resolved.

DRDS, Michael D. Attfield
CAN 183 Dates: 10/83-C

WORK-RELATED LUNG DISEASE SURVEILLANCE REPORT

Purpose: The purpose of this project is to regularly update, publish and disseminate surveillance data related to occupational lung disease.

DRDS, Helen Montagliani
CAN 184 Dates: 10/91-C

COMPREHENSIVE STATE-BASED LUNG DISEASE SURVEILLANCE

Purpose: In the SENSOR program, states have developed experience and skills in occupational asthma and silicosis surveillance. Project will build on experience acquired in SENSOR. More comprehensive and uniform computer-based reporting with improved guidelines for investigation and reporting of gases will enhance future surveillance and intervention activities.

DRDS, Karl J. Musgrave/Corrado Ugolini
CAN 185 Dates: 10/91-09/97

OCCUPATIONAL LUNG DISEASES

OCCUPATIONAL RESPIRATORY DISEASE SURVEILLANCE IN AGRICULTURE

Purpose: This project will support the NIOSH program of occupational disease surveillance by analyzing existing secondary data sources to identify high risk occupations (by agricultural sector/geographic region, etc.) for further evaluation, research, or public health intervention.

DRDS, Karl J. Musgrave
CAN 186 Dates: 10/89-C

ENDOTOXIN EXPOSURE/ACUTE RESPIRATORY EFFECTS IN AGRICULTURAL WORKERS

Purpose: This project will analyze data previously collected by NIOSH in order to evaluate the exposure-response relationship between acute respiratory effects and inhalation exposure to airborne endotoxin in agricultural workers.

DRDS, Robert M. Castellan
CAN 187 Dates: 10/89-09/92

SILICOSIS RISK IN THE CONSTRUCTION INDUSTRY

Purpose: This project will (1) determine whether drillers and cutters of silica-bearing materials are at elevated risk or experiencing elevated prevalence of silicosis, (2) disseminate the findings, and (3) recommend those measures necessary to reduce the risk and incidence of new cases.

DRDS, Dennis W. Groce
CAN 188 Dates: 10/89-03/95

HEALTH RISK OF EXPOSURE TO ASBESTOS SUBSTITUTES IN INSULATION WORK

Purpose: This project will provide data to estimate the prevalence of dust-induced disease in a selected group of insulation workers.

DRDS, Robert M. Castellan
CAN 189 Dates: 10/89-09/92

FARM FAMILY SURVEY: RESPIRATORY DISEASE TECHNICAL SUPPORT

Purpose: This project will provide technical support for occupational respiratory disease activities to the U.S. Farm Family Health and Hazard Survey.

DRDS, John L. Hankinson
CAN 190 Dates: 10/89-09/95

DEVELOPMENT OF RESPIRATORY DISEASE SURVEILLANCE SYSTEMS

Purpose: This project will compile, analyze, and disseminate information for use as the basis of occupational respiratory disease surveillance systems. Reports will provide support for other OLD projects by identifying worker groups at high risk, and by describing trends over time.

DRDS, Rochelle B. Althouse
CAN 192 Dates: 10/90-C

OCCUPATIONAL LUNG DISEASES

EMERGING PROBLEMS IN OCCUPATIONAL RESPIRATORY DISEASE

Purpose: This project will provide an administrative mechanism to permit DRDS epidemiologists to become familiar with specific industries, hazards, or occupational lung diseases in order to develop well-defined research projects.

DRDS, Robert M. Castellan
CAN 193 Dates: 10/90-C

MEDICAL TECHNICAL SUPPORT

Purpose: By providing medical technical support, this project enables other research projects as well as health hazard evaluations to collect high quality data for use in their respective studies.

DRDS, John L. Hankinson
CAN 202 Dates: 10/87-C

STUDIES OF AIRWAY CLOSURE AND EMPHYSEMA

Purpose: This project is designed to provide information concerning the magnitude and consequences of surface forces that may act in the lung, and their role in the progression of lung disease. This knowledge may aid in the prevention and treatment of lung diseases resulting from tissue destruction due to abnormal surface forces.

DRDS, David G. Frazer
CAN 203 Dates: 10/90-09/93

EFFECTS OF SILICA ON PULMONARY ENZYMES IN THE PATHOGENESIS OF LUNG CANCER

Purpose: This project will, through controlled animal exposures to silica dust, determine whether a link between silica exposure and carcinogenicity can be developed in an animal model.

DRDS, Philip R. Miles
CAN 204 Dates: 10/90-09/93

ASTHMA IN AND OUT OF THE WORKPLACE: CONFERENCE

Purpose: This project will assist the New York Academy of Sciences with the planning and implementation of a research symposium on asthma in the workplace. This meeting will attract investigators from the international community to the first meeting of its kind to emphasize the growing problem of workplace exposure-induced asthma.

DRDS, Kenneth C. Weber
CAN 206 Dates: 10/90-09/93

LONGITUDINAL ANALYSIS OF SPIROMETRY

Purpose: Through the use of cooperative agreements, source of medical surveillance data will be identified, standardized, improved, and used to develop and test methods of interpreting longitudinal spirometry data.

DRDS, John L. Hankinson
CAN 209 Dates: 10/91-10/94

OCCUPATIONAL LUNG DISEASES

AIRWAYS DISEASE IN MINERS

Purpose: This project will identify environmental and constitutional risk factors which predict the development of severe lung impairment in coal miners and possibly in other dusty occupations.

DRDS, Edward L. Petsonk
CAN 212 Dates: 10/89-09/94

OCCUPATIONAL ASTHMA IDENTIFICATION METHODS

Purpose: This project will develop simple, objective, standardized methods and criteria for identifying cases of occupational asthma. This will encourage both case reporting by physicians and surveillance efforts by state health departments.

DRDS, Edward L. Petsonk
CAN 213 Dates: 10/89-09/93

DOSE ASSESSMENT IN FIELD STUDIES: TASK-RELATED VARIATION

Purpose: This project will result in the development of a practical guide to ventilatory requirements of elemental job activities, useful for combining with environmental dust exposure measurements, to more accurately estimate worker dose-response relationships.

DRDS, Edward L. Petsonk
CAN 214 Dates: 10/91-10/94

AGRICULTURAL DUSTS: FIELD-BASED EVALUATION-EXPOSURE AND ACUTE RESPIRATORY ILLNESS

Purpose: This project will provide information on exposure and disease relationships to be used for prevention strategies.

DRDS, Alwin Dieffenbach
CAN 215 Dates: 10/89-C

RURAL HOSPITAL NURSES: RESPIRATORY DISEASE TECHNICAL SUPPORT

Purpose: This project provides technical support on occupational respiratory diseases to the NIOSH Rural Hospital Nurses Program

DRDS, Elizabeth B. Knutti
CAN 216 Dates: 10/89-C

EVALUATION/REHABILITATION OF OCCUPATIONAL RESPIRATORY DISEASE AND INJURY

Purpose: This project will, through the development and implementation of a cooperative agreement with a major medical center, develop a model evaluation and rehabilitation program for occupational lung diseases and musculoskeletal disorders.

DRDS, John L. Hankinson
CAN 217 Dates: 10/89-09/93

OCCUPATIONAL LUNG DISEASES

HAZARD SURVEILLANCE IN THE CONSTRUCTION INDUSTRY

Purpose: This project will define the current respiratory exposures in various segments of the construction industry, and increase the ability of NIOSH to respond to requests for health hazard evaluations, in this industry, in a timely manner.

DRDS, Joseph E. Burkhart
CAN 218 Dates: 10/89-09/92

NATIONAL STRATEGY FOR ELIMINATION OF OCCUPATIONAL ASTHMA

Purpose: This project will be the mechanism for the development of a national strategy for the elimination of chronic respiratory disease related to occupational asthma. NIOSH intramural and extramural program priorities can then be based on a comprehensive, knowledge-based strategy directed toward this goal.

DRDS, Edward L. Petsonk
CAN 219 Dates: 10/91-09/93

INDUSTRIAL HYGIENE TECHNICAL SUPPORT

Purpose: This project quantifies levels of exposure to toxins, allergens, pathogens, hazardous dusts, and carcinogens. It provides services, environmental sampling, and review/comment on draft NIOSH documents.

DRDS, Jerry L. Clere
CAN 223 Dates: 10/82-C

BIAS IN PARTICULATE EXPOSURE SAMPLING DEVICES

Purpose: Analysis of variability of deposition will be used to examine the range of bias for various particle sizes and used with information from studies of particle size in coal mines to determine an appropriate dose curve for coal mine dust.

DRDS, Paul Hewett
CAN 224 Dates: 10/89-09/91

FIBER TOXICITY: SURFACE PROPERTIES AND ANALYSIS

Purpose: This project will use physical methods to reveal the surface properties of fibers, including surface and bulk composition, dimensions and surface area, using Auger, XPS, and EDX spectroscopy and BET surface analysis. Results will be correlated with the surface toxicity of native and surfactant-treated mineral fibers.

DRDS, William E. Wallace
CAN 225 Dates: 10/89-09/93

PILOT ENVIRONMENTAL SURVEILLANCE OF ENDOTOXIN AT SELECTED COTTON GINS

Purpose: This project will demonstrate the feasibility of determining the distribution of endotoxins in the U.S. cotton crop.

DRDS, Dennis W. Groce
CAN 227 Dates: 10/89-09/92

OCCUPATIONAL LUNG DISEASES

EVALUATION SUPPORT TO NIOSH COALWORKERS' SURVEILLANCE PROGRAM

Purpose: Through review and evaluation of policies, procedures and support systems for the surveillance program, more accurate data will be generated to facilitate public health decision making.

DRDS, John E. Parker
CAN 228 Dates: 10/89-09/92

COMPUTER SUPPORT

Purpose: Computer support in terms of Parklawn Computer Center charges, data entry, and programming support will be provided to all DRDS projects.

DRDS, Karen Hilling
CAN 232 Dates: 10/87-C

AUTOPSY PROGRAM: PROGRAM OPERATION

Purpose: This project will provide data about coal workers' pneumoconiosis and will aid in assessing the effectiveness of the coal dust standard.

DRDS, Mitzie L. Martin
CAN 233 Dates: 05/71-C

CHARACTERIZATION OF WELDING FUMES

Purpose: This project will identify the welding processes that will be the focus of a morbidity study, elicit union and industry support, and will produce a protocol to be used in obtaining approval.

DRDS, Paul Hewett
CAN 234 Dates: 10/90-09/91

COAL MINER MEDICAL SURVEILLANCE: RECEIVING CENTER OPERATION

Purpose: This project provides for the collection and recording of data related to the x-ray surveillance program; such data is then available for research and analysis in surveillance and related projects.

DRDS, Mitzie L. Martin
CAN 235 Dates: 08/70-C

DIESEL PARTICULATE MEASUREMENTS

Purpose: Project will determine whether or not it is feasible to conduct a case-control study of lung cancer in underground miners.

DRDS, Rebecca S. Stanevich
CAN 236 Dates: 10/88-09/93

OCCUPATIONAL LUNG DISEASES

RESPIRABLE GENOTOXIC PARTICULATE EXPOSURE MEASUREMENT MONITORING

Purpose: This project will develop and apply methods to collect and measure the genotoxic dose associated with respirable particulate exposures in a manner predictive of their fate in the lung.

DRDS, William E. Wallace
CAN 237 Dates: 10/88-09/94

NIOSH STRATEGY FOR ELIMINATION OF SILICOSIS

Purpose: The final product of this project will be a document recommending specific action items for NIOSH divisions which together will form a directed program to eliminate silicosis in the United States.

DRDS, John E. Parker
CAN 238 Dates: 10/91-09/93

COAL DUST CRITERIA DOCUMENT (CD)

Purpose: This project will provide a critical evaluation of information concerning occupational lung disease in workers (e.g., coal miners) exposed to coal dust. The evaluation will be used to develop a criteria document which will provide criteria for a recommended standard.

DSDTT, Eileen D. Kuempel
CAN 053 Dates: 10/90-09/93

GENERAL PRINCIPLES OF OCCUPATIONAL MEDICAL SCREENING (CD)

Purpose: This project will develop a medical monitoring document with a section on general principles, and criteria for establishing medical monitoring and screening programs in the workplace.

DSDTT, Ralph D. Zumwalde
CAN 055 Dates: 10/90-09/92

CONSTRUCTION HEALTH AND SAFETY DISSEMINATION

Purpose: This project will enable NIOSH materials to be distributed to appropriate secondary disseminators in the construction industry.

DSDTT, Charlene B. Maloney
CAN 075 Dates: 10/89-C

MAN-MADE MINERAL FIBERS CURRENT INTELLIGENCE BULLETIN (CIB)

Purpose: This project will provide a critical evaluation of information concerning occupational exposure to man-made mineral fibers with emphasis on specific types of fibers. The evaluation will be used to develop a CIB that will provide recommendations for controlling occupational exposure to these fibers.

DSDTT, Clayton B. Doak
CAN 088 Dates: 10/89-09/94

OCCUPATIONAL LUNG DISEASES

GENERAL PRINCIPLES OF EXPOSURE ASSESSMENT

Purpose: This project will develop, for OSHA, a draft decision logic and supporting criteria for assessing worker exposure.

DSDTT, Jerome P. Flesch
CAN 107 Dates: 10/90-09/92

UPDATE OF NIOSH AND OSHA OCCUPATIONAL SAFETY & HEALTH GUIDELINES

Purpose: This project will update all of the existing 333 guidelines, originally developed under a joint project between NIOSH and OSHA, by including appropriate new toxicity information on each guideline and making necessary revisions on other sections to include relevant new information and procedures. The project will be done under an IA with OSHA.

DSDTT, John J. Whalen
CAN 108 Dates: 10/90-09/93

INTERIM-RECOMMENDED EXPOSURE LIMITS (I-RELS) GUIDELINES

Purpose: This project will develop data quality criteria for laboratory, industrial hygiene and epidemiologic data, define significant health effects end points, and develop and apply guidelines for extrapolation of health effects data to derive recommended occupational exposure limits.

DSDTT, Robert W. Mason
CAN 122 Dates: 10/89-C

SURFACE COAL MINERS CRITERIA DOCUMENT

Purpose: This project will provide a critical evaluation of information concerning occupational lung disease in surface coal miners. The evaluation will be used to develop a Criteria Document which will provide criteria for a recommended standard for the prevention of occupational lung diseases in surface coal miners.

DSDTT, Clayton B. Doak/Henry S. Chan
CAN 136 Dates: 10/89-09/92

MYOCARDIAL INFARCTION REGISTRY–PILOT PROJECT

Purpose: This project will determine the feasibility of constructing a comprehensive myocardial infarction registry. Such a registry can be used in case-control investigations to describe associations between workplace risk variables (both chemical and nonchemical) and the development of cardiovascular disease.

DSHEFS, Robert A. Rinsky
CAN 503 Dates: 10/91-09/93

TRENDS IN NATIONAL INDUSTRIAL HYGIENE AND SAFETY ACTIVITIES

Purpose: This project will develop procedures for the trend analysis of industrial hygiene/safety activities based on data from the National Occupational Hazard Survey and the National Occupational Exposure Survey.

DSHEFS, Pedersen/Venable/Sieber
CAN 510 Dates: 10/91-09/93

OCCUPATIONAL LUNG DISEASES

HAZARD SURVEILLANCE OF WORKER EXPOSURE TO ELECTROMAGNETIC FIELDS (EMF)

Purpose: Project will assess extent of worker exposure and range of exposure levels to EMF in non-utility industries and establish an EMF data repository.

DSHEFS, Alice L. Greife
CAN 512 Dates: 10/91-C

AN EPIDEMIOLOGIC STUDY OF IAQ

Purpose: This study will address the relationships between indoor air quality (IAQ) and symptoms of disease including respiratory effects, headaches, skin and eye irritation, and determine if inadequate ventilation is associated with these symptoms.

DSHEFS, Raymond J. Alderfer
CAN 527 Dates: 10/89-09/94

COHORT MORTALITY STUDY OF ANTIMONY SMELTER WORKERS

Purpose: This epidemiologic study will assess the association between exposure to antimony and the risk of developing lung cancer.

DSHEFS, Teresa M. Schnorr
CAN 533 Dates: 10/83-09/92

MORTALITY STUDY OF WORKERS EXPOSED TO TOLUENE DIISOCYANATE

Purpose: This epidemiologic study will assess the association between exposure to TDI and the risk of developing respiratory cancer.

DSHEFS, Teresa M. Schnorr
CAN 534 Dates: 06/83-09/92

IMMUNOTOXICITY OF WORKPLACE EXPOSURES IN HUMANS

Purpose: This project will evaluate the effects of selected chemical exposures on the human immune system. This is important since suppression of the immune system may lead to an increased risk of cancer (as well as other health effects).

DSHEFS, Elizabeth M. Ward
CAN 538 Dates: 10/91-09/96

EXPOSURE VARIABILITY AS A GUIDE IN DEFINING GROUPS OF WORKERS

Purpose: This project will address the issue of exposure misclassification of workers in epidemiologic studies by examining the sources and nature of variance components in exposure measurements. This will help to assure the quality and usefulness of future occupational epidemiology studies.

DSHEFS, Martha A. Waters
CAN 539 Dates: 10/91-09/94

OCCUPATIONAL LUNG DISEASES

LEADS FROM U.S., GREAT BRITAIN, AND CANADIAN MORTALITY DATA

Purpose: This project will look at the mortality experience of all race/sex groups to generate leads for further research, and will assist in describing the occupation mortality experience of women and blacks.

DSHEFS, Joyce A. Salg/Nina R. Lalich
CAN 552 Dates: 10/91-09/93

LABORERS' UNION HEALTH PROGRAM

Purpose: This project will develop specific programs for health promotion and disease prevention for laborers. NIOSH and other Centers in CDC will serve as resources to assist the Laborers' National Health and Safety Fund in developing and implementing these programs.

DSHEFS, Paul A. Schulte
CAN 558 Dates: 10/88-09/94

FFHHS SURVEY COORDINATION AND SUPPORT

Purpose: This project will provide support for FFHHS proposals going through OMB review, will maintain NIOSH involvement with surveys, and will monitor progress. It will provide for cross-comparisons and descriptive analysis of the survey data and publication of results.

DSHEFS, Joyce A. Salg/Lorri L. Cameron
CAN 565 Dates: 10/91-09/94

URANIUM MINERS-LOW DOSE INVESTIGATION

Purpose: This epidemiologic study will assess the association between exposure to low levels of radon daughters and the risk of developing lung cancer.

DSHEFS, Robert J. Roscoe
CAN 567 Dates: 10/82-09/93

HAZARD SURVEILLANCE IN AGRICULTURE

Purpose: This project will provide a mechanism for oversight and management of hazard related FFHHS activities and investigation of surveillance leads and issues generated during the FFHHS.

DSHEFS, Alice L. Greife/Joseph A. Seta
CAN 572 Dates: 10/91-09/95

SURVEILLANCE DATA MICROCOMPUTER SYSTEM

Purpose: The project will provide a mechanism to respond quickly and efficiently to requests for occupational exposure data on specified agents or tradename products. Development of the system will permit in-depth analysis and investigation of occupational exposure data without reliance on costly mainframe data processing.

DSHEFS, R. O. Young/W. K. Sieber
CAN 586 Dates: 10/90-09/93

OCCUPATIONAL LUNG DISEASES

MORTALITY STUDY OF BUTADIENE PRODUCTION WORKERS

Purpose: This study will evaluate the association between risk of hematopoietic cancer and employment in butadiene refining operations.

DSHEFS, Elizabeth M. Ward
CAN 597 Dates: 10/90-09/93

EPIDEMOLOGIC AND INDUSTRIAL HYGIENE INVESTIGATION OF TWO NEW GSA BUILDINGS

Purpose: This project will establish baseline data on chemical, microbiological, and psycho-social stresses in two new office buildings, and determine the effects of seasonality on these factors.

DSHEFS, Robert F. Mouradian
CAN 627 Dates: 10/91-09/94

HIV-RELATED HEALTH HAZARD EVALUATIONS

Purpose: Evaluation of potential exposures and work practices of health care personnel during the care of patients in various hospital settings will aid in developing prevention strategies that will minimize the risks from patient to worker transmission of HIV, MDR-TB, and other diseases. UV exposures and needlestick risks will also be assessed.

DSHEFS, David S. Sundin
CAN 685 Dates: 10/91-C

PROTECTIVE TECHNOLOGY BRANCH MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of national prevention strategies involving investigative laboratory and field research with all types of respirators, chemical and other protective clothing and equipment, and safety control systems and associated physiology responses to the use of such equipment.

DSR, Chief, PTB
CAN 785 Dates: 10/85-C

SIMULATED WORKPLACE PROTECTION FACTORS

Purpose: This project will develop more accurate methods of measuring respirator performance to improve NIOSH respirator certification and respirator performance, which in turn will reduce worker exposure to toxic chemicals.

DSR, Donald L. Campbell
CAN 786 Dates: 01/88-09/92

LIQUID PARTICULATE CHALLENGE TO REPLACE DOP

Purpose: This project will develop improved performance standards for respirators and will enable respirator manufacturers to produce respirators that will better protect workers from airborne contaminants.

DSR, Ernest S. Moyer
CAN 812 Dates: 10/90-06/93

ORGANIC VAPOR CHALLENGE TO REPLACE CARBON TETRACHLORIDE

Purpose: This project will develop improved organic vapor and gas performance standards for cartridges and will enable respirator manufacturers to produce respirators that will better protect workers from airborne organic vapor/gas contaminants.

DSR, Ernest S. Moyer
CAN 828 Dates: 10/89-09/93

"USE TEST" FOR SCBA PERFORMANCE EVALUATION

Purpose: This project will modify current "Use Test" performance requirements and test procedures to reflect advancements in continuous, online measurement technology, the wide variety of improved SCBA available, and the physiological basis for appropriate test protocols.

DSR, Nina L. Turner
CAN 829 Dates: 10/89-09/92

FEASIBILITY STUDY TO EVALUATE TRAINING FOR CONSTRUCTION PAINTERS

Purpose: This project will conduct a feasibility study of evaluating training for painters who work with hazardous chemicals and/or in hazardous situations. Background information on different types of training programs and databases will be collected and evaluated.

DSR, Janet J. Johnston
CAN 832 Dates: 10/91-09/92

PROMULGATION OF 42 CFR 84

Purpose: This project will increase worker protection from airborne contaminants by upgrading the certification standards and increasing the safety and reliability of respirators.

DSR, Richard W. Metzler
CAN 839 Dates: 01/87-C

OSHA METHYLENE CHLORIDE ORGANIC VAPOR BREAKTHROUGH STUDY

Purpose: This project will transmit data to OSHA in support of their methylene chloride rulemaking process.

DSR, Ernest S. Moyer
CAN 850 Dates: 10/91-03/93

EVALUATION, CERTIFICATION, AND COORDINATION ACTIVITIES

Purpose: This project will provide judgment and guidance to the legislatively mandated respirator and coal mine dust personal sampler certification programs which will help to increase worker protection from airborne contaminants.

DSR, Richard W. Metzler
CAN 852 Dates: 05/72-C

OCCUPATIONAL LUNG DISEASES

AIR PURIFYING RESPIRATOR TESTING

Purpose: This project will increase worker protection from airborne contaminants by (1) approving respirators in accordance with regulations, (2) through the audit and complaints program assuring that respirators in the marketplace comply with regulations, and (3) providing expert advice on respirator applications.

DSR, Christopher C. Coffey
CAN 853 Dates: 05/72-C

ATMOSPHERE SUPPLIED RESPIRATOR TESTING

Purpose: This project will increase worker protection from airborne contaminants by (1) approving respirators in accordance with regulations, (2) through the audits and complaints program assuring that respirators in the marketplace comply with regulations, and (3) providing expert advice on respirator applications.

DSR, Samuel L. Terry
CAN 854 Dates: 05/72-C

COAL MINE DUST PERSONAL SAMPLER UNIT

Purpose: This project will increase worker protection from airborne contaminants by certifying CMDPSU which will provide more accurate measurements of particulate levels for MSHA compliance purpose.

DSR, Joan R. Allender
CAN 855 Dates: 05/72-C

QUALITY ASSURANCE DOCUMENTATION CONTROL

Purpose: This project will increase worker protection from airborne contaminants by (1) evaluating quality assurance of respirator manufacturers, and (2) through an in-plant audit program assuring that respirators are reliable.

DSR, Theodore A. Pettit
CAN 857 Dates: 05/72-C

DEVELOPMENT OF ALVEOLAR/THORACIC PERSONAL DUST SAMPLER

Purpose: This project will permit particle size-dependent over-estimates to be characterized for other CMDPSU samplers. The true miner's deposited dose will be more accurately determined for epidemiological studies, and will serve as a better monitoring/sampling instrument for evaluating the toxicological effectiveness of coal mine exposure control technologies.

DSR, John M. Dower
CAN 859 Dates: 10/90-09/92

SAFETY AND HEALTH FOR OCCUPATIONAL PROFESSIONALS (SHOP)

Purpose: This project specifically conducts education and training programs to implement information dissemination strategies in occupational lung diseases, musculoskeletal injuries, psychological disorders, and disorders of reproduction.

DTMD, Michael J. Colligan
CAN 766 Dates: 10/88-C

OCCUPATIONAL LUNG DISEASES

SMALL BUSINESS INITIATIVE

Purpose: Provide for the educational and training component of the NIOSH small business initiative. These instructional materials and training programs for managers will create an awareness of, and provide knowledge on, occupational hazards, their health effects, and control strategies to reduce the hazards.

DTMD, James B. Walters
CAN 774 Dates: 10/88-C

PROJECT EPOCH

Purpose: This project will provide an ongoing educational program for physicians and residents in the primary care specialties to improve their skills in recognizing and treating occupational diseases.

DTMD, Norbert J. Berberich
CAN 790 Dates: 10/89-09/94

MUSCULOSKELETAL INJURIES

ERGONOMIC RISKS FROM TOOL USAGE AND DESIGN

Purpose: This project will evaluate the effects of tool usage and design factors that contribute to hand/wrist disorders. Prototype control studies will be conducted to illustrate improved tool design.

DBBS, Daniel J. Habes
CAN 244 Dates: 10/87-09/93

BIODYNAMICS OF FREQUENT ASYMMETRIC LIFTING

Purpose: This project will provide biomechanical data on the capacity of workers to safely perform frequent, asymmetric lifting tasks.

DBBS, Thomas R. Waters
CAN 246 Dates: 10/89-09/94

AGE AS AN ERGONOMIC RISK FACTOR

Purpose: This project will identify age, gender, and occupational groups at risk for musculoskeletal disorders and validate NOES findings with the Bureau of Labor Statistics (BLS) and the Finnish Institute of Occupational Health (FIOH) incidence data.

DBBS, Vern P. Anderson
CAN 250 Dates: 10/90-09/93

ERGONOMIC DESIGN OF KEYBOARDS TO REDUCE CUMULATIVE TRAUMA DISORDERS

Purpose: Project will evaluate existing research data and conduct laboratory/ field studies to provide information on keyboard design alternatives for preventing cumulative trauma disorders in keyboard operators.

DBBS, Naomi G. Swanson
CAN 259 Dates: 10/91-09/93

SHOULDER/NECK MUSCLE TENSION FOR REPETITIVE WORK

Purpose: This project will develop control techniques in the form of work-rest ratios for reducing shoulder and neck fatigue from overhead work.

DBBS, Roger R. Rosa
CAN 260 Dates: 10/85-09/93

ASSESSMENT OF MUSCULOSKELETAL DISORDERS IN THE RETAIL FOOD INDUSTRY

Purpose: This project will identify and assess ergonomic job stressors in the retail food industry. Data will be used to describe the dose-response relationships between exposures and musculoskeletal disorders. Ergonomic interventions will be developed to control or prevent work-related musculoskeletal disorders.

DBBS, Katharyn A. Grant
CAN 268 Dates: 10/91-09/95

MUSCULOSKELETAL INJURIES

JOB ASSESSMENT PROTOCOL FOR ERGONOMIC HAZARD EVALUATIONS

Purpose: This project will identify and document methods for conducting ergonomic hazard evaluations. The resulting methods will be assembled into a series of job assessment protocols or methods for field use.

DBBS, Vern P. Anderson
CAN 269 Dates: 10/91-09/94

BIOMOLECULAR MARKERS OF CHRONIC TRAUMA

Purpose: This project will identify biomolecular markers which will be used to detect the development of occupationally related joint injury at an early, pre-clinical stage. Those workers most vulnerable to this condition can potentially be identified before irreversible damage occurs and moved to a less physically demanding job.

DBBS, James P. Mastin
CAN 344 Dates: 10/88-09/94

DEVELOPMENT OF AN INTERVENTION MODEL FOR MUSCULOSKELETAL INJURIES

Purpose: This project will involve an intervention program or plan to reduce identified musculoskeletal problems.

DPSE, James H. Jones
CAN 422 Dates: 10/88-C

ERGONOMIC INTERVENTIONS FOR THE BEVERAGE DELIVERY INDUSTRY

Purpose: Provide recommendations to reduce injury during beverage crate handling and disseminate such information to equipment manufacturers and users.

DPSE, James D. McGlothlin
CAN 424 Dates: 10/90-09/93

ERGONOMIC STUDY OF POWERED HAND TOOLS IN THE AUTOMOTIVE INDUSTRY

Purpose: This project will provide listing of ergonomically-designed tools to assist with job design in the auto industry.

DPSE, Stephen S. Smith
CAN 454 Dates: 10/91-09/94

CUMULATIVE TRAUMA DISORDERS CRITERIA DOCUMENT (CD)

Purpose: This project will provide a critical evaluation of information on occupationally-induced cumulative trauma disorders. The evaluation will be used to develop a Criteria Document that will provide a recommended standard for the prevention of cumulative trauma disorders of the upper extremities.

DSDTT, Joann A. Wess
CAN 138 Dates: 10/89-09/93

MUSCULOSKELETAL INJURIES

CARPAL TUNNEL STUDY

Purpose: This study will give an estimate of the incidence of work-related carpal tunnel syndrome seen in the offices of primary care doctors and provide insight into the operation of provider-based surveillance methods.

DSHEFS, Eugene Freund
CAN 507 Dates: 11/88-09/92

SENTINEL HEALTH EVENT FOLLOW-BACK

Purpose: Project will provide a surveillance system to identify where preventable occupational diseases are occurring. This will assist in direct prevention and help prioritize further research.

DSHEFS, Paul J. Seligman
CAN 518 Dates: 10/85-09/92

SURVEYOR TRAINING

Purpose: This project will identify and provide the training and data needed by cooperative agreement states to assess the chemical, physical, biological, and safety hazards in the agricultural sector.

DSHEFS, David H. Pedersen
CAN 566 Dates: 10/89-09/92

OCCUPATIONAL AND SAFETY SURVEILLANCE THROUGH HEALTH DEPARTMENTS AND NURSES IN AGRICULTURAL COMMUNITIES

Purpose: Provides community-based surveillance and intervention by assigning nurses in rural communities.

DSHEFS, Eugene Freund
CAN 585 Dates: 10/90-09/95

DEVELOPMENT OF INDUSTRY-WIDE MUSCULOSKELETAL STUDIES

Purpose: This project will assess the prevalence of musculoskeletal disorders (MD) in a number of industries, develop methods to identify and measure exposures associated with MD and hold a conference on the prevention of MD.

DSHEFS, Marie H. Sweeney
CAN 596 Dates: 10/90-09/95

ASSESSMENT OF MUSCULOSKELETAL DISORDERS IN THE RETAIL FOOD INDUSTRY

Purpose: This project will assess the prevalence of work-related musculoskeletal disorders in retail grocery workers, identify risk factors associated with these disorders, and recommend strategies for reducing them.

DSHEFS, Sherry L. Baron
CAN 634 Dates: 10/91-09/96

MUSCULOSKELETAL INJURIES

MUSCULOSKELETAL INJURIES IN AGRICULTURE

Purpose: This project will recommend procedures to reduce the biomechanical stresses to the musculoskeletal system for high-risk agricultural jobs.

DSR, Thomas G. Bobick
CAN 806 Dates: 10/90-09/93

NIOSH ATLAS OF LOW BACK TESTS/MEASURES: CLINICAL TRIALS

Purpose: This project will serve to develop and validate the discriminate validity of the NIOSH Low Back Atlas for assessing low back injuries. The NIOSH Low Back Atlas has established a series of standardized diagnostic tests/measures which have the potential to classify low back musculoskeletal injuries.

DSR, Thomas K. Hodous
CAN 815 Dates: 10/87-09/92

NURSING HOME BACK INTERVENTION STUDY

Purpose: This project will compare low back injury rates and subjective stresses to nursing home staff with and without the use of selected mechanical lifting devices. Preliminary research suggests that these devices can reduce low back injuries to nursing staff involved with transferring patients by 30 percent to 50 percent.

DSR, Linda A. Chamberlain
CAN 824 Dates: 10/91-09/95

PROJECT SHAPE

Purpose: This project will increase OSH awareness through instructional materials in the engineering profession. In turn, engineering efforts to prevent occupational hazards through engineering design and other engineering functions will occur.

DTMD, John T. Talty
CAN 775 Dates: 10/88-C

METHODS FOR ASSESSING WORKER EXPOSURE TO ELECTROMAGNETIC FIELDS

Purpose: This project will determine the methodologies and instrumentation to be employed in assessing worker exposures to EMF.

DBBS, Joseph D. Bowman
CAN 266 Dates: 10/90-09/92

2D-PAGE AS A TOOL IN MOLECULAR EPIDEMIOLOGY OF AGRICULTURAL DISEASE(S)

Purpose: This project will compare 2D-Page generated protein maps/patterns derived from human tissue cultures exposed to agricultural hazards with their controls. Differences in protein maps/patterns will provide clues for further investigation as potential biomarkers for agricultural hazard exposures.

DBBS, Russell E. Savage, Jr.
CAN 283 Dates: 10/91-09/94

EXPERIMENTAL MODEL FOR HUMAN BLADDER CARCINOGENESIS

Purpose: A laboratory research model will be developed to mimic the continuum of phases associated with human bladder carcinogenesis. These include the initial exposure phase and culminate in malignancy. Biochemical events associated with selected phases will be examined for potential as biomarkers for effect.

DBBS, Russell E. Savage, Jr.
CAN 285 Dates: 10/90-09/93

BIOLOGICAL MONITORING FOR ARYL AMINES

Purpose: This project will investigate analytical techniques for detection of accessible tissue DNA or hemoglobin adducts for use in biomonitoring of industrial carcinogens. The ultimate goal is the development of a routine analytical procedure which indicates exposure and relates qualitatively and/or quantitatively to carcinogenesis.

DBBS, Kenneth L. Cheever
CAN 314 Dates: 10/85-09/92

IN VITRO SYSTEMS FOR HUMAN BIOLOGICAL MONITORING

Purpose: Project will investigate the human and rodent cellular production-of and response-to reactive intermediates of toxicants. Effects and defenses to reactive oxygen species produced by carcinogens, and organ-specific toxicants will be examined. Effects will be assessed as potential biomarkers of exposure or indicators of heightened sensitivity.

DBBS, Mark A. Toraason
CAN 317 Dates: 10/87-09/93

IMMUNOLOGICAL MARKERS OF HERBICIDE EXPOSURE

Purpose: Project will identify immunologic changes in animals and humans resulting from exposure to the model agent herbicide, alachlor. Specific immune system damage may be a major mechanism of disease production. Alachlor antibody formation will be evaluated which can serve as an indicator of exposure.

DBBS, Raymond E. Biagini
CAN 343 Dates: 10/89-09/92

VALIDATION STUDIES IN OCCUPATIONAL IMMUNOTOXICOLOGY

Purpose: A validated panel of immunotoxicity tests will be used to assess subtle, relevant, immunotoxicologic changes in worker populations. Collaborations with DSHEFS will provide proper human samples and NIEHS (NTP Agreement) will conduct animal model studies that parallel the field studies.

DBBS, Raymond E. Biagini
CAN 345 Dates: 10/90-09/95

ASSESSING EXPOSURES OF MAGNETIC RESONANCE IMAGING (MRI) TECHNICIANS

Purpose: This project will study the feasibility and methods of measuring personal exposures of MRI technicians to electric and magnetic fields from the static to the radio-frequency range. Together with an NCI study on the feasibility of an MRI technician registry, this study will determine how an epidemiological study can best be conducted.

DBBS, Joseph D. Bowman
CAN 375 Dates: 10/91-09/94

INHALATION TOXICOLOGY AND RESEARCH SUPPORT

Purpose: This project will provide resources for the development of generation techniques, measurement methods, and quality control procedures for inhalation chamber exposure atmospheres for NIOSH inhalation toxicology research and the conduct of the inhalation exposures required for DBBS research and collaborative research with other divisions (DRDS).

DBBS, Alexander W. Teass
CAN 379 Dates: 10/80-C

DIAGNOSTIC AND RESEARCH PATHOLOGY

Purpose: This project will provide gross and microscopic examination/diagnosis for experimental animal tissues and consultation pathology services for NIOSH research studies.

DBBS, Richard A. Salomon
CAN 386 Dates: 10/76-C

PARTICULATE AND TISSUE ANALYSIS RESEARCH AND SERVICE

Purpose: This project will use electron microscopy and microprobe analysis to characterize quartz particles being used in an inhalation study. Electron microscopy and particle analysis support will be provided to other NIOSH research programs and field studies as requested.

DBBS, Robert D. Riley
CAN 387 Dates: 10/76-C

APPLIED CONTROL TECHNOLOGY STUDIES

Purpose: This project provides for dissemination of the results of control technology studies to industry, labor, and other agencies. It also provides for the investigation of emerging problems and control techniques. These may include substances for which regulatory action is considered, new processes or manufacturing technologies, etc.

DPSE, James A. Gideon
CAN 403 Dates: 10/80-C

CONTROL TECHNOLOGY FOR NIOSH SURVEILLANCE ACTIVITIES

Purpose: This project will disseminate control information directly to plants with cases of silicosis, and will develop guidelines for state follow-back of health hazards.

DPSE, Dennis M. O'Brien
CAN 404 Dates: 10/88-C

CONTROL TECHNOLOGY FOR SMALL BUSINESS

Purpose: Develop and disseminate control technology information to radiator repair shops which have been selected as a small business for intervention.

DPSE, John W. Sheehy
CAN 415 Dates: 10/88-03/92

CONTROL OF WOOD DUST FROM WOODWORKING PROCESSES

Purpose: Results of this project will be used to increase the efficiency of emission controls for woodworking processes including hand sanding and sawing. Technology will be applicable to a number of processes although the control criteria will be developed with a focus on reduction of wood dust emissions.

DPSE, Jennifer L. Topmiller
CAN 430 Dates: 10/90-09/93

A SAMPLING AND ANALYTICAL METHOD FOR AIRBORNE DIESEL-EXHAUST PARTICLES

Purpose: A sampling and analytical method for diesel-exhaust particles in work-place air will be developed. This project will provide support for exposure surveillance and health effects evaluations.

DPSE, Mary E. Birch
CAN 438 Dates: 10/89-09/92

PORTABLE MASS SPECTROMETER OR FTIR EVALUATION

Purpose: The goal will be achieved through the evaluation of a gas chromatography/mass spectrometer for use in the field by trained industrial hygienists where present monitoring techniques are inadequate.

DPSE, Harley V. Piltingsrud
CAN 444 Dates: 10/89-12/92

DEVELOPMENT OF ANALYTICAL METHODS FOR AGRICULTURAL CHEMICALS

Purpose: This project will develop three sampling and analytical methods for pesticides or herbicides in air. Many of these compounds are suspected of causing cancer, reproductive or neurotoxic disorders.

DPSE, Eugene R. Kennedy
CAN 447 Dates: 10/90-09/92

APPLIED MONITORING STUDIES

Purpose: This project will provide monitoring instrumentation selection and support to other NIOSH divisions. Monitoring support to DSHEFS projects will provide recommendations for monitoring worker exposures through the use of direct reading instruments.

DPSE, Judd C. Posner
CAN 456 Dates: 10/89-C

ASPHALT FUME FRACTIONATION AND IDENTIFICATION OF GENOTOXIC COMPONENTS

Purpose: Carcinogenic fractions from a prior NIOSH asphalt fume study will be subfractionated, tested for genotoxicity, and active components characterized. This information is needed to develop specific methods for monitoring worker exposure and controls or improved materials to minimize the levels of genotoxic compounds in asphalt fume.

DPSE, Larry D. Olsen
CAN 467 Dates: 10/91-09/95

BENZENE SCREENING IN SHIPYARDS

Purpose: The development of a field screening technique for benzene with reasonable specificity at sub-part per million levels, applicable for use in shipyard environments and other complex atmospheres, will provide the ability to ensure safe entry into areas of potential benzene contamination, such as compartments of ships.

DPSE, Guy E. Burroughs
CAN 469 Dates: 10/91-12/92

COMPREHENSIVE ANALYTICAL CHEMISTRY SERVICES

Purpose: This project coordinates requests from NIOSH researchers for analytical chemistry support for all NIOSH projects which require chemical analyses. The project also provides overall laboratory administration of sample analyses performed either on contract or in the NIOSH laboratories.

DPSE, Donald D. Dollberg
CAN 482 Dates: 10/83-C

ANALYTICAL SUPPORT TO DBBS RESEARCH AND IWSB/DSHEFS

Purpose: Analytical support to DBBS and IWSB/DSHEFS will be provided in the areas of (1) inhalation studies of toxic substances, (2) chemical characterization of complex mixtures such as diesel emissions and pesticides, and (3) industry-wide studies of lead workers and indoor air quality.

DPSE, John L. Holtz
CAN 483 Dates: 10/85-C

ANALYTICAL CHEMISTRY SUPPORT TO DPSE RESEARCH

Purpose: This project provides for chemistry support to DPSE research activities. Sampling and analytical support will be given to the control technology program's attempts to prevent the exposure of workers to hazardous levels of chemical agents. New measurement methods for asbestos will also be evaluated.

DPSE, Donald D. Dollberg
CAN 484 Dates: 10/85-C

OCCUPATIONAL CANCERS

INDUCTION OF DNA-ADDUCT IN THE LUNGS BY INDUSTRIAL CHEMICALS

Purpose: This project will establish and evaluate the efficacy of the lung cell DNA adduct analysis, a molecular methodology, for the detection and assessment of the potential carcinogenic hazards of chemicals and complex mixtures to which workers are exposed.

DRDS, Wen-zong Whong
CAN 106 Dates: 10/89-09/92

TOXICITY STUDIES OF MILD GASIFICATION PRODUCTS

Purpose: This project will determine whether mild coal gasification products can cause DNA and chromosomal alterations or damages in bacterial and/or mammalian cells.

DRDS, Tong-man Ong
CAN 166 Dates: 10/90-12/93

WOOD DUST EXPOSURE IN THE CONSTRUCTION INDUSTRY

Purpose: Sampling methods and exposure assessment of wood dust among carpenters is needed to provide data for risk assessment for nasal cancer as well as asthma.

DRDS, Michael McCawley
CAN 175 Dates: 10/91-10/94

QUANTITATIVE RISK ASSESSMENT

Purpose: This project will make QRA efforts to understand the basic mechanism of disease causation; evaluate the metabolic pathways of, and variation in response to, a particular substance; estimate the adverse health risks to humans; provide a basis for prioritizing the issues for regulatory recommendations and provide a component for decision making.

DSDTT, Leslie T. Stayner
CAN 085 Dates: 10/70-C

RUBBER PRODUCTS MANUFACTURING

Purpose: This project will provide a critical evaluation of the health hazards in the rubber products manufacturing industry. The evaluation will be used to develop a position paper that will recommend development of a journal article describing the hazards and the need for research to determine the extent of the problem.

DSDTT, Faye Rice
CAN 139 Dates: 10/89-09/92

ASPHALT CURRENT INTELLIGENCE BULLETIN (CIB)

Purpose: This project will provide a critical evaluation of information on the health risks associated with exposure to asphalt. The evaluation will be used to develop a CIB that addresses the hazards of exposure to asphalt and recommends measures for control.

DSDTT, Crystal L. Ellison
CAN 144 Dates: 10/89-09/92

CHILDHOOD LEUKEMIA AND PARENTAL OCCUPATIONAL EXPOSURE TO IONIZING RADIATION

Purpose: Project will replicate study by Gardner et al., at the Sellafield Nuclear Facility in the U.K. regarding an excess of childhood leukemia associated with parental exposure to ionizing radiation.

DSHEFS, Anne T. Fidler
CAN 504 Dates: 10/91-C

EMERGING PROJECTS--SURVEILLANCE BRANCH

Purpose: Identify existing information gaps in our knowledge base about hazard and health effects, and evaluate the feasibility of occupational disease and hazard surveillance activities.

DSHEFS, Todd M. Frazier/John P. Sestito
CAN 506 Dates: 10/91-09/94

REGISTRY OF DIOXIN WORKERS AND MORTALITY STUDY

Purpose: This epidemiologic study will assess the association between exposure to dioxin and the risk of developing cancer, especially soft tissue sarcoma.

DSHEFS, Marilyn A. Fingerhut
CAN 525 Dates: 10/79-09/93

EPIDEMIOLOGIC METHODS DEVELOPMENT

Purpose: This epidemiologic methods project will improve the overall research program being conducted as part of the industry-wide studies program by maintaining state-of-the-art methods.

DSHEFS, Nelson K. Steenland
CAN 532 Dates: 10/84-C

MORTALITY STUDY OF WORKERS EXPOSED TO HALOWAX

Purpose: This epidemiologic study will assess the association between exposure to halowax and the risk of developing cancer.

DSHEFS, Elizabeth M. Ward
CAN 536 Dates: 10/83-09/92

EPIDEMIOLOGICAL STUDY OF BLADDER CANCER AMONG WORKERS EXPOSED TO O-TOLUIDINE AND O-ANILINE

Purpose: This study will assess the association between exposures at a chemical manufacturing plant and the occurrence of bladder cancer and heart disease.

DSHEFS, Elizabeth M. Ward
CAN 537 Dates: 10/88-09/93

OCCUPATIONAL CANCERS

UPDATE OF COMPLETED COHORT MORTALITY STUDIES

Purpose: These epidemiologic studies will assess the association between exposure and the risk of developing disease (primarily cancer).

DSHEFS, Andrea H. Okun
CAN 542 Dates: 10/82-C

MEDICAL, BIOMETRIC, AND IH STUDY OF EMERGING PROBLEMS

Purpose: Provide management and guidance for the implementation of the national prevention strategies involving epidemiologic research.

DSHEFS, Marilyn M. Fingerhut
CAN 543 Dates: 10/79-C

EXPOSURE ASSESSMENT OF WORKERS EXPOSED TO ACRYLONITRILE

Purpose: This project will help establish the link between acrylonitrile and cancer in humans and develop new methods for historical exposure assessment.

DSHEFS, John Zey
CAN 545 Dates: 10/88-09/93

MULTIVARIATE ANALYSES OF DATA COLLECTED IN THE NOES

Purpose: The project will identify and evaluate occupational factors associated with specific occupational programs and industries.

DSHEFS, William Sieber/David Pedersen
CAN 548 Dates: 10/91-09/92

BERYLLIUM CASE CONTROL STUDY

Purpose: This study will assess the relationship between level and type of beryllium exposure and risk of lung cancer.

DSHEFS, Wayne T. Sanderson
CAN 553 Dates: 10/88-09/94

WORKER NOTIFICATION

Purpose: Notification of workers regarding their risk of disease results in some prevention of the disease by encouraging screening, health promotion, and better awareness (education).

DSHEFS, Paul A. Schulte
CAN 554 Dates: 03/85-C

OCCUPATIONAL CANCERS

FEASIBILITY ASSESSMENTS FOR NEW TOPICS

Purpose: This project will contribute to the resolution of the goal by (1) filling in data gaps on exposure to agents, (2) locating suitable cohorts for epidemiologic investigation, and (3) determining the feasibility of epidemiologic investigations on exposure of interest.

DSHEFS, John M. Fajen
CAN 556 Dates: 10/88-09/92

ETHYLENE OXIDE MORTALITY STUDY

Purpose: This epidemiologic study will assess the association between exposure to ethylene oxide and the risk of developing leukemia.

DSHEFS, Nelson K. Steenland
CAN 557 Dates: 10/82-09/91

GENOTOXIC EFFECTS OF FORMALDEHYDE EXPOSURE OF MORTUARY SCIENCE STUDENTS

Purpose: This project will assess the development of cytogenetic changes among students and staff at a college of mortuary science following exposure to formaldehyde.

DSHEFS, Paul A. Schulte
CAN 569 Dates: 10/89-09/93

EVALUATION OF RADON/RADON PROGENY EXPOSURES TO RADON MITIGATORS

Purpose: This project will determine the factors involved in exposure to radon during mitigation activities.

DSHEFS, Thomas F. Bloom
CAN 573 Dates: 10/89-09/94

COMPUTERIZATION OF IHS/IWSB FILES

Purpose: This project will provide valuable information on exposure levels by year and by standard industrial classification for many suspect carcinogens.

DSHEFS, Thomas F. Bloom
CAN 574 Dates: 10/89-09/94

LUNG CANCER MORTALITY AMONG BLACK WORKERS

Purpose: This project will seek to determine what factors are responsible for elevated lung cancer rates among black males.

DSHEFS, Nelson K. Steenland
CAN 575 Dates: 10/89-09/93

OCCUPATIONAL CANCERS

CANCER SCREENING IN FARMERS

Purpose: This project will develop a series of cancer control demonstration projects. It will also provide for a series of studies to identify barriers to effective cancer control and to evaluate markers of premalignant changes.

DSHEFS, Paul A. Schulte
CAN 577 Dates: 10/89-09/94

MORTALITY STUDY (LIUNA)

Purpose: PMR analyses will be used to identify high mortality risks as leads to in-depth epidemiologic studies of exposure disease relationships.

DSHEFS, Frank Stern
CAN 578 Dates: 10/89-09/93

BIOLOGICAL MARKERS OF OCCUPATIONAL BLADDER CANCER

Purpose: This project will seek to determine (1) molecular changes that result from occupational exposure to aromatic amines, and (2) metabolic phenotypes that predispose workers to bladder cancer.

DSHEFS, Paul A. Schulte
CAN 584 Dates: 10/89-09/96

CONSTRUCTION TRADES SURVEILLANCE

Purpose: Will identify excess risks for death in construction workers that can be targeted for intervention strategies and those that need further research. Project will assist a national union with the development of an in-house mortality surveillance program per the request from the Occupational Health Foundation, Building and Construction Trades Department.

DSHEFS, Cynthia Robinson/Frank Stern
CAN 594 Dates: 10/90-09/93

COAL HYDROGENATION MORTALITY STUDY

Purpose: This study will evaluate the association between exposure to the products of coal combustion and catalysis and respiratory disease and cancer mortality.

DSHEFS, Avima M. Ruder
CAN 598 Dates: 10/90-09/93

PENTACHLOROPHENOL PRODUCTION WORKERS MORTALITY STUDY

Purpose: This study will evaluate the association between exposure to pentachlorophenol (and dioxin and furan contaminants in its production) and cancer mortality.

DSHEFS, Avima M. Ruder
CAN 599 Dates: 10/90-09/93

OCCUPATIONAL CANCERS

DRY CLEANING MORTALITY UPDATE AND CANCER MORBIDITY

Purpose: This study will evaluate the association between exposure to perchloroethylene (and other dry-cleaning solvents) and cancer morbidity and mortality.

DSHEFS, Avima M. Ruder
CAN 622 Dates: 10/90-09/93

EVALUATION OF EXPOSURE AND ADVERSE HEALTH OUTCOMES IN CONSTRUCTION INDUSTRY

Purpose: This project will assess the feasibility of conducting large-scale industrywide studies of exposure and adverse health outcomes in construction industry populations.

DSHEFS, Dennis Zaebst
CAN 624 Dates: 10/90-09/93

AGRICULTURE RELATED EMERGING PROBLEMS

Purpose: Provide management and guidance for the implementation of the national prevention strategies involving epidemiologic research.

DSHEFS, Marilyn M. Fingerhut
CAN 625 Dates: 10/90-C

INDUSTRY-WIDE EXTENT OF EXPOSURE ASSESSMENT FOR O-TOLUIDINE

Purpose: This project will identify and assess the major formulators, producers and users of o-toluidine. An exposure assessment consisting of biological monitoring, measuring personnel and area airborne exposure, wipe samples, and determining dermal exposure will be conducted.

DSHEFS, John Fajen
CAN 629 Dates: 10/91-09/93

SERUM LEVELS OF DIOXINS AND FURANS IN CURRENTLY EXPOSED WORKERS

Purpose: This study will assess the levels of dioxins and furans in the work places and serum of workers with known or postulated current exposures.

DSHEFS, Marilyn A. Fingerhut
CAN 630 Dates: 10/91-09/94

CASE-CONTROL STUDY OF COLORECTAL CANCER IN AGRICULTURAL STATES

Purpose: This study will investigate risk factors for colorectal cancer which are unique to farmers and their work environment.

DSHEFS, Raymond J. Alderfer
CAN 635 Dates: 10/91-09/95

OCCUPATIONAL CANCERS

SPONSORSHIP OF 9TH INTERNATIONAL SYMPOSIUM OF EPIDEMIOLOGY IN OCCUPATIONAL HEALTH

Purpose: The symposium will bring together people working in occupational epidemiology to share findings and applications in the NIOSH top ten areas.

DSHEFS, Lawrence J. Fine
CAN 643 Dates: 10/90-09/93

ACCESS TO NOHS DATABASE--PROFILE DEVELOPMENT

Purpose: Specific dissemination strategies will be developed for workers at risk of exposure to hazards that result in diseases.

DSHEFS, Joseph A. Seta/Leela I. Murthy
CAN 662 Dates: 10/78-C

DRAKE REGISTRY AND SCREENING PROJECT

Purpose: This study will develop a structure for identifying workers at high risk of disease and provide the opportunity for the delivery of services.

DSHEFS, Paul A. Schulte
CAN 894 Dates: 10/88-09/94

PREVENTION OF BIOLOGICAL EXPOSURE IN HEALTH CARE WORKERS

Purpose: This project will evaluate and then apply quick test methods to determine penetration of latex surgical gloves by viruses.

DSR, Stephen P. Berardinelli
CAN 817 Dates: 10/90-09/92

PES EMERGING PROBLEMS IDENTIFICATION AND TECHNICAL ASSISTANCE

Purpose: This project will allow us to assist other NIOSH divisions in conducting HHEs and similar evaluations, and to conduct training where deemed appropriate.

DSR, Gary P. Noonan
CAN 820 Dates: 10/91-09/94

EDUCATING PRIMARY CARE HEALTH PROVIDERS ABOUT AIDS

Purpose: This project will provide an ongoing educational program for physicians, residents, medical students, and nurses to improve their skills in dealing with exposure to HIV infection, occupational lung diseases and occupational cancers.

DTMD, Norbert J. Berberich
CAN 059 Dates: 10/91-09/92

OCCUPATIONAL CANCERS

COURSES/MODULES DEVELOPMENT

Purpose: This project will provide for the development of training materials for OSH practitioners identified in the prevention strategy documents through the NIOSH and ERC CE network. Numerous educational curriculum modules & technical documents, both written & video, require information to be provided either graphically or visually.

DTMD, Norbert J. Berberich
CAN 765 Dates: 10/88-C

HAZARDOUS SUBSTANCES TRAINING

Purpose: This project will increase the occupational safety and health knowledge base of state, local, and other health professionals to carry out their responsibilities in the management of hazardous substance activities. This will help prevent the major health and safety environmental problems nationwide.

DTMD, Bernadine B. Kuchinski
CAN 779 Dates: 10/89-C

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

ECONOMIC AND MANAGEMENT FACTORS IN THE CONTROL OF WORK EXPOSURES

Purpose: This project will identify patterns of management which promote or prevent proper control of occupational exposures. Identifying these patterns will improve effective communication and technology transfers with employers and managers.

DSDTT, Heinz W. Ahlers
CAN 093 Dates: 10/89-09/92

OCCUPATIONALLY RELATED HOMICIDES ALERT

Purpose: This project will develop an Alert in conjunction with DSR that identifies the high-risk job categories and associated causal factors for occupational homicides. The Alert will make recommendations for preventing such homicides.

DSDTT, Laurence D. Reed
CAN 112 Dates: 10/89-09/92

LOCKING AND TAGGING OF ENERGY SOURCES ALERT

Purpose: This project will develop an Alert in conjunction with DSR that identifies the high-risk job categories and associated causal factors for deaths and injuries related to the inappropriate locking and tagging of hazardous energy sources. The Alert will make recommendations for preventing such injuries/deaths.

DSDTT, Laurence D. Reed
CAN 114 Dates: 10/89-09/92

DEVELOPMENT OF NIOSH ALERTS

Purpose: This project will develop several Alerts in conjunction with other NIOSH divisions that identify the hazards associated with significant, new safety and health findings from NIOSH research.

DSDTT, Laurence D. Reed
CAN 129 Dates: 10/91-C

SURVEY INSTRUMENT DESIGN: HAZARD QUESTIONNAIRE

Purpose: Questions are purposely designed to provide information on occupational exposures in the agricultural sector.

DSHEFS, Joseph Seta/David Pedersen
CAN 579 Dates: 10/89-09/92

OCCUPATIONAL FATALITY INJURY SURVEILLANCE

Purpose: This project will identify the number and rate of occupational fatalities occurring in the nation through establishment of a National Traumatic Occupational Fatality Database.

DSR, Eleanor L. Jenkins
CAN 805 Dates: 10/84-C

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

FATAL ACCIDENT CIRCUMSTANCES AND EPIDEMIOLOGY–TECHNICAL ASSISTANCE

Purpose: This project will identify personal, organizational, environmental and circumstantial risk factors contributing to occupational fatalities and injuries.

DSR, Virgil J. Casini
CAN 807 Dates: 10/83-C

GRAIN HANDLING INJURY AND FATALITY PREVENTION

Purpose: This project will develop a work practices guide to provide scientifically sound recommendations on safe work practices to reduce the hazards of working with grain and grain handling systems on the farm and in other industrial environments.

DSR, Karl A. Snyder
CAN 808 Dates: 10/89-09/93

DEVELOPMENT OF A WORKPLACE HOMICIDE PREVENTION STRATEGY

Purpose: This project will facilitate the use of existing, both in-house and external, data systems to describe the occupational homicide experience of U.S. workers. Coordination and consultation with other professionals working in this area will lead to review compilation of additional data sources regarding occupational violence & related prevention strategies.

DSR, Dawn N. Castillo
CAN 809 Dates: 10/89-09/92

ROLLOVER PROTECTION FOR AGRICULTURAL TRACTORS

Purpose: This project will reduce traumatic injuries and fatalities associated with agricultural tractors by evaluating the advantages and disadvantages of different rollover protection systems, making recommendations for effective intervention strategies, and supporting their implementation.

DSR, John R. Etherton
CAN 810 Dates: 10/89-09/92

DEVELOPMENT OF NATIONALLY STANDARDIZED O/I CODING (SOIC) SOFTWARE

Purpose: This project will enable accurate identification of the occupation and industry of injured workers and provide comparability of occupational surveillance systems nationwide.

DSR, Nancy A. Stout
CAN 819 Dates: 10/91-09/93

QUANTIFICATION OF RISK FACTORS FOR FALLS FROM BUILDINGS UNDER CONSTRUCTION

Purpose: This project will compare fall injury risk with respect to the quality of company safety programs and personal and work-related risk factors.

DSR, Gwendolyn H. Cattledge
CAN 825 Dates: 10/87-09/94

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

OCCUPATIONAL INJURY RATES IN THE ALASKA COMMERCIAL FISHING INDUSTRY

Purpose: By using fatal and non-fatal rates, researchers will be able to make statements of risk, both inter- and intra-industry, and test hypotheses concerning significant differences in magnitude and trend of these industries. Variables concerning vessel characteristics will also be incorporated in any causal factor analysis.

DSR, Richard D. Kennedy
CAN 826 Dates: 10/91-09/93

OCCUPATIONAL TRAUMATIC INJURY SURVEILLANCE OF FARMERS

Purpose: This project will promote a uniform agricultural traumatic injury surveillance system through extension safety specialists in various states, evaluate data acquired specifically from the agricultural industry, and perform analyses in support of interventions to reduce fatalities and traumatic injuries.

DSR, John R. Myers
CAN 827 Dates: 10/87-C

CAUSAL FACTORS OF ALASKAN FISHING FATALITIES

Purpose: This project will look at fishing-specific and other more detailed injury data in Alaska. In addition, it will explore other databases, and develop a protocol for future research.

DSR, Linda A. Chamberlain
CAN 833 Dates: 10/91-09/92

DEVELOPMENT OF NEW METHODS FOR OCCUPATIONAL INJURY SURVEILLANCE

Purpose: This project will develop new, and improve existing, methods of occupational injury surveillance, and will also provide statistical and epidemiologic support to various DSR traumatic and musculoskeletal research projects.

DSR, Nancy A. Stout
CAN 834 Dates: 10/79-C

FEASIBILITY STUDY OF INJURY IN POWER COMPANY AND CONTRACT LINE MECHANICS

Purpose: The project will analyze workers' compensation data and obtain crude injury rates. The usefulness of company records and workers' compensation data will be assessed.

DSR, Deborah D. Landen
CAN 836 Dates: 10/91-09/92

IMPLEMENTATION OF SAFETY AND HEALTH PROGRAMS IN SMALL CONSTRUCTION COMPANIES

Purpose: This project will conduct training sessions for employers and employees and will pre-and post-test participants to determine retention and implementation of safety issues in company programs.

DSR, Gwendolyn H. Cattledge
CAN 842 Dates: 10/91-09/95

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

HOMICIDE IN CONVENIENCE STORES: AN EVALUATION OF PREVENTIVE STRATEGIES

Purpose: This project will conduct a study of convenience stores in cities which have the nation's most elevated crime rates. Preventive strategies will be developed, implemented, and evaluated.

DSR, Harlan E. Amandus
CAN 843 Dates: 10/91-09/95

SURVEILLANCE AND FIELD INVESTIGATIONS BRANCH MANAGEMENT

Purpose: This project will coordinate, evaluate, and facilitate the merging of musculoskeletal and traumatic injury research and surveillance programs into a coordinated research initiative which will address the recommendations of the National Strategies for Prevention of the Leading Work-Related Diseases and Injuries.

DSR, Timothy J. Pizatella
CAN 847 Dates: 10/85-C

CRITERIA FOR SHARPS CONTAINER DESIGN AND PLACEMENT

Purpose: This project will make recommendations on the design, placement, and use of sharps containers to minimize injuries in various health care settings, including emergency vehicles and laboratories.

DSR, James S. Spahr
CAN 863 Dates: 10/91-09/93

ANALYSIS AND FIELD EVALUATIONS BRANCH MANAGEMENT

Purpose: This project will coordinate, evaluate, and facilitate the merging of musculoskeletal and traumatic injury analytic research programs into a coordinated research initiative which will address the recommendations of the National Strategies for Prevention of the Leading Work-Related Diseases and Injuries.

DSR, Harlan E. Amandus
CAN 866 Dates: 10/90-C

STATE-BASED FATALITY SURVEILLANCE USING THE FACE MODEL

Purpose: This project will enable individual states to conduct occupational fatality surveillance and field investigation using the NIOSH FACE Model. This study will allow states to identify potential risk factors for work-related trauma and target intervention strategies and research priorities.

DSR, Louis D. Smith
CAN 870 Dates: 10/88-C

DEVELOPMENT OF SURVEILLANCE METHODS FOR OCCUPATIONAL MOTOR VEHICLE INJURIES

Purpose: This project will develop and evaluate incentive programs to increase seat belt usage on the job.

DSR, Janet J. Johnston
CAN 874 Dates: 10/88-09/94

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

NATIONAL SURVEILLANCE OF NON-FATAL OCCUPATIONAL INJURIES

Purpose: The project will provide for national estimates of occupational injuries within labor force groups on a real-time basis to identify high risk industries and occupations. The project has provision for case follow-back to identify risk factors and develop intervention strategies.

DSR, Larry A. Layne
CAN 875 Dates: 10/91-C

DSR SURVEILLANCE REPORT SERIES

Purpose: This project will develop a form and format, using desktop publishing technology, to simplify, streamline, and speed up the process of dissemination of surveillance data and analyses.

DSR, Herbert I. Linn
CAN 876 Dates: 10/90-09/92

U.S. FARM FAMILY HEALTH AND HAZARD SURVEY--INJURY SURVEILLANCE

Purpose: This project will develop a model questionnaire to determine the severity of work-related injuries to agricultural operators.

DSR, Deborah D. Landen
CAN 877 Dates: 10/89-09/92

STUDY OF LINEMAN-RELATED FATALITIES AND INJURIES

Purpose: This project will identify potential injury risk factors for utility linemen and develop recommendations to reduce the risk of injury.

DSR, Deborah D. Landen
CAN 878 Dates: 10/86-09/93

ANALYSIS OF OCCUPATIONAL INJURIES IN THE HEALTH INTERVIEW SURVEY

Purpose: This project will estimate injury rates using data from the HIS 1983-1987 Core Interview Survey and from the 1988 Occupational Supplement.

DSR, Deborah D. Landen
CAN 882 Dates: 10/90-09/92

AGRICULTURAL HEALTH PROMOTION SYSTEM

Purpose: Project will provide direct access to agricultural workers and their families by utilizing existing USDA Cooperative Extension Systems (CES) within land grant universities. This access will permit the dissemination of safety and health information through CES. In addition, innovative sources of dissemination identified by CES will be used as appropriate by state AHPS programs.

DSR, David L. Hard
CAN 883 Dates: 10/89-C

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

STATE MODEL CONSTRUCTION SAFETY AND HEALTH PROGRAM

Purpose: This project will develop model safety and health programs for the construction industries of three states to implement injury analyses systems and intervention methods for reducing industry-specific occupational injuries.

DSR, Ronald L. Stanevich
CAN 884 Dates: 10/89-09/95

OCCUPATIONAL INJURY PREVENTION IN ALASKA

Purpose: This project will develop a state-based field approach to the study and prevention of the leading types of work-related trauma. Prevention strategies will be identified, evaluated, and demonstrated in the Alaskan workplace.

DSR, Thomas R. Bender
CAN 893 Dates: 10/90-C

INFORMATION MANAGEMENT AND DISSEMINATION ACTIVITY

Purpose: This project will provide division network management; information management, storage, and retrieval support; and information product planning, development, writing/editing, production, and dissemination support. Methods of communicating information on hazards, scientific findings, and recommendations will be identified, applied, and evaluated in association with DSDTT.

DSR, Herbert I. Linn
CAN 895 Dates: 10/91-C

AGRICULTURAL SAFETY AND HEALTH

Purpose: Provide for the development of the educational resources to prepare various disciplines with knowledge to reduce fatalities, diseases, and injuries in the agricultural sector.

DTMD, Stephen D. Hudock
CAN 772 Dates: 10/89-C

PROJECT MINERVA

Purpose: This project will allow NIOSH to work collaboratively with an external academic-based organization to expedite the implementation of Project Minerva into the business school curriculum.

DTMD, Walter M. Haag
CAN 776 Dates: 10/88-C

OCCUPATIONAL CARDIOVASCULAR DISEASES

CONTROL OF EXPOSURES IN MINE ASSAY LABORATORIES

Purpose: This project will develop and disseminate control technology information to mine assay laboratories which are small businesses lacking effective engineering controls.

DPSE, John W. Sheehy
CAN 464 Dates: 10/91-09/94

INORGANIC LEAD CRITERIA DOCUMENT UPDATE

Purpose: This project will provide a critical evaluation of information of the health risks associated with exposure to lead. The evaluation will be used to develop a criteria document that will provide criteria for a recommended standard for the prevention of occupationally related disorders associated with exposure to inorganic lead.

DSDTT, Henryka U. Nagy
CAN 052 Dates: 10/90-09/92

MORTALITY AND IH STUDY OF BRIDGE & TUNNEL OFFICERS EXPOSURE TO CARBON MONOXIDE

Purpose: This study will address whether the current OSHA standard is adequate to protect the working population from cardiovascular disease.

DSHEFS, Frank B. Stern
CAN 505 Dates: 10/88-09/93

PROPORTIONAL MORTALITY STUDY OF A CONSTRUCTION TRADE UNION (II)

Purpose: This project will identify excess risks for death in construction workers that can be targeted for intervention strategies and those that need further research. Project will assist a national union with the development of an in-house mortality study per the request from the Occupational Health Foundation, Building and Construction Trades Department.

DSHEFS, Frank B. Stern
CAN 546 Dates: 10/91-09/94

MORTALITY SURVEILLANCE OF OCCUPATION AND INDUSTRY

Purpose: Through this project occupational health researchers have the data resources necessary to monitor U.S. occupational and industrial mortality differentials, and to assist in implementation of the national strategies.

DSHEFS, Carol A. Burnett
CAN 633 Dates: 10/80-C

COMBINED CHEMICAL/RF RADIATION TERATOGENESIS

Purpose: This project will determine whether long-term, low-level exposure to radiofrequency (RF) radiation acts synergistically in enhancing chemical-induced teratogenesis.

DBBS, David L. Conover
CAN 263 Dates: 10/89-09/93

IN VITRO METHODS FOR DETECTING DEVELOPMENTAL TOXICANTS

Purpose: This project will further evaluate and confirm the utility of an *in vitro* (nonmammalian) test system using drosophila melanogaster (fruit flies) to screen chemicals for their potential to cause mammalian developmental toxicity/teratogenesis.

DBBS, Dennis W. Lynch
CAN 286 Dates: 10/90-09/93

METHODS FOR ASSESSING REPRODUCTIVE POTENTIAL IN FEMALES

Purpose: This project will evaluate the potential of currently available methods to assess reproductive function in females for incorporation into a test battery which can be used to assess the reproductive potential of female workers in occupational settings.

DBBS, James S. Kesner
CAN 287 Dates: 10/87-09/94

VALIDATION OF A RABBIT MODEL FOR ASSESSING REPRODUCTIVE TOXICANTS

Purpose: This project proposes to validate the rabbit model for human male reproductive toxicity. A comparison of dose-response effects on semen parameters for the two species (high dose effects for men often exist in literature) will indicate the validity of this model.

DBBS, William J. Moorman
CAN 288 Dates: 10/91-09/95

METHODS FOR DETERMINING EVIDENCE OF SPERMATOGENIC DAMAGE

Purpose: This project will evaluate currently available methods to detect germ cell genetic damage and the most useful method(s) will be incorporated into the current DBBS semen profile so that both male reproductive impairment and genetic damage can be assessed using a single semen sample.

DBBS, Steven M. Schrader
CAN 289 Dates: 10/87-09/92

RF-INDUCED BODY CURRENT AND ABSORBED POWER DETERMINATIONS

Purpose: This project will assess workplace and operator variables affecting worker exposure to radiofrequency (RF) radiation, a suspected human reproductive hazard. NIOSH has documented that many RF sources exceed recommended exposure limits. RF-induced body currents will be used to quantify the influence of these variables on worker exposure.

DBBS, David L. Conover
CAN 363 Dates: 10/87-09/93

DISORDERS OF REPRODUCTION

CONTROL OF ANESTHETIC GASES IN DENTAL OPERATORIES

Purpose: The project will evaluate and/or develop and recommend controls for reducing persistent over-exposures to anesthetic gases in dental operatories. This information will be disseminated through the American Dental Association and other professional organizations.

DPSE, Keith G. Crouch
CAN 405 Dates: 10/86-09/92

IH EXPOSURE ASSESSMENTS IN SELECTED INDUSTRIES

Purpose: This project will fill in data gaps on exposure to selected agents and locate suitable cohorts for epidemiologic investigations.

DSHEFS, Kenneth M. Wallingford
CAN 547 Dates: 10/88-C

REPRODUCTIVE STUDY OF FEMALE FLIGHT ATTENDANTS

Purpose: This epidemiologic study will assess the association between work as a female flight attendant and the risk of adverse reproductive outcomes and conditions.

DSHEFS, Barbara A. Grajewski
CAN 626 Dates: 10/91-09/98

REPRODUCTIVE STUDY OF FEMALE VIDEO DISPLAY TERMINAL (VDT) OPERATORS

Purpose: This epidemiologic study will assess the association between working with video display terminals and the risk of adverse reproductive outcomes.

DSHEFS, Barbara A. Grajewski
CAN 687 Dates: 10/84-09/93

NEUROTOXIC DISORDERS

HUMAN NEUROBEHAVIORAL EFFECTS OF COMBINATION CHEMICAL EXPOSURES

Purpose: Neurological and behavioral dose-effect characteristics of common industrial solvents administered in combinations (two chemicals/ combination) will be evaluated using controlled human exposures. Primary interest will center on the neurotoxic and pharmacokinetic properties of these chemical combinations.

DBBS, Robert B. Dick
CAN 243 Dates: 10/87-09/94

WHO NEUROTOXICITY METHODS VALIDATION

Purpose: This project is part of an international collaborative effort coordinated by the World Health Organization (WHO) to evaluate the reliability, sensitivity, and specificity of a set of neurobehavioral methods designed to screen, in animals, chemicals that are potential neurotoxic agents in humans.

DBBS, Benjamin K. Nelson
CAN 245 Dates: 10/89-09/92

NEUROBEHAVIORAL ASSESSMENT OF PESTICIDE APPLICATORS

Purpose: Workers exposed to, or poisoned by, pesticides and fumigants are being evaluated for neurobehavioral impairment using the WHO-recommended Neurobehavioral Core Test Battery (NCTB), the Neurobehavioral Evaluation System (NES) Computerized Test Battery, and computerized measures specific to detect postural instability.

DBBS, John M. Russo
CAN 249 Dates: 10/88-09/93

NEUROBEHAVIORAL HEALTH RISKS IN FARM WORKERS

Purpose: Project will evaluate existing tests and develop new methods that can be used in agricultural environments for assessing neurobehavioral impairment in groups of agricultural workers or in individual farmers who have been exposed to chemical and physical hazards.

DBBS, Robert B. Dick
CAN 253 Dates: 10/91-09/96

ANIMAL HUSBANDRY SERVICES

Purpose: This project will manage and utilize resources to provide efficient animal husbandry and effective health surveillance for experimental animals used for DBBS research programs.

DBBS, Douglas D. Sharpnack
CAN 385 Dates: 10/76-C

DEVELOPMENT OF CONTROL TECHNOLOGY APPLICATIONS OF REAL-TIME MONITORING

Purpose: This project will explore the use of new real-time instruments to monitor for contaminants in the workplace. The project will also explore procedures for monitoring exposures not previously monitored in real-time. Agriculture and construction will be among the new areas in which applications will be explored.

DPSE, Michael G. Gressel
CAN 406 Dates: 10/90-09/92

NEUROTOXIC DISORDERS

CONTROL OF METHYLENE CHLORIDE IN FURNITURE STRIPPING

Purpose: Recommend controls for methylene chloride, a neurotoxin, carcinogen, and reproductive toxin in furniture stripping. This is an industry made up mostly of small businesses with no occupational health expertise.

DPSE, John Sheehy
CAN 418 Dates: 10/87-09/92

CONTROL OF HEALTH HAZARDS IN THE CONSTRUCTION INDUSTRY

Purpose: This project will document and/or develop, and disseminate appropriate control measures to protect workers from health hazards during maintenance (sand blasting) of steel structures (bridges, water towers, etc.).

DPSE, Ronald L. Mickelsen
CAN 435 Dates: 10/89-09/93

MONITORING TECHNIQUES FOR CHEMICAL AGENTS

Purpose: Improved sensitivity monitoring techniques will be evaluated/developed. This includes evaluating/comparing existing methodologies and optimization of analytical procedures. Particular attention will be paid to sampling high relative humidity atmospheres.

DPSE, Judd C. Posner
CAN 449 Dates: 03/87-12/91

REAL-TIME MONITORING FOR PESTICIDES

Purpose: Instrumentation developed by the Army to monitor for organophosphorus nerve agents will be evaluated. The ACAMS (Automated Continuous Air Monitoring System) and the IMS (Ion Mobility Spectrometer) will be examined.

DPSE, Judd C. Posner
CAN 450 Dates: 10/90-09/93

NATIONAL REPORTING OF OCCUPATIONAL LEAD EXPOSURE

Purpose: This project will provide for the successful implementation of state-based reporting of occupational lead poisoning.

DSHEFS, M. Montopoli/Paul Seligman
CAN 509 Dates: 10/91-09/96

AN ASSESSMENT OF THE EFFECTIVENESS OF OSHA'S LEAD STANDARD

Purpose: By identifying industries with current problems controlling lead exposure, surveillance efforts and prevention strategies can be focused to eliminate occupational lead poisoning.

DSHEFS, Allison Tepper/Paul Seligman
CAN 515 Dates: 10/86-09/93

NEUROTOXIC DISORDERS

NEUROLOGICAL SEQUELAE OF ACUTE PESTICIDE POISONING

Purpose: This project will seek to determine if there are any long-term neurological effects after organophosphate poisoning.

DSHEFS, Nelson K. Steenland
CAN 530 Dates: 10/89-09/93

STUDY OF METHYL BROMIDE AND SULFURYL FLUORIDE APPLICATORS

Purpose: This project will assess the effects of methylbromide and sulfuryl fluoride on target organs (nervous system and kidney) and develop biological monitoring techniques for both.

DSHEFS, Geoffrey Calvert
CAN 535 Dates: 10/89-09/94

HEALTH AND HAZARD SURVEILLANCE OF MIGRANT FARM WORKERS

Purpose: This project will describe the current state of knowledge of the occupational hazards and health of migrant farm workers (MFW). It will also identify existing and potential mechanisms of implementing and conducting health and hazard surveillance of MFW. Mechanism will be evaluated in designing a model surveillance network.

DSHEFS, L. L. Cameron/Janie Gittleman
CAN 592 Dates: 10/90-09/92

TAKE-HOME LEAD IN THE CONSTRUCTION INDUSTRY

Purpose: This project will characterize the extent of lead exposure in the construction industry and the potential for, and extent of, lead taken home from the worksite.

DSHEFS, Grace M. Egeland
CAN 608 Dates: 10/91-09/94

ASSESSMENT OF LEAD EXPOSURE IN RADIATOR REPAIR SHOPS

Purpose: This project will assess the level of compliance with existing exposure criteria for lead in radiator repair shops.

DSHEFS, Greg M. Piacitelli
CAN 623 Dates: 10/90-09/92

DIOXIN MORBIDITY AND REPRODUCTIVE STUDY OF U.S. CHEMICAL WORKERS

Purpose: This epidemiologic study will assess the association between exposure to dioxin and the risk of developing disease, including neurologic disease and dermatologic conditions.

DSHEFS, Marie H. Sweeney
CAN 849 Dates: 10/84-09/93

NOISE-INDUCTED HEARING LOSS

HEARING CONSERVATION PROGRAMS FOR UNDERSERVED WORKER GROUPS

Purpose: This project will assess current knowledge on the relation between hearing loss and exposure to impact noise. Noise and hearing data collected from selected impact noise-exposed populations (farmers, construction workers, and trades people) will permit development of dose-response formulas for hearing loss and exposure to impact noise.

DBBS, John R. Franks
CAN 262 Dates: 10/89-09/94

IMPACT NOISE EFFECTS ON HEARING IN LABORATORY ANIMALS

Purpose: The project will analyze available information, identify critical information gaps, and collect data to define the relationship between auditory damage and exposure to the parameters of impulse and impact noise (e.g., peak pressure, spectrum, duration, rise time, etc.). These data can be used to develop criteria for impact noise exposure.

DBBS, Derek E. Dunn
CAN 264 Dates: 10/89-09/94

NOISE-INDUCED HEARING LOSS: SUPPORT FOR FFHH SURVEY

Purpose: Project will provide training and support to NIOSH and extramural personnel in the collection of data relating to noise exposure and noise-induced hearing loss among agricultural workers. Project will also involve assisting in follow-back investigations and hearing health promotion activities.

DBBS, Christa L. Themann
CAN 265 Dates: 10/89-09/92

LABORATORY TECHNIQUES TO PREDICT HEARING PROTECTOR ATTENUATION

Purpose: This project will develop laboratory and field instrumentation and procedures to accurately and reliably determine the amount of hearing protection a worker is receiving. These data will help workers and supervisors select hearing protectors that provide adequate sound attenuation and reduce the possibility of noise-induced hearing loss.

DBBS, Carol J. Merry
CAN 267 Dates: 10/90-09/95

ELECTRON MICROSCOPIC METHODS FOR MORPHOLOGICAL INVESTIGATIONS

Purpose: Electron microscopic (EM) methods will be developed to quantitate cochlear morphological changes resulting from various noise exposures. Additional work will investigate development of quantitative EM morphological methods for other tissue/cells such as sperm, ova, and leukocytes.

DBBS, Douglas D. Sharpnack
CAN 346 Dates: 10/90-09/93

OCCUPATIONAL NOISE EXPOSURE CRITERIA DOCUMENT UPDATE (CD)

Purpose: This project will provide a critical evaluation of recent information on the health risks from occupational exposure to noise. The evaluation will be used to develop a CD update that will provide recommendations for preventing occupationally induced hearing loss.

DSDTT, Henry Chan
CAN 134 Dates: 10/89-09/93

DERMATOLOGICAL CONDITIONS

CUTTING FLUIDS

Purpose: This project will provide a critical evaluation of information on the health risks associated with exposure to cutting fluids. The evaluation will be used to develop a position paper that will recommend the possible development of an alert on nitrosamines and a journal article on metal working fluids.

DSDTT, Brenda K. Boutin
CAN 140 Dates: 10/89-09/92

ANALYSIS OF HEALTH INTERVIEW SURVEY DATA

Purpose: This project will continue the surveillance of employment-related morbidity to help achieve the goal of identifying and monitoring employment-related health effects in the U.S. worker population and help establish priorities for NIOSH research.

DSHEFS, Virginia Behrens
CAN 508 Dates: 10/83-09/92

HAZARD ASSESSMENT OF THE USE OF ANHYDROUS AMMONIA IN AGRICULTURE

Purpose: These data can be used to determine if there is a greater hazard between commercial and non-commercial personnel in the use of anhydrous ammonia; recommended changes in equipment work practices, and/or need for worker education will then be developed, reported, and disseminated.

DSHEFS, H. Venable/A. Beasley
CAN 576 Dates: 10/91-09/93

CHARACTERIZATION OF HOLES IN GLOVES

Purpose: This project will produce and characterize small holes in the range of 50 to 200 microns in protective materials and determine the relationship of penetration rate of chemicals as a function of hole size. Latex gloves have been shown to have a defect (pin hole) rate of 1.7 percent to 9 percent among brands/styles.

DSR, Stephen P. Berardinelli
CAN 886 Dates: 10/88-09/92

PSYCHOLOGICAL DISORDERS

METHODS FOR RATING JOB STRESS/STRAIN

Purpose: Improved methods for assessing stress factors for purposes of detecting stressful job conditions and promoting more uniform approaches to assessing job stress and strain will be developed.

DBBS, Joseph J. Hurrell
CAN 242 Dates: 10/83-09/93

ELECTRONIC PERFORMANCE MONITORING: STRESS PREVENTION STRATEGIES

Purpose: Job/organizational stress factors in electronic performance monitoring (EPM) will be investigated and work redesign solutions will be formulated.

DBBS, Traci L. Galinsky
CAN 247 Dates: 10/88-09/95

METHODS FOR ASSESSING INFORMATION PROCESSING DEMANDS

Purpose: Methods will be developed for assessing the contribution of psychological demands in the production of musculoskeletal strain among information workers.

DBBS, Naomi G. Swanson
CAN 248 Dates: 10/90-09/94

METHODS FOR IDENTIFYING STRESSORS IN AGRICULTURAL OCCUPATIONS

Purpose: Job stressors in agricultural occupations will be identified and compared to stressors in other occupations; intervention programs will be recommended.

DBBS, Lawrence R. Murphy
CAN 254 Dates: 10/91-09/94

CHARACTERISTICS OF HEALTHY WORK ORGANIZATIONS

Purpose: Factors associated with decreased stress-related disability and increased productivity will be identified using case study methods. The validation of these factors will be examined in an empirical study of matched pairs of organizations differing in disability and productivity experience.

DBBS, Joseph J. Hurrell
CAN 255 Dates: 10/91-10/94

STRESS CONTROL STRATEGIES IN COMPUTER-MEDIATED WORK

Purpose: Laboratory and field studies will be conducted to determine the usefulness of rest breaks and exercise for reducing stress, and to recommend improved rest break designs for implementation in the workplace.

DBBS, Steven L. Sauter
CAN 256 Dates: 10/85-09/93

PSYCHOLOGICAL DISORDERS

DEVELOPMENT OF SURVEY ASSESSMENT INSTRUMENT FOR IAQ

Purpose: An item pool for defining self-report measures of job demands and environmental work conditions will be developed. Such items will be proposed for inclusion in protocols for studying indoor air quality problems where apparent health complaints may be due to interaction among perceived job stressors and air quality factors.

DBBS, Joseph J. Hurrell
CAN 257 Dates: 10/88-09/93

CONTROL OF JOB STRESS: APA

Purpose: Project will fund a joint American Psychological Association (APA)--NIOSH conference on job stress issues and award a cooperative agreement to support post-doctoral training for psychologists in occupational health psychology.

DBBS, Steven L. Sauter
CAN 258 Dates: 10/91-09/94

IMMUNOTOXICOLOGY RESEARCH AND SUPPORT

Purpose: This project will develop and employ immunoassays as molecular and cellular probes for use in pathogenesis studies in animal models and in determining the relevance of immune biomarkers for use in field studies. The assays will be validated and applied to NIOSH research (DBBS and DRDS) and field studies (HHEs) requiring immunology input.

DBBS, Lloyd E. Stettler
CAN 342 Dates: 10/88-C

AN ANALYSIS OF SUICIDE MORTALITY BY OCCUPATION

Purpose: By identifying occupations at high risk for suicide deaths through mortality-based surveillance, prevention strategies can be targeted to reduce suicide rates among workers.

DSHEFS, Carol Burnett
CAN 562 Dates: 10/91-09/94

MENTAL DISORDERS AND OCCUPATIONAL FACTORS

Purpose: Most previous studies of causes of mental illnesses and work factors have not used measures of health outcomes but rather have used measures of symptoms. Studies involving clinically evaluated diagnoses will contribute to our better understanding of the problem.

DSHEFS, Lawrence J. Fine
CAN 645 Dates: 10/91-09/96

ASSISTANCE REQUESTS

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (PSYCHOLOGY/ERGONOMICS)

Purpose: Assures program planning, budget management, and staff development to conduct research, methods development, control studies, consultations and evaluations as prescribed in prevention strategies in work-related musculoskeletal injuries, neurotoxic and psychological disorders.

DBBS, Alexander Cohen
CAN 284 Dates: 10/80-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (TOXICOLOGY)

Purpose: Effect plans and manage resources for toxicology research and methods development which implement the national prevention strategies and NIOSH initiatives; furnish support to NTP and other public health programs requiring toxicology expertise.

DBBS, Russell E. Savage
CAN 348 Dates: 10/86-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (PHYSICAL AGENTS)

Purpose: The project will provide management and guidance for the implementation of the national prevention strategies as well as consultation involving investigative research, instrument/methods development, and personal protective equipment.

DBBS, Derek E. Dunn
CAN 374 Dates: 10/83-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (BIOLOGY/CHEMISTRY)

Purpose: This project will provide technical assistance and support for investigative research, methods development, and biological and immunological assay activities related to implementation of the national prevention strategies and plan/manage branch programs and resources directed to such needs.

DBBS, Lloyd E. Stettler
CAN 390 Dates: 10/80-C

QUALITY ASSURANCE OF ANALYTICAL MEASUREMENTS

Purpose: This project will expand the internal quality assurance program to insure the quality of analytical data generated internally and by MRSB contract laboratories.

DPSE, Peter M. Eller
CAN 420 Dates: 10/85-C

HIV ENGINEERING CONTROL AND MONITORING TECHNICAL ASSISTANCE

Purpose: The project will provide engineering control and monitoring support to DSHEFS, and other CDC divisions for the control of HIV in both occupational and health care facilities.

DPSE, Robert T. Hughes
CAN 440 Dates: 10/90-C

ASSISTANCE REQUESTS

ANALYTICAL SUPPORT FOR INFECTIOUS DISEASES

Purpose: Provides timely analytical services to the infectious diseases program by assuring rapid turnaround of requests for sample analyses. It is projected that 300 field samples will be analyzed by both in-house staff and task order contracts.

DPSE, John L. Holtz
CAN 485 Dates: 10/90-C

RESPIRATORY DISEASE HEALTH HAZARD EVALUATION AND TECHNICAL ASSISTANCE

Purpose: This project responds to health concerns of miners in coal, metal and non-metal mines and of workers in general industry with respiratory related complaints. This project will address the division objective to increase the number of completed HHE/TAs by effectively responding to requests for health hazard evaluations.

DRDS, John L. Hankinson
CAN 153 Dates: 10/87-C

TECHNICAL INQUIRIES--CONSTRUCTION

Purpose: This project will improve the delivery of construction safety and health information to researchers, employers and employees by publicizing the availability of the information through the NIOSH 800-number and disseminating the information as requested.

DSDTT, Rodger L. Tatken
CAN 076 Dates: 10/89-C

800 TELEPHONE INFORMATION SERVICE

Purpose: This project will provide to the public free access to NIOSH information resources and to the HETA program.

DSDTT, Raymond Ruhe
CAN 149 Dates: 10/89-C

STATE FARM, FAMILY HEALTH AND HAZARD SURVEY (FFHHS)

Purpose: Identify existing information, gaps in our information base about hazard and health effects, and initiate steps leading to prevention of occupational disease among farm workers.

DSHEFS, John P. Sestito
CAN 549 Dates: 10/89-09/95

GUIDELINES FOR GENERIC EXPOSURE ASSESSMENT

Purpose: The project will assist OSHA in its attempt to develop a standardized approach to exposure assessment and monitoring by providing a document which addresses the general principles of workplace exposure determination, and provides guidelines for designing and implementing exposure assessment programs.

DSHEFS, Robert F. Herrick
CAN 642 Dates: 10/90-10/92

ASSISTANCE REQUESTS

HEALTH HAZARD EVALUATIONS AND TECHNICAL ASSISTANCE

Purpose: Investigations result in recommendations relating to the national prevention strategies and NIOSH research efforts.

DSHEFS, David S. Sundin
CAN 688 Dates: 10/80-C

SAFETY COMPONENTS OF SMALL BUSINESS INITIATIVE

Purpose: This project will enable DSR to collaborate with other NIOSH divisions in identifying hazards found in small businesses and in developing intervention strategies to minimize risk of traumatic injuries.

DSR, Carl A. Angoli
CAN 804 Dates: 10/88-C

ADMINISTRATION

DBBS ADMINISTRATION

Purpose: Expedition, intervention, or reallocation of expenditures by four branches is provided. Personnel utilization is evaluated and considered when assigning special tasks and allocating positions. Responses to requests for technical assistance are assigned to available personnel and expedited through a tracking system.

DBBS, Janet C. Haartz
CAN 303 Dates: 10/76-C

FIFTH US-FINNISH JOINT SYMPOSIUM

Purpose: The objectives of the MOU between NIOSH and the FIOH will be supported by providing the physical accommodations and program structure needed to implement personal communication and foster collaboration between attendees from both institutes.

DBBS, Janet C. Haartz
CAN 304 Dates: 10/91-09/92

ADMINISTRATIVE SUPPORT FOR DPSE RESEARCH

Purpose: This project will, in addition to providing strategy implementation, develop criteria for monitoring, and assess control technology through research and development. Provides for the Institute's chemical analysis needs and operates a quality control reference program for analytical laboratories.

DPSE, Philip J. Bierbaum
CAN 402 Dates: 10/85-C

OFFICE OF THE DIRECTOR--DIVISION MANAGEMENT

Purpose: Provide management and guidance for the implementation of the national prevention strategies involving investigative research, environmental, and medical surveillance.

DRDS, Gregory R. Wagner
CAN 103 Dates: 10/86-C

PROGRAM MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of the national prevention strategies. This project is primarily directed toward increasing the number and quality of documents and other NIOSH policy statements produced annually through management of resources and disseminating information.

DSDTT, Richard W. Niemeier
CAN 082 Dates: 10/70-C

TECHNOLOGY TRANSFER

Purpose: This project will address the goal by extending access to NIOSH-developed databases worldwide by monitoring interagency agreements and memoranda of understanding for NIOSH information services.

DSDTT, Vivian K. Morgan
CAN 084 Dates: 10/83-C

ADMINISTRATION

CONSULTATION AND BRANCH ADMINISTRATION: DOCUMENT DEVELOPMENT BRANCH

Purpose: This project will provide administrative, consultative, and technical assistance for implementation of the national prevention strategies.

DSDTT, Ralph D. Zumwalde
CAN 094 Dates: 10/84-C

PRINTING MANAGEMENT

Purpose: This project will serve as liaison with GPO, GSA, commercial printers, and other federal agencies for the procurement of NIOSH printed materials, typesetting, graphic requirements, and other related services. Works directly with NIOSH officials at all levels in a consulting capacity at all stages in the development of publications.

DSDTT, Shirley M. Carr
CAN 170 Dates: 10/90-C

TECHNICAL MANAGEMENT--DSHEFS, (OD)

Purpose: This project will provide technical and managerial guidance for the implementation of the national prevention strategies. In addition to surveillance, industry-wide studies, and hazard evaluations, methods will be developed to intervene in certain situations so as to reduce workplace hazards.

DSHEFS, Lawrence J. Fine
CAN 522 Dates: 10/80-C

TECHNICAL MANAGEMENT

Purpose: This project will provide management and guidance to effect the transfer of the analytic epidemiology program regarding energy-related health effects under the MOU, to evaluate studies currently underway at DOE facilities and to plan a long-term research program.

DSHEFS, Richard W. Hornung
CAN 644 Dates: 10/91-C

TECHNICAL MANAGEMENT

Purpose: This project maintains a staff of highly skilled ADP professionals and statisticians and actively recruits for vacancies at established and respected institutions, provides training opportunities to current staff to enable them to maintain and improve skills, and contracts for services not available.

DSHEFS, Lawrence R. Catlett
CAN 680 Dates: 10/87-C

DIVISION ADMINISTRATION AND COLLABORATIVE NETWORKS

Purpose: This project will provide management and guidance for the implementation of the national prevention strategies involving work force development, health promotion and support to academic programs.

DTMD, Edward D. Leininger
CAN 763 Dates: 10/88-C

GRANTS ADMINISTRATION (GRADS)

Purpose: This project will specifically address Section 21a of the OSH Act that calls for an adequate supply of qualified personnel to carry out the purposes of the Act. It supports academic programs by building the OSH professional work force for implementation of the NIOSH strategies.

DTMD, John T. Talty
CAN 764 Dates: 10/88-C

OTHER

COMPLIANCE WITH HIV PREVENTION MEASURES AMONG HIGH-RISK WORKERS

Purpose: Identification and assessment of educational and motivational techniques that enhance compliance with HIV prevention practices will result in the development of training programs optimized to reduce worker exposure to HIV infection.

DBBS, Lawrence R. Murphy
CAN 251 Dates: 10/90-09/95

STATISTICAL SUPPORT TO DBBS

Purpose: Support personnel, equipment, and training are provided to increase the quality and quantity of support given to division project officers in design, implementation, and analyses of planned projects.

DBBS, Stephen D. Simon
CAN 305 Dates: 10/85-C

BIOLOGICAL MONITORING RESEARCH AND SUPPORT

Purpose: This project will provide biological monitoring support, including the development and application of new methods to implement research strategies in DSHEFS and DBBS. Support activities will be conducted in-house and by BPA labs. Biological monitoring methods will be evaluated in the field in collaboration with DSHEFS staff.

DBBS, Alexander W. Teass
CAN 378 Dates: 10/80-C

STATISTICAL SUPPORT FOR DPSE RESEARCH

Purpose: Experiments will be designed using statistics and data will be statistically analyzed to support DPSE research projects.

DPSE, Stanley A. Shulman
CAN 407 Dates: 10/85-C

IDENTIFICATION OF AEROSOL PRODUCING SURGICAL PROCEDURES

Purpose: The project will use real-time monitoring and videotaping techniques to demonstrate the production of aerosols during surgical procedures. These techniques can then be used to train surgical personnel about which procedures produce aerosols and to study measures that can be used to reduce exposure.

DPSE, Jerome P. Smith
CAN 428 Dates: 10/90-09/93

DEVELOP HIV EMISSION CONTROLS FOR MEDICAL PROCEDURES

Purpose: This project will focus on the development of controls for airborne aerosols for medical procedures which may result in health care personnel contracting AIDS or other infectious diseases. The results will be used by health care and engineering professionals to identify, correct, or install control technology where potential exposures occur.

DPSE, Vincent D. Mortimer
CAN 432 Dates: 10/90-09/94

OTHER

CONTROL TECHNOLOGY GUIDELINES FOR HIV TREATMENT FACILITIES

Purpose: This project will develop, evaluate, and document effective ventilation and other controls to prevent the spread of airborne infectious disease in hospitals and health care facilities. The guidelines will be used by health care and engineering professionals to identify and correct problems and to incorporate effective control systems.

DPSE, Vincent D. Mortimer
CAN 433 Dates: 10/90-09/94

LIBRARY SERVICES--MORGANTOWN

Purpose: This project will maintain the collection and provide services of the Morgantown facilities library.

DSDTT, Janice M. Huy
CAN 066 Dates: 10/91-C

AGRICULTURAL HEALTH AND SAFETY DISSEMINATION

Purpose: This project enables NIOSH material to be distributed to appropriate secondary disseminators in the agricultural industry.

DSDTT, Charlene B. Maloney
CAN 073 Dates: 10/89-C

LIBRARY-CONSTRUCTION REFERENCES

Purpose: This project will improve the delivery of occupational safety and health information to NIOSH researchers and the occupational safety and health community.

DSDTT, Colleen M. Herrington
CAN 079 Dates: 10/89-C

LIBRARY SERVICES

Purpose: This project will maintain the collection and provide services of the Cincinnati facilities libraries.

DSDTT, Colleen M. Herrington
CAN 083 Dates: 10/83-C

RESPONSES TO REGULATORY ACTIVITIES

Purpose: This project will provide for coordination of activities by NIOSH, DOL/OSHA/MSHA standards development staff in making recommendation for workplace standards through the DOL/OSHA/MSHA rule-making process. The most current information developed by or available to NIOSH is used to develop public testimony and make recommendations to DOL/OSHA/MSHA.

DSDTT, Laurence D. Reed
CAN 087 Dates: 10/83-C

OTHER

SENIOR REVIEW ACTIVITIES

Purpose: This project will provide a multi-disciplinary team of senior scientists who will evaluate scientific and policy issues to ensure the accuracy and scientific quality of documents and the appropriate consideration of policy implications. This review will provide for the implementation of all of the national prevention strategies.

DSDTT, John J. Whalen
CAN 092 Dates: 10/87-C

NIOSH INFORMATION SYSTEMS

Purpose: This project will provide for availability of technical information through current, computerized databases to NIOSH personnel and the OSH community. Principal systems include the Document Information Directory System (DIDS), and the NIOSH mailing list (NMLS).

DSDTT, Rolland R. Rogers
CAN 095 Dates: 10/70-C

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)

Purpose: This project will deliver toxicological data to serve the information needs of the occupational safety and health community and produce innovative changes to assist users.

DSDTT, Doris V. Sweet
CAN 096 Dates: 10/70-C

NIOSHTIC

Purpose: This project will assist the research and technical assistance activities of NIOSH and the occupational safety and health community as a whole. This system currently contains over 168,000 citations derived from the world's occupational safety and health literature.

DSDTT, William D. Bennett
CAN 097 Dates: 10/70-C

PUBLICATION AND DISSEMINATION OF NIOSH PUBLICATIONS

Purpose: This project will address the goal by providing for dissemination of occupational safety and health information in support of NIOSH research and in response to public inquiries. In addition, NIOSH-developed technologies will be presented through the exhibit program.

DSDTT, Charlene C. Maloney
CAN 098 Dates: 10/83-C

INFORMATION RETRIEVAL AND ANALYSIS

Purpose: This project will provide technical information services to Institute personnel in support of research, public hearings, and to the public requesting information on OSH issues. It also will provide for the development of chemical and hazard-specific information packages.

DSDTT, Rodger L. Tatken
CAN 099 Dates: 10/70-C

OTHER

OCCUPATIONAL DISEASES BOOK UPDATE

Purpose: This project will result in the revision and update of the NIOSH publication "Occupational Diseases: A Guide to their Recognition."

DSDTT, Ralph D. Zumwalde
CAN 100 Dates: 10/90-09/93

CRITERIA FOR ESTABLISHING JOINT MANAGEMENT/WORKER COMMITTEES (CD)

Purpose: This project will provide a critical evaluation of the effectiveness of management/worker committees in reducing health risks. The evaluation will be used to develop a criteria document that can be used for establishing and defining the scope of management/worker committees in all workplaces.

DSDTT, Faye Rice
CAN 117 Dates: 10/90-09/93

INTERNATIONAL PROGRAMME FOR CHEMICAL SAFETY (IPCS) CARDS

Purpose: This project will develop 25 chemical safety cards each year as a joint effort with the International Programme on Chemical Safety (IPCS), World Health Organization (WHO).

DSDTT, Howard R. Ludwig
CAN 118 Dates: 10/89-C

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

Purpose: This project will update the existing information in the pocket guide and list an additional 200 chemicals with NIOSH RELS and/or OSHA PELS.

DSDTT, Howard R. Ludwig
CAN 120 Dates: 10/89-C

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) CONCENTRATIONS

Purpose: This project will formulate criteria for selecting IDLHS for chemicals that currently have none assigned.

DSDTT, Vlasta B. Molak
CAN 125 Dates: 10/89-09/92

HAZARD REVIEW PROGRAM

Purpose: This project will assist DSDTT in selecting future topics for document development and provide other divisions with a source of information for assessing research needs.

DSDTT, Robert W. Mason
CAN 145 Dates: 10/90-C

OTHER

P.C. VERSION OF LIFE TABLE ANALYSIS SYSTEM

Purpose: This project will improve the overall research program by providing state-of-the-art methods.

DSHEFS, Kyle Steenland
CAN 526 Dates: 10/88-09/93

SURVEY INSTRUMENT DESIGN: HEALTH HISTORY EXAMINATION

Purpose: This project will develop, standardize, and evaluate health interview and examination modules used in the FFHHS data collection by the state cooperative agencies.

DSHEFS, Lorraine L. Cameron
CAN 559 Dates: 10/89-09/92

HISTORIC PHOTOGRAPHS OF INDUSTRIAL WORKERS

Purpose: Through photographs, this study will investigate the history of occupational disease in the United States.

DSHEFS, Barbara L. Jenkins
CAN 595 Dates: 10/90-09/93

LAN SERVICE AND SUPPORT

Purpose: This project supports word processing, statistical and data processing aspects of DSHEFS' industry-wide studies, health hazard evaluations, and surveillance activities.

DSHEFS, Lawrence R. Catlett
CAN 683 Dates: 10/91-C

SAFETY DIVISION MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of the national prevention strategies involving investigative research, information dissemination/document development, respirators, surveillance, and other epidemiological studies.

DSR, Thomas R. Bender
CAN 802 Dates: 06/77-C

A FEASIBILITY STUDY OF IHS HIV/HBV SAFETY TECHNOLOGIES

Purpose: This project will determine the feasibility of a study of IHS health care workers to evaluate hospital reporting systems for needlestick injuries and the needleless-IV device.

DSR, Gale E. Savage
CAN 846 Dates: 10/91-09/92

NIOSH PROJECTS BY DIVISION

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

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DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

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DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

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DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES (DSHEFS)

DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES (DSHEFS)

DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES (DSHEFS)

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DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES (DSHEFS)

DIVISION OF SAFETY RESEARCH (DSR)

DIVISION OF SAFETY RESEARCH (DSR)

DIVISION OF SAFETY RESEARCH (DSR)

DIVISION OF SAFETY RESEARCH (DSR)

DIVISION OF TRAINING AND MANPOWER DEVELOPMENT (DTMD)

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