NIOSH



## *OCCUPATIONAL SAFETY AND HEALTH*

# RESEARCH AND DEMONSTRATION GRANTS FY 1977–78



U. S. Department of Health, Education, and Welfare
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

# OCCUPATIONAL SAFETY AND HEALTH RESEARCH AND DEMONSTRATION GRANTS FY 1977/78

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Rockville, Maryland 20857

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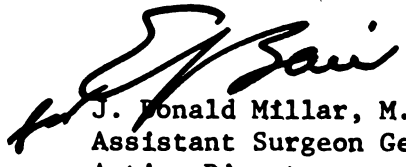
FOREWORD

The National Institute for Occupational Safety and Health (NIOSH) plans, directs, and coordinates the national program effort to develop and establish recommended occupational safety and health standards and to conduct research, training, and related activities to assure safe and healthful working conditions for every working man and woman. Under the provisions of the Federal Coal Mine Health and Safety Act of 1969, and the Occupational Safety and Health Act of 1970, research investigations, particularly those in which dose-effect relationships may be identified and quantified thereby leading to the development of effective standards, represent one of the principal areas of responsibility of NIOSH.

In fulfilling its mission, NIOSH employs many mechanisms including the making of grants to eligible institutions and organizations for the purpose of supporting research projects relating to innovative approaches to understanding the underlying characteristics of occupational safety and health problems and for effective solutions in dealing with them. Grant support is also available for demonstration projects which are designed to demonstrate, either on a pilot or full-scale basis, the technical and economic feasibility of new or improved methodologies in dealing with occupational safety and health problems amenable to technological solutions.

This booklet, which has been prepared to describe the research and demonstration projects supported through grants should be of interest and assistance to appropriate institutions, organizations, agencies, and individuals such as scientists, engineers, physicians, and others currently engaged in or contemplating activities germane to the responsibilities and functions of NIOSH.



**J. Donald Millar, M.D.**
**Assistant Surgeon General**
**Acting Director**
**National Institute for Occupational Safety and Health**

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## INTRODUCTION

Project grants for research and demonstrations are available to universities, colleges, research institutions, and other public and private nonprofit-making organizations for the support of scientific and technical activities in all the areas of occupational safety and health which sustain and undergird the mission and functions of the National Institute for Occupational Safety and Health.

Examples of appropriate research field and activities include:

1. Laboratory, clinical, and epidemiologic investigations of diseases, pathologic changes, physiologic and psychologic alterations which arise, or are presumed to arise, from an occupational causation; aspects of prevention, diagnosis, therapy, disease processes and mechanisms, and interpretations of abnormalities are apropos. Specific subjects of interest include: causes and prevention of musculoskeletal and back injuries, skin disorders, neurologic disorders, respiratory disease, and reproductive effects of occupational hazards.
2. Investigations of psychologic and motivational factors in occupational situations and their impact on mental health and job performance. Included in this category are studies of the effects of impaired physical, mental, and emotional states on safe and effective work performance and the appropriate placement and observation of workers with physical, mental, or emotional impairments.
3. Research studies of safety factors in work flow, plant design, work operations, man-machine interrelationships, and occupational environmental situations.
4. Health effects of mining and energy extraction, utilization, conversion, and transmission.
5. Control methodologies and technologies for effective reduction or elimination of occupational hazards.
6. Research on methods development, evaluation, and application for the sampling, analysis, measurement or other objective appraisals of chemical, physical, biological, motivational, behavioral and other components of the occupational environment, and the extent of exposure to these components.
7. Epidemiologic, biometric, and demographic studies of morbidity and/or mortality of human beings exposed to occupational and industrial hazards, the development evaluation, and application of methods for diagnosing and measuring the effects of such hazards.
8. Investigations of capacities of workers to withstand and deal with occupational stresses in their environments, and the development and evaluation of methods for protection of workers from such harmful environmental factors.
9. Investigations of interrelationships between employment conditions and the onset, development, and course of chronic diseases.
10. Studies on the nature of fatigue and its role in worker susceptibility to accidents and occupational illness.

Grants are made under the authority of applicable legislation and in accordance with the prescribed rules and regulations of the Department of Health, Education, and Welfare and the National Institute for Occupational Safety and Health. All applications for research and/or demonstration grant

support are initially reviewed according to established schedules by a consultative committee of distinguished scientific and technical experts, constituted as a study section using the peer review system, who provide objective appraisals of scientific merit of each proposal. These recommendations are then reviewed by (an advisory council in some cases as appropriate) the Institute for a funding determination within available budgets, taking into account program relevance and consonance with public policy.

All inquiries about research and demonstration grant applications, eligibility, guidelines, regulations, review schedules, program and procedural matters, and the like should be addressed to:

C. Ilana Howarth
Research Grants Program Officer
Grants Administration and Review Branch, OECSP
National Institute for Occupational Safety and Health
Room 8-63 Parklawn Building
5600 Fishers Lane
Rockville, Maryland 20857
Tel. (301) 443-4493

# CONTROL TECHNOLOGY FOR OCCUPATIONAL HAZARDS

NORTH CAROLINA STATE UNIVERSITY
Raleigh, North Carolina

GRANT NUMBER: 2 R01 OH 00442-04

PRINCIPAL INVESTIGATOR

Paul D. Emerson, B.S., M.E., Ph.D.
Associate Professor
School of Textiles
North Carolina State University
P.O. Box 5006
Raleigh, North Carolina 27607

TITLE

Coordinated Textile Industry Noise Reduction Program

OBJECTIVES

This research seeks to either re-design the machine components of the textile industry that are auditory offenders or to design retrofit elements to quiet the process in question.

DESCRIPTION

In this renewal grant, investigation will continue into noise abatement techniques in the textile industry. Attention is focused at specific auditory offenders such as shuttles, belt drives, spindles, and the shuttleless loom. Analytical and experimental studies to either re-design components or to design retrofit elements to quiet the process will include an economic analysis.

Field trials are performed and the results of these data are communicated to approximately 700 textile plants. A comprehensive noise control manual will be developed.

RECENT RELATED PUBLICATIONS

Emerson, P.D. et. al. 1977. Fly Shuttle Loom Noise, Mech. Eng. Magazine 99:40-43.

Emerson, P.D. et. al. 1977. Economic Impact of a 90 dBA Noise Standard on Textile Spinning Operations. ASME paper 77-RC-15.

Emerson, P.D. et. al. 1976. Fly Shuttle Loom Noise Source Identification. ASME Paper no. 76-DE-39.

Emerson, P.D. et. al. 1976. Compendium of Noise Control Case Histories in the Textile Industry. Presented at the ASME Textile Engineering Conference, Charlotte, North Carolina.

Emerson, P.D. et. al. 1976. Spinning Frame Noise Sources. Transactions of the ASME Journal of Engineering for Industry. pp.840-844.

Emerson, P.D. 1975. Practical Noise Control. Indust. Engineer. 7:24-28.

Emerson, P.D. et. al. 1975. Identification of Textile Spinning Noise Sources. Proceedings of the Technical Program, NOISEXPO.

Emerson, P.D. 1974. Techniques for Reducing Textile Machine Noise. Transactions National Safety Congress.

COLORADO SCHOOL OF MINES
Golden, Colorado

GRANT NUMBER: 2 R01 OH 00565-03

PRINCIPAL INVESTIGATOR

Franklin D. Schowengerdt, Ph.D.
Department of Engineering Physics
Colorado School of Mines
Golden, Colorado 80401

TITLE

Nucleation Properties of Respirable Coal Dust

OBJECTIVES

This research effort seeks to develop means of enhancing the nucleation properties of respirable coal dust so as to improve the precipitation characteristics of coal dust with water and, thereby, lay a better scientific foundation for more effective control of coal dust in underground mines.

DESCRIPTION

This is both a theoretical as well as experimental research project to examine soft coal aerosols qualitatively and quantitatively using the methods of particle physics and engineering. Properties of coal dust such as size, charge, and composition relative to nucleation are measured. Effects of environmental variables such as humidity, temperature, pressure, and electric fields are examined. Scavenging techniques to increase nucleation and precipitation efficiencies are applied along with modifications of particle properties and control of environmental factors.

Early findings indicate that water droplets of the approximate size of dust particles are more effective than either larger or smaller sizes in interactions. The factors affecting efficiency of water droplet formation include particle size, particle solubility, particle wettability, relative humidity, pressure, presence of hygroscopic salts, charge, temperature, and electric fields.

Emphasis will be placed on advancing methodology, evaluating the effects of competition for available water vapor, and studying differences in nucleation efficiencies among various kinds of coal. Improved techniques will be developed for generating monodisperse coal dust samples for measuring supersaturation, and for detecting and sizing sub-micron coal dust. Studies of nucleation and droplet growth will be conducted in a thermal diffusion cloud chamber developed under the previous grant. Long range objectives of the research are to provide data which can lead to improvements of dust control methods in coal mines and other related industries, and can also aid in

understanding the behavior and deposition of coal dust in the lungs.

RECENT RELATED PUBLICATIONS

Schowengerdt, F.D. and J.T. Brown. 1976. Colorado School of Mines Tackles Control of Respirable Coal Dust. Coal Age 81:129-131.

UNIVERSITY OF MIAMI
Coral Gables, Florida

GRANT NUMBER: 1 R01 OH 00626-01

PRINCIPAL INVESTIGATOR

John E. Davies, M.D., M.P.H.
Epidemiology and Public Health
University of Miami
School of Medicine
Post Office Box #520875
Biscayne Annex
Miami, Florida 33152

TITLE

Protection of Pesticide Applicators

OBJECTIVES

The overall objective of this research is to measure the protective effect of silicone treatment of worker's clothing in reducing pesticide dermal exposure under normal working conditions.

DESCRIPTION

This research will evaluate the treatment of work clothing with organo-silicone derivatives for the purpose of increasing the degree of repellancy of such treated clothing to pesticides. The goal is to find a means of providing protective clothing to pesticide applicators and certain agricultural field workers exposed to pesticides at a reasonable price and without imposing a heat exchange barrier for the worker. The major route of exposure for pesticide applicators and agricultural field workers is by the dermal route. With the increasing use of the more highly toxic organic phosphates and carbamates, there have been significant numbers of cases of pesticide poisoning among these workers in both Florida and California, as well as in other parts of the world. Measurement of effectiveness of the protective clothing when treated with the organo-silicone will be by direct measurement of pesticide deposit on alpha cellulose pads and gauze pads placed on various parts of the body and also by the direct measurement of pesticides on t-shirts, stockings, and gloves. Also, the investigators plan to use the indirect method of measuring changes in cholinesterase levels and urinary pesticide metabolites.

The research will be directed to three interrelated but separate tasks: 1) the studying of clothing, the effects of impregnation of clothing with silicones, and the effects of washing upon such treated clothing; 2) the heat exchange characteristics of treated clothing; 3) field studies involving workers from three companies--a helicopter applicator company, a company applying pesticides with fixed-wing aircraft, and a structural pest control operator.

The employees of each of the three companies will be divided into two groups, thus forming six separate groups who will be studied over three experimental periods with at least one intervening week between each of the three periods. Each experimental period will include six days under background conditions and then a day off, and then six days of work with the use of experimental clothing. During the first experimental period, half of the groups will work with treated clothing and the other half will conduct their work with untreated clothing. During the second experimental period, the groups that wore treated clothing will be given untreated clothing and those that wore untreated clothing will be given treated clothing. During the third period, all of the groups will use clothing treated on one side and untreated on the other side. During the second year, studies will be conducted in the field to determine whether or not the treated clothing becomes saturated with insecticide on long exposure and whether such saturated clothing constitutes an exposure problem.

Laboratory studies of clothing will be performed in the Environmental Sciences Center of the Oregon State University. The study will compare organic phosphates, carbamates, and possibly one or more of the organo-chlorine compounds in terms of uptake and retention by the cloth. Different formulations of these materials will be compared. Various techniques based on the chemistry of the pesticide in question will be evaluated for laundering or removal of the pesticide from the treated cloth, and the resistance of the treatment material to removal by laundering will also be studied.

Heat transfer characteristics of the treated cloth will be studied by the School of Engineering by measurement of thermal resistance water vapor resistance and air permeability. Ergonometric studies are also planned in which human subjects will wear clothing made of the treated fabric or clothing made of untreated fabric while performing work at measured levels on a bicycle ergonometer; heart rate, skin temperature and body temperature will be measured at all levels of work output. Both regular style clothing made of treated and untreated fabrics and an undescribed specially-designed suit will be tested.

RECENT RELATED PUBLICATIONS

None

# OCCUPATIONAL MUSCULOSKELETAL AND BACK DISORDERS

UNIVERSITY OF TEXAS
Austin, Texas

GRANT NUMBER: 2 R01 OH 00470-03

PRINCIPAL INVESTIGATOR

Douglas D. Reynolds, Ph.D.
Department of Mechanical Engineering
University of Pittsburgh
Pittsburgh, Pennsylvania 15261

TITLE

Vibration Characteristics of the Hand and Arm

OBJECTIVES

This proposal is designed to investigate the effects on the hand and arm of vibration resulting from hand-held or hand-directed power, and other, mechanical tools. The ultimate objective is to correlate the medical findings in Raynaud's phenomenon (and other related disorders of the hand) to the mechanical and vibration response characteristics of the hand.

DESCRIPTION

This is a project proposal for a three-year investigation using the mechanical impedance measurement technique to measure the system parameters that describe the response characteristics of the hand and arm under the influence of tool-induced vibration. Objective as well as subjective information will be collected. Objectively, the investigator will observe operator, size, the manner in which a tool is held, tightness of clasp of tool handle, area of hand in which a tool is held, percent of total hand area needed to hold or control a tool, and size of a tool handle. Subjectively, the operator will be asked to describe response characteristics to a tool vibration input. Test results and subjective responses will be correlated.

RECENT RELATED PUBLICATIONS

Reynolds, D.D. 1975. Hand-Arm Vibration: A Review of Three Years Research. Report presented at International Occupational Hand-Arm Vibration Conference, Cincinnati, Ohio, pp.1-82.

Reynolds, D.D., and R.H. Keith. 1977. Hand-Arm Vibration. Part 1. Anal. Model of the Vibration Response Characteristics of the Hand. J. Sound and Vibration 51:237-253.

Reynolds, D.D., and E.N. Angevine. Hand-Arm Vibration. 1977. Part 2. Vib. Transmission Characteristics of the Hand and Arm. J. Sound and Vibration 51:255-265.

Reynolds, D.D., K.G. Standlee, and E.N. Angevine. 1977. Hand-Arm Vibration. Part 3. Subjective Response Characteristics of Individuals to Hand Induced Vibration. J. Sound and Vibration 51:267-282.

TEXAS TECH UNIVERSITY
Lubbock, Texas

GRANT NUMBER: 5 R01 OH 00545-02

PRINCIPAL INVESTIGATOR

M. M. Ayoub, BSME, MSIE, Ph.D.
Department of Industrial Engineering
Texas Tech University
Lubbock, Texas 79409

TITLE

Determination and Modeling of Lifting Capacity

OBJECTIVES

This research is aimed at determining the lifting capacity of the industrial worker population for both males and females.

DESCRIPTION

The underlying distribution of lifting capacities of the industrial population in at least three ranges of lifting will be used. Predictive models will be developed based on several individual human variables such as anthropometric measures, strength, posture, mobility task endurance measure, age, and sex as well as task variables such as the shape and size of the object or container handled, height of lift, distance of transport, and frequency of lift. This predictive ability will, in later phases of the model, be utilized to establish the relationship between medical incidences and the severity of the manual handling task.

RECENT RELATED PUBLICATIONS

Ayoub, A.A. and S. Deivanayagam. 1977. The Relationship between Lifting Capacity, Task Variables, and Operator Characteristics. 4th International Conference on Production Research, Tokyo, Japan.

Ayoub, A.A. 1977. Lifting Capacity of Workers. International Symposium on Effects of Modern Work Systems on Human Performance. Tokyo, Japan.

UNIVERSITY OF KENTUCKY
Lexington, Kentucky

GRANT NUMBER: 5 R01 OH 00562-02

PRINCIPAL INVESTIGATOR

Stephen D. Smith, Ph.D.
Wenner-Gren Research Laboratory
University of Kentucky
Lexington, Kentucky 40506

TITLE

Etiology of Disc Degeneration Related to Low Back Pain

OBJECTIVES

This fundamental investigation of spinal mechanical stresses aims at determining the origin and mechanism of disc degeneration.

DESCRIPTION

The investigators propose to examine both the effects of direct exposure of the disc nucleus to the adjacent vertebral body vascular bed, and to determine if the disc's electrical properties are altered by the induced mechanical stresses.

A novel simple method is used to apply pressures across discs of contiguous vertebral using the transverse processes of vertebral as anchor points for rubber bands and/or metal springs. The clamping force technique does not require interference with the posterior back muscles and ligaments, as an anterior surgical approach is to be used. The transverse processes of the monkey spines are lateral to the vertebral bodies, therefore, provide excellent anchor points for the bands or springs installed to create compression forces on the entrapped disc. Immediately before sacrifice, disc pressure measurement will be taken to determine applied forces. A careful histological work-up of compressed and adjoining discs will be done to determine:

1) disc hormonal levels,
2) mucopolysaccharide loss,
3) fibrolytic development,
4) decalcification,
5) DNA/RNA ratios, and
6) physical changes in disc and cartilage endplates (e.g., nodes, osteophytic growth, disc size, etc.).

The effects of CEP nodes will be examined. Both dynamically produced (by axial shake table compression) and surgically produced nodes will be evaluated as to their potential effects on disc degeneration. Histological evaluations will be performed at varying periods, and for different node

severity levels. Electrical studies will be conducted to determine if degeneration of the disc is associated with measurable tissue impedance changes, as well as attempting to intervene in the degeneration process by electrical stimulation of the disc.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF ILLINOIS AT CHICAGO CIRCLE
Chicago, Illinois

GRANT NUMBER: 2 R01 OH 00514-03

PRINCIPAL INVESTIGATOR

Albert B. Schultz, Ph.D.
Professor of Mechanical Engineering
Department of Materials Engineering
University of Illinois at Chicago Circle
Box 4348
Chicago, Illinois 60680

TITLE

Back Injuries: Mechanical Stresses in the Human Spine

OBJECTIVES

This research effort is directed toward:

1) an analysis of the three-dimensional force systems active on the spine during industrial handling and lifting tasks;
2) determination of the intervertebral joint stresses; and
3) recommendation of methods for handling and lifting of leads in industry.

DESCRIPTION

This is a three-year proposal to investigate the previously established model of the three-dimensional force system acting on the spine by means of computer-generated conditions and changes in conditions. Thus, large numbers of "experiments" are to be performed with the results analyzed and "classified" as to which factors are significant in a given situation. Spinal muscle and abdominal pressure effects are also to be studied in this work.

RECENT RELATED PUBLICATIONS

Schultz, A.B., et al. 1977. Voluntary Strengths of Male Adults with Acute Low Back Syndromes. Clinical Orthopaedics and Related Research. 129:84-95.

Schultz, A.B., et al. 1976. Roentgenographic Evaluation of Vertebral Rotation. J. of Bone and Joint Surgery. 58A:1125-1129.

Schultz, A.B., et al. 1976. Nonlinear Behavior of the Human Intervertebral Disc Under Axial Load. J. of Biomechanics. 9:377-386.

Schultx, A.B., et al. 1975. Biomechanical Characteristics of Vertebral Motion Segments and Intervertebral Discs. Orthopaedics Clinics of North America. 6:121-133.

Schultz, A.B., et al. 1974. A Model for Studies of Mechanical Interactions Between the Human Spine and Rib Cage. J. Biomechanics. 7:497-507.

Mechanics of the Human Spine. 1974. Appl. Mech. Reviews. 27:1486-1497.

Schultz, A.B., et al. 1974. Finite Element Stress Analysis of an Intervertebral Disc. J. Biomechanics. 7:277-285.

Schultz, A.B., et al. 1974. Force-Deformation Properties of Human Costo-Sternal and Costo-Vertebral Articulations. J. Biomechanics. 7:311-318.

Schultz, A.B., et al. 1974. Force-Deformation Properties of Human Ribs. J. Biomechanics. 7:303-309.

Schultz, A.B., et al. 1973. Analog Studies of Forces in the Human Spine: Mechanical Properties and Motion Segment Behavior. J. Biomechanics 6:373-383.

Schultz, A.B., et al. 1973. Analog Studies of Forces in the Human Spine: Computational Techniques. J. Biomechanics 6:361-371.

SAINT LUKE'S HOSPITAL
Milwaukee, Wisconsin

GRANT NUMBER: 1 R01 OH 00659-01

PRINCIPAL INVESTIGATOR

Eric P. Kindwall, M.D., Director
Department of Hyperbaric Medicine
St. Luke's Hospital
2900 W. Oklahoma Avenue
Milwaukee, Wisconsin 53215

TITLE

Bone X-ray Survey of Former Compressed Air Workers

OBJECTIVES

Former compressed air workers will be evaluated to determine if any of the men have acquired aseptic necrosis, particularly under higher pressures, when using the OSHA decompression schedules.

DESCRIPTION

The investigators have identified thirty-nine men in the Milwaukee area who have been exposed to work using the OSHA schedules since 1970 but who have not been followed up radiographically. The present study proposes to trace these men and to study them using X-rays of shoulders, hips and knees and bone scans using Technetium 99m pyrophosphate. Repeat X-rays will be done at the end of six months and at the end of one year. At the year's end, the bone scan will be repeated. The radiographic findings will be compared with the work history of the thirty-nine test subjects. Bone changes will be correlated with previous work histories regarding decompression and working pressures, in the hope of establishing maximum safe pressure levels for use with the present decompression schedules. The incidence of aseptic necrosis will be related to the number of decompressions sustained by the individual as well as the pressures at which he worked. Attempts will be made to rule out other causes of aseptic necrosis. Baseline data will be collected to determine how bone scans correlate with clinical and X-ray changes in the hope that computer techniques will be useful in identifying pathologic or repair processes in bone before X-ray signs become evident.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

GRANT NUMBER: 5 R01 OH 00679-02

PRINCIPAL INVESTIGATOR

Don B. Chaffin, Ph.D.
2260 G. G. Brown Laboratory
The University of Michigan
Ann Arbor, Michigan 48019

TITLE

An Investigation of Occupational Wrist Injuries in Women

OBJECTIVES

This investigation seeks to ascertain the influence of intra-wrist forces as factors in the etiology of tenosynovitis and carpal tunnel syndrome, as problems of particular significance to women in industrial wrist injuries.

DESCRIPTION

The investigators are conducting series of in-plant studies in workers who have developed wrist injuries and are compared with workers on the same jobs who have not developed such afflictions. Careful analyses of hand-wrist postures and force loadings are developed for a variety of jobs that have both a high incidence rate and a low incidence rate of wrist injury.

The investigations are performed at the Fisher-Body Division of General Motors Corporation, Tecumsen Plant in Michigan. Eight different jobs are studied in which at least three different operators are filmed to obtain postural information of hand positions. Force measurements are then performed to determine peak forces operating on the hand during the entire job cycle.

In addition, workers who have been identified as having carpal tunnel syndrome are to be investigated and compared to a control group.

Simulations are to be conducted for data analysis on a digital computer and a statistical approach is made for the interpretation of the data derived from the experimental and control subjects.

The results of this project should clarify the approaches to be taken diagnostically, preventatively, and therapeutically in workers-especially female workers-performing jobs with a high risk factor for wrist damage. The results should provide a clearer understanding of why women workers are at much greater risk than men, and it would better define those work methods which increase important tissue loading in the wrist and which are correlated with increased incidence of disorders. Such information could assist in the

development of better designed guides for tools and materials handling procedures as well as indicate which specific jobs may be hazardous to certain people.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF VERMONT
Burlington, Vermont

GRANT NUMBER: 1 R01 OH 00745-01

PRINCIPAL INVESTIGATOR

John Frymoyer, M.D.
Department of Orthopaedic Surgery
Medical Alumni Building
University of Vermont
Burlington, Vermont 05401

TITLE

Vibration and Industrially Related Low Back Disease

OBJECTIVES

This research will attempt to clarify mechanical factors responsible for low back pain.

DESCRIPTION

Through retrospective and prospective studies, a survey of a general practice population will be performed to determine the incidence of low back disorders. Six study populations will be selected with no risk, high, or low mechanical risk factors; they will be studied through questionnaires, psychological evaluation, and physical examination (including radiographs, biomechanical studies, and case histories which also analyze the working environments. The greatest emphasis of the study will be placed on the role of repetitive vibrational stresses. The questionnaire will determine (1) episodes of low back pain not requiring treatment, (2) episodes treated by other health care professionals, (3) disability resulting from the pain, and (4) any occupational stresses such as vibration or heavy lifting. From the retrospective study, the investigators will attempt to define age-matched volunteers from the six male population subgroups that can be used for their prospective study: those with a history of low back pain, both with and without identifiable mechanical risk factors, who have required medical attention; and those with an without identifiable mechanical risk factors who have never had any low back pain. They hope to identify 50 to 100 persons in each of these six categories, and analyze about 50 variables.

The prospective studies will involve five steps: giving all volunteers (1) a computerized questionnaire and (2) a standard physical examination, (3) taking AP and lateral spine radiographs, (4) doing biomechanical studies, and (5) studying individual case histories. The computerized questionnaire will include medical, historical, occupational and psychosocial variables, the latter designed to generate personality characteristics similar to those currently identified as important in the large-scale MMPI test. The standardized physical examination will include a Moire Fringe analysis of spinal posture, a Moire Fringe and a modified vectorstereographic analysis of

spine motion, determinations of abdominal and extensor strength and hamstring tightness, and a standardized neurological examination.

RECENT RELATED PUBLICATIONS

None

# OCCUPATIONAL NEUROLOGIC DISORDERS

UNIVERSITY OF CALIFORNIA
Berkeley, California

GRANT NUMBER: 5 R01 OH 00368-05

PRINCIPAL INVESTIGATOR

Robert C. Spear, Ph.D.
Environmental Health Sciences
University of California-Berkeley
Berkeley, California 94720

TITLE

Occupational Exposure to Organophosphorous Compounds

OBJECTIVES

This research is designed to identify and assess the biochemical and other parameters of organophosphorous pesticide toxicity in agricultural field workers and to develop effective methodologies and procedures to modify or prevent poisoning among field workers who enter pesticide-treated workplaces (fields, vineyards, and orchards).

The objectives of this project are to discover:

1) discover variations in the physical and chemical nature of the pesticide residues in the field in various regions of the nation;
2) further develop and verify techniques for meaningful correlations of the environmental sampling of pesticide residues to work exposures through the measurement of cholinesterase changes and the excretion of the dialkyl phosphate and phenolic metabolites of the applied pesticide in the urine of the exposed worker; and
3) determine the effects of specific environmental variables upon the chemical composition and physical availability of pesticide residues.

DESCRIPTION

The research project is divided into four parts:

1) there will be a work practices survey aimed at defining the work practices, hygienic conditions and demographic data on the work force that may influence the residue intoxication hazard in a particular crop and geographic region;
2) there is to be an experimental residue decay study involving a study of the decay of foliar residues of one or more pesticides on a particular crop under replicated, carefully controlled conditions;
3) a cross sectional study will focus on the decay of foliar residues in groves or vineyards that have received commercial applications of a pesticide under normal agricultural conditions; and
4) using students as pickers, there is to be a human exposure study, with blood cholinesterase being monitored by the University of California

group, and 24 hour urines being monitored by the University of Miami group for alkyl phosphate and its metabolites and relationships being drawn between these data and exposure data.

RECENT RELATIONS PUBLICATIONS

Spear, R.C. et al. 1977. Fieldworkers Response to Weathered Residues of Parathion. J. Occup. Med. 19:406-410.

Spear, R.C. et al. 1977. Worker Poisoning Due to Paraoxon Residues. J. Occup. Med. 19:411-414.

TEMPLE UNIVERSITY SCHOOL OF DENTISTRY
Philadelphia, Pennsylvania

GRANT NUMBER: 2 R01 OH 00518-03

PRINCIPAL INVESTIGATOR

Martin F. Tansy, Ph.D.
Professor and Chairman
Department of Physiology and Biophysics
Temple University School of Dentistry
3223 N. Broad Street
Philadelphia, Pennsylvania 19140

TITLE

Toxic Mechanisms of Inhaled Methyl Methacrylate Vapor

OBJECTIVES

The proposal seeks to investigate the toxicity, in rats, of inhaled vapors of methyl methacrylate.

DESCRIPTION

This study examines both the acute and chronic toxicity effects in rats of inhaled vapor of methyl methacrylate, a chemical widely used in dental laboratories. It is proposed to study acute gastric secretomotor effects and the mechanisms responsible for the effects and also to determine the histopathology and mortality connected with chronic long-term exposure (at the TLV) to the chemical.

RECENT RELATED PUBLICATIONS

Tansy, M.F., F.M. Kendall, S. Benhayem, F.J. Hohenleitner, W.E. Landin, and M. Gold. 1976. Chronic Biological Effects of Methyl Methacrylate Vapor. 1. Body and Tissue Weights, Blood Chemistries, and Intestinal Transit in the Rat. Environ. Res. 11:66-67.

YESHIVA UNIVERSITY
Albert Einstein College of Medicine
The Bronx, New York

GRANT NUMBER: 5 R01 OH 00535-02

PRINCIPAL INVESTIGATOR

Peter S. Spencer, Ph.D.
Scientific Director
Neurotoxicology Unit
Albert Einstein College of Medicine
1410 Pelham Parkway
Bronx, New York 10461

TITLE

A Neuropathologic Study of Acrylamide Intoxication

OBJECTIVES

The objectives of the study are to develop new, sensitive methods for the assessment of chemically induced neurotoxicity and neuroteratogenicity and to illuminate the mechanism of neurotoxin-induced nerve fiber degeneration.

DESCRIPTION

Experiments have been designed to demonstrate in monkeys and cats the nature and distribution of systemic toxicity, local vulnerability as determined by distance from the neuron and systemic intoxication. Rhesus monkeys will be exposed to oral acrylamide for two years. These animals will be observed for motor activity, have footpad biopsies taken every six months for pacinian corpuscle study, and finally will be sacrificed for EM studies. In another set of experiments, a special cast will be constructed to maintain a sponge containing acrylamide in contact with the foot of the animal for two weeks following which sacrifice and EM studies will be done. In a third series, a silastic nerve-cuff will be placed around the tibial nerve of cats for two weeks. Fourthly, silastic cuffs will be placed at three different levels (ankle, knee, and mid-thigh) in monkeys. Other monkeys will be given acrylamide systemically. When the first evidence of damage occurs, silastic cuffs will be applied to the nerves at each of the three levels.

These investigations are designed to answer the questions of whether the anatomic pathologic alterations in nerve tissue can be demonstrated before clinical signs of toxicity and also whether the mechanism of toxic action of acrylamide can be explained by a direct effect of the acrylamide on the distal part of the nerve. The clinical manifestations of the toxicity of methyl butyl ketone and related solvents such as n-hexane, methyl n-butyl ketone, 2-5 hexanedione, are similar to those produced with acrylamides. Thus, the study of the mechanism of action of acrylamide should help in understanding the toxicity of those compounds as well.

RECENT RELATED PUBLICATIONS

Spencer, P.S. and H.H. Schaumburg. 1975. Nervous system degeneration produced by acrylamide monomer. Envir. Health Perspect., 11: 129.

Prineas, J. and P.S. Spencer. 1975. Pathology of the Nerve Cell Body in Disorders of the Peripheral Nervous System, p.253. In: P.J. Dyck, P.K. Thomas, and E.H. Lambert, Eds., Philadelphia. Peripheral Neuropathy.

Spencer, P.S., and H.H. Schaumburg. 1977. Ultrastructural Studies of the Dying-Back Process III. The volution of giant axonal degeneration. J. Jeuropath. Exp. Neurol. 36:276.

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UNIVERSITY OF CALIFORNIA
Los Angeles, California

GRANT NUMBER: 5 R01 OH 00616-02

PRINCIPAL INVESTIGATOR

Robert W. Baloh
Reed Neurological Research Center
UCLA Center for Health Sciences
Los Angeles, California 90024

TITLE

Effects of Increased Lead Absorption in Lead Workers

OBJECTIVES

This investigation seeks to identify early signs of neurologic damage in 50 lead smelter workers and attempted correlation with their lead exposure, previous lead poisoning, and lead absorption measurements. In addition, the relationship is sought between whole blood lead and plasma and RBC binding and effects of lead poisoning.

DESCRIPTION

Distribution of lead in blood with special emphasis on plasma and RBC binding is investigated and correlations made of any observed shifts in binding with clinical symptoms, signs and tests-particularly routine neurological findings, and routine electrophysiology and audiology, and special technical tests such as eye-tracking. Plasma lead will be correlated with neurological findings to determine if it is a better indication of lead absorption than the commonly used whole blood lead value. The study population will be drawn from the 200 workers in a secondary lead smelter in Vernon, California. The control group will be non-exposed workers from a different type of plant in the same area.

This project is anticipated to produce results useful in the development of plasma-level criteria and neurological techniques in lead-poisoning studies.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

GRANT NUMBER: 1 R01 OH 00631-01

PRINCIPAL INVESTIGATOR

Franz Halberg, M.D.
Chronobiology Laboratories
380 Lyon Laboratories
Laboratory Medicine & Pathology
University of Minnesota
Minneapolis, Minnesota 55455

TITLE

Repeated Schedule-Shifts, Rhythms and Life Span of Mice

OBJECTIVES

This research will investigate the life span and selected circadian rhythyms at several levels of organization in mice subjected to repeated shifting of two synchronizers, daily lighting and/or feeding schedules.

DESCRIPTION

Circadian rhythms to be assessed include body core temperature (by longitudinal telemetry), biochemical, and resistance variables (in transverse profiles) with particular attention being paid to adrenocortical hormones and liver glycogen as cyclic resources for optimal (rhythmic) function. Major factors to be examined are heredity, age at first exposure, interaction of synchronizers, frequency of shifting, extent of shift, and direction of shift. Representative mice will be implanted with temperature transensors to determine by telemetry the nature and rate of change of temperature rhythms as a result of the shifts. On the basis of these results, time points will be selected for spot-checks of biochemical variables and resistance to potentially harmful agents including drugs. In the first stage, the investigators will concentrate on determining the effects of an interplay between schedules of lighting and feeding, the frequency of shifting and the age of first exposure to shifting. In the second stage, they will investigate the effects of the extent and direction of repeated synchronizer-shifting on the life span and circadian rhythms.

These studies on a well-controlled model may indicate means to avoid any adverse effects of shift-work in man both by the optimization of shift-schedules and by the design of tests for the selection of shift-workers.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

GRANT NUMBER: 1 R01 OH 00707-01

PRINCIPAL INVESTIGATOR

Gary D. Langolf, Ph.D.
Industrial and Operations Engineering
2260 G. G. Brown Laboratory
The University of Michigan
Ann Arbor, Michigan 48109

TITLE

Longitudinal Study of Effects of Mercury Exposure

OBJECTIVES

This research will demonstrate the use of an advanced behavioral testing methodology as a part of medical monitoring of workers exposed to inorganic mercury. It will also evaluate possible subclinical changes in tremor, electromyographic spectra, and psychomotor functions in mercury-exposed chlor-alkali workers.

DESCRIPTION

By employing a longitudinal design, this research will use test measures that explore timewise functional changes in individual workers after they are either newly introduced to mercury exposure or removed from mercury exposure. Previously tested mercury exposed workers will also be retested on a continuing basis in order to explore the possibility of functional changes which may accompany long-term chronic exposures. A methodology and statistical basis for using sensitive subclinical tests will be provided as an aid in controlling individual workers' exposure to inorganic mercury. The longitudinal monitoring methods developed may also be applicable to control of exposure to other potentially neurotoxic substances.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF CALIFORNIA
Los Angeles, California

GRANT NUMBER: 1 R01 OH 00730-01

PRINCIPAL INVESTIGATOR

Harvey C. Gonick, M.D.
Department of Medicine
University of California
Los Angeles, CA 90024

TITLE

RBC Lead-Binding Protein After Occupational Exposure

OBJECTIVES

Five major objectives are outlined for this research. The investigators will purify and identify a recently discovered low molecular weight lead-binding protein in RBC of lead-exposed workers, develop an immunoassay for this protein, investigate the role of this protein in protection against lead toxicity, determine whether it is the free, rather than total, lead in RBC which correlates with inhibition of RBC membrane Na-K-ATPase and delta amino-levulinic acid dehydratase, and investigate the effects of various chelating agents such as CaEDTA and D-penicillamine on binding of lead to hemoglobin and the low molecular weight lead-binding protein.

DESCRIPTION

The investigators will explore in greater depth their preliminary evidence indicating that there is a fraction of lead in erythrocytes bound to a low molecular weight protein which is not metallothionein. This protein has been found in the erythrocytes of occupationally-exposed workmen, but not in the blood of control subjects. They hypothesize that this low molecular weight lead-binding protein may serve functions in relation to lead, which are similar to the apparent role of metallothionein in cadmium metabolism and cadmium toxicity. They propose to determine whether this protein may play a protective role against lead toxicity. An immunoassay for this protein will be developed in order to follow the sequential appearance after initial lead exposure and possible disappearance after chelation treatment and removal from exposure. They will determine whether this low molecular weight lead-binding protein, rather than the total erythrocyte lead, may correlate more closely with inhibition of erythrocyte delta-aminolevulinic acid dehydratase activity and red cell membrane Na-K-ATPase activity.

RECENT RELATED PUBLICATIONS

None

TEMPLE UNIVERSITY
Philadelphia, Pennsylvania

GRANT NUMBER: 1 R01 OH 00740-01

PRINCIPAL INVESTIGATOR

David L. Innes, Ph.D.
Department of Physiology and Biophysics
Temple University
Health Sciences Center
3223 North Broad Street
Philadelphia, Pennsylvania 19140

TITLE

Methyl Methacrylate Induced Changes in CNS Activity

OBJECTIVES

The acute and chronic effects of exposure to methyl methacrylate monomer vapor on the nervous system of male Sprague Dawley rats will be determined.

DESCRIPTION

This research will investigate the hypothesis that neuronal activity in the hypothalmic area of the rat is markedly depressed during acute exposure to methyl methacrylate (MMA) vapor. The cortical EEG and multiple unit activity from those brain regions involved in the regulation of gastrointestinal function will be studied. The investigators will also determine if chronic exposure to MMA vapor alters those neuronal structures found to be acutely affected over a longer period of time.

Adult rats under Nembutal anesthesia will be implanted with recording electrodes in four specific brain loci, rats will be exposed to methacrylate vapor in room air at 400 ppm for one hour and multiple unit activity will be recorded from lateral, ventromedial, anterior and posterior regions of the hypothalamus, amygdala and hippocampus. Controls from these studies will include recordings from brain areas unrelated to GI function, exposure of rats to a related acrylate, exposure of rats to an agent unrelated but with a pungent odor, and exposure of rats following severance of the olfactory nerves. The site of electrode implantation will be verified histologically at termination after production of direct current marking lesions. In the second phase, multiple unit recording electrodes will be chronic positioned into those neuronal structures with the greatest amount of change in the acute phase. Rats will be exposed to concentrations of 400, 100, and 25 ppm of methyl methacrylate monomer vapor in air, verified by gas chromatography. An Anova analysis of recording data will be conducted.

RECENT RELATED PUBLICATIONS

None

# OCCUPATIONAL RESPIRATORY DISEASE

MOUNT SINAI SCHOOL OF MEDICINE
New York, New York

GRANT NUMBER: 5 R01 OH 00320-11

PRINCIPAL INVESTIGATOR

Irving J. Selikoff, M.D.
Environmental Sciences Laboratory
Mount Sinai School of Medicine
Fifth Avenue and 100 Street
New York, New York 10029

TITLE

Relation of Smoking to Neoplasia in Asbestos Workers

OBJECTIVES

The aim of this project is to:

1) determine the risk factors of asbestos exposure to life, and support from the smoking factor;
2) the relationship of cigarette smoking to pleural and peritoneal mesothelioma;
3) the relationship of smoking and asbestos to gastrointestinal cancer;
4) the diminished risk factor of lung cancer in asbestos workers who have given up smoking; and
5) the value of smoking prevention educational programs.

DESCRIPTION

Using a well-defined cohort of asbestos workers, information will be obtained on the following problems: lung cancer deaths among nonsmoking asbestos workers (to determine whether asbestos alone, without cigarette smoking increases the risk of bronchogenic carcinoma); the relationship of cigarette smoking to pleural and peritoneal mesothelioma; its relation to pulmonary fibrosis; interaction between smoking and gastrointestinal neoplasms; and relationships of cigarette smoking to other neoplasms among asbestos workers. There are strong suggestions in the findings that there is a real and important association between cigarette smoking and the development of lung cancer in asbestos workers.

RECENT RELATED PUBLICATIONS

Selikoff, I.J. 1977. Air Pollution and Asbestos Carcinogenesis: Investigation of Possible Synergism. In: U. Mohr, D. Schmahl, and L. Tomatis, Eds. Air Pollution and Cancer in Man. pp.247-253. Lyon.

Selikoff, I.J. 1977. Cancer Risk of Asbestos Exposure. Origins of Human Cancer. pp.1765-1784. Cold Spring Harbor Laboratory.

Selikoff, I.J. 1973. Widening Perspectives of Occupational Lung Disease. Preventive Medicine 2:412-437.

Selikoff, I.H., et al. 1973. Cancer risk of insulation workers in the United States. In: P. Bogouski, et. al. Eds. Biological Effects of Asbestos. pp.209-216. Lyon.

Hammond, E.C. and I.J. Selikoff. 1973. Relation of Cigarette Smoking to Risk of Death of Asbestos-Associated Disease Among Insulation Workers in the United States. In: P. Bogouski, et al. Eds. Biological Effects of Asbestos.

UNIVERSITY OF WASHINGTON
Seattle, Washington

GRANT NUMBER: 5 R01 OH 00340-07

PRINCIPAL INVESTIGATOR

Nedd Robert Frank, M.D.
Department of Environmental Health
University of Washington
Seattle, Washington 98195

TITLE

Respiratory Effects of Inhaled Gases and Aerosols

OBJECTIVES

The two major objectives of this research are:

1) to elucidate the effects, in vivo, exerted by irritant gases and particles ($SO_2$ and a NaCl aerosol) on the lungs and;

2) to explore the use of mitochondria as sensitive indicators of biochemical toxicity. Studies on the effects of ozone are also planned.

DESCRIPTION

This is a three-year renewal project to be performed in guinea pigs and also in human beings. Animals will be exposed acutely and semichronically to combinations of $SO_2$ and NaCl aerosol at high and low relative humidities (RH). Body weight and flow resistance will be measured periodically. Lungs will be studied by light and electron microscopy, following the exposure periods. Ten human volunteers (nonsmoking), aged 20-25 years, will be studied on three separate occasions. Flow rate, tidal volume, flow resistance, dynamic compliance, transpulmonary pressure, functional residual capacity, vital capacity, and maximum expiratory flow rate will be measured following exposure for 30 minutes to: a) clean air at high RH; b) $SO_2$ + NaCl at low RH; and c) $SO_2$ + NaCl at high RH.

In a second part of this research, the effects of ozone at the subcellular level, particularly mitochondria of the ciliated epithelium will be investigated in normal rabbits and in rabbits subjected to various exposure regimes of $SO_2$ and NaCl aerosol combinations.

RECENT RELATED PUBLICATIONS

Frank, N.R. 1972. Clean and Dirty Lungs. Air and Water Pollution. Boulder, Colorado.

Yokoyama, E., et al. 1972. Respiratory Uptake of Ozone in Dogs. Arch. Env. Hlth. 25:132-138.

McJilton, C., et al. 1973. Role of Relative Humidity in the Synergistic Effect of a Sulfur Dioxide-Aerosol Mixture on the Lung. Amer. Assoc. for the Advan. of Sci. 182:503-504.

Watanabe, S., et al. 1973. Acute Effects of Ozone on Lungs of Cats. I. Functional. Amer. Rev. Resp. Dis. 108:1141-1151.

Botman, E.S., et al. 1974. Acute Effects of Ozone on Cat Lungs. II. Structural. Amer. Rev. Resp. Dis. 110:157-169.

Richmond, V.L., et al. 1974. In Vitro Hydrolase and Phyagocytic Activities of Alveolar Macrophages. J. Lab. and Clin. Med. 83:(5)757-767.

STANFORD UNIVERSITY
Palo Alto, California

GRANT NUMBER: 5 R01 OH 00352-08

PRINCIPAL INVESTIGATOR

Eugene D. Robin, M.D.
Department of Medicine
Stanford University
School of Medicine
Palo Alto, California 94305

TITLE

Lung Cell Function in Health and Disease

OBJECTIVES

This biochemical and physiological project, which is an extension of the earlier metabolic investigations in alveolar macrophage (AM), is directed toward elucidation of some of the mechanisms of respiratory physiology. Specific objectives include the development of knowledge of lung cells applicable to cellular physiology and the impact of various inhaled industrial pollutants on the normal cellular function of individual lung cells. The stated ultimate goal is the provision of approaches "aimed at the prevention, diagnosis, treatment, and rehabilitation of lung disease."

DESCRIPTION

This is a five-year renewal project to be carried out in animals (mice, rats, rabbits, and dogs) and in vitro, using recognized biochemical and physical techniques including radionuclides. The procedural plan is divided into five major subsections. In the first, the investigators plan to use measurement of reduced and oxidized glutathione to estimate the free NADP+/NADPH ratio in AM in control cells, phagocytizing AM's, and after in vitro exposure of these cells, to hypoxia and oxidant gases. In the second portion, they plan to examine energy metabolism in AM's (aerobic cells) as compared to peritoneal macrophages and would determine the influence of in vivo chronic hypoxia and hyperoxia on metabolism and ultrastructure. The third section would involve measurement of Ca++ transport in alveolar macrophages and Ca++ transport from blood or alveolas into pulmonary lymph. In the forth series of experiments, continuation of "enzyme implantation into alveolar macrophages" would be pursued. They would expose AM's to rate-limiting glycolytic enzymes and measure lactate ion production as compared to macrophages exposed to heat-inactivated enzymes. In the fifth and final protion, the possible protective effect of Vitamin E and glycerol against oxidant gases would be examined.

The investigators have demonstrated that phagocytosis and pinocytosis in isolated alveolar macrophages were impaired by high oxygen exposure. Increases in superoxide dismutase with hyperoxia were not found to prevent

impairment of phagocytosis. Significant findings have been made in uncovering a mechanism which accounts for the bioenergetic differences between aveolar and peritoneal macrophages which also equips alveolar macrophages to function more adequately during conditions of alevolar hypoxia. Right-to-left alveolar, true pulmonary and intracardiac vascular shunts have been found to have different impacts on pulmonary hemodynamics.

In the final year of the project, investigations will be performed on electrolyte and water metabolism in isolated type II pneumocytes, the nature and regulation of energy metabolism, the structural and functional impact of oxidant injury, osmotic properties of single aveolar macrophages and modifications of these cells by O2 and NO2, and the influence of high and low oxygen activities on macrophages.

RECENT RELATED PUBLICATIONS

Liu, J. et al. 1977. Superoxide Dismutase (SOD) Activity in Hypoxic Mammalian Systems. J. Appl. Physiol. 42:107-110.

Liebhaber, M. et al. 1977. Pulmonary Conference at Stanford: Reye's Syndrome Complicated by Ondine's Curse. West. J. Med. 126:110-118.

Simon, L, et al. 1977. Enzymatic Basic for Bioenergetic Differences of Alveolar Versus Peritoneal Macrophages and Enzyme Regulation by Molecular O2. J. Clin. Invest. 59:443-448.

Robin, E., et al. 1977. A Shunt Is (Not) A Shunt Is (Not) A Shunt. Amer. Rev. Resp. Dis. 115:553-557.

Robin, E.D. 1977. Dysoxia - Abnormal Tissue O2 Utilization. Arch. Int. Med. 87.

Graham, D. et al. 1977. Acute Cynide Poisoning Complicated by Lactic Acidosis and Pulmonary Edema (Report of a Case and Review of the Literature). Arch. Int. Med. 137:1051-1055.

Robin, E.D. 1977. Claude Bernard's (extended) milieu interieur revisited: Autoregulation of cell and subcell integrity. Clin. Sci. and Molec. Med. 52: 443-448.

Robin, E.D. and L. Simon. 1977. Regulation of Biosynthesis/Biodegradation of O2 Related Enzymes by Molecular O2. Ibid.

Simon, L.M., et al. 1977. Enzymatic Basis for Bioenergetic Differences of Alveolar Versus Peritoneal Macrophages and Enzyme Regulation by Molecular O2 J. Clin. Invest. 50:443-448.

Robin, E.D., et al. 1976. Platypnea Related to Orthodeoxia Caused by True Mascular Lung Shunts. NEJM 294:941.

Robin, E.D. and J. Theodore. 1976. Intracellular and Subcellular Oedema and Dehydration. Ciba Foundation Symposium (Lung Liquids). 38:273-289.

Lewiston, J. and E.D. Robin. 1976. Pulmonary Alveolar Proteinosis. West. Med. 124:29-35.

Lewiston, N., J. Theodore, and E.D. Robin. 1976. Intracellular Edema and Dehydration: Effects on Energy Metabolism in Alveolar Macrophages. Science 191:403-404.

Robin, E.D., et al. 1975. Detection, Quantitation, and Pathophysiology of Lung Spiders. Trans. of the Assoc. of Amer. Phys. 88:202-216.

Robin, E.D., R. Gaudio, and J. Acevedo. 1975. Transalveolar Transport of Large Polar Solutes (Sucrose, Inulin, Dextran). Amer. J. Physiol. 229:989-996.

Theodore, J. and E.D. Robin. 1975. Pathogenesis of Neurogenic Pulmonary Edema. Lancet 18:749.

Robin, E.D., et al. 1975. Platypnea Related to Orthodeoxia Caused by True Vascular Lung Shunts. NEJM 294:941.

Theodore, J., et al. 1975. Transalveolar Transport of Large Polar Solutes (Surcose, Inulin, Dextran). Amer. J. Physiol. 229:989-996.

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

GRANT NUMBER: 2 R01 OH 00356-07

PRINCIPAL INVESTIGATOR

Robert T. Christian, Ph.D.
Department of Environmental Health
University of Cincinnati
Eden and Bethesda Avenues
Cincinnati, Ohio 45267

TITLE

Cellular Response to Coal In Vitro (CWP)

OBJECTIVES

The aims of this research are to:

1) determine the effects of coal leachates on proline hydroxylation of collagen and on the synthesis of connective tissue ground substance molecules using human lung fibroblast cells in culture;
2) investigate the effects of coal leachates on pulmonary surfactant synthesis by lung cells;
3) study the reaction of coal leachates on lung organ cultures;
4) determine whether coal contains mutagens or promoters; and
5) prepare fractions of coal leachates for testing on the above biological processes.

DESCRIPTION

This is a study of Coal Workers' Pneumoconiosis (CWP) syndrome at the cellular level. During the previous years of this grant, a cell culture bioassay system was developed to determine the cytotoxicity of coal leachates. Depressed cell growth was greatest with coal particles from mines where the miners had the greatest incidence of CWP. The growth response was linear, dose dependent and independent of the particle size of the coal. The production of cross-linked collagen (hydroxy proline) was depressed by the more toxic coal while not affected by the least toxic coal, using human embryonic lung fibroblasts.

These studies are continuing, using human lung fibroblasts exposed to coal leachates and other chemicals. The effects of collagen and ground substance components will be determined by chemical analysis and electron microscopy. Pulmonary surfactant synthesis will be determined by the presence of lamellar bodies in organotypic cultures of rat cells.

Coal leachates and their chemical fractions will be studied. One of many biological tests employed in the research is a cell culture mutagenesis test system.

RECENT RELATED PUBLICATIONS

Christian, R.T., J. Cooke, V.J. Elia and T.E. Cody. 1975. The Effects of Aqueous and Simple Extracts on Cultured Mammalian Cells. pp. 446-448. In: L.K. Cecil, Ed. Proceedings of the Second National Conference on Complete Water Reuse: Water's Interface with Energy, Air and Solids. AIChE and EPA, New York.

Cody, T.E., R.T. Christian, V.J. Elia, and C.S. Clark. 1975. Cell Culture as a Toxicity Bioassay for Potable Reuse Water. pp. 408-412. In: L.K. Cecil, Ed. Proceedings of the Second National Conference on Complete Water Reuse: Water's Interface with Energy, Air and Solids. AIChE and EPA, New York.

WEST VIRGINIA UNIVERSITY
Morgantown, West Virginia

GRANT NUMBER: 2 R01 OH 00360-07

PRINCIPAL INVESTIGATOR

Robert Burrell, Ph.D.
Department of Microbiology
West Virginia University Medical Center
Morgantown, West Virginia 26506

TITLE

Immune Injury in Occupational Respiratory Diseases

OBJECTIVES

The overall aim is the elucidation of the underlying mechanisms responsible for producing immune injury in occupationally-related chronic pulmonary disease. This project aims at development of simpler methods of assessing impairment in pulmonary function due to immune injury in an experimental model of hypersensitivity pneumonitis (EHP). Also to be continued is the investigation of long-term effects of passive administration of anti-lung serum on normal pulmonary structure and function.

DESCRIPTION

This is a renewal project to be performed primarily in animals (rabbits). Human beings are also to be surveyed for immune responses to selected antigen. Ten principal tasks are identified:

1) by means of the Corning blood gas apparatus, blood gas determinations are to be made in the development of simpler methods of assessing pulmonary functional changes due to immune injury;
2) rabbits are to be used to study experimental hypersensitivity pneumonitis. Immunized animals will have their pulmonary function checked following aerosol challenges;
3) determination of effects of aerosol challenge in "decomplemented" previously immunized rabbits;
4) expand studies of passive transfers of sensitivity;
5) study the effects of differences of antigen, (soluble vs. cellular), and route of immunization upon type of tissue reaction and/or physiologic impairment in experimental hypersensitivity pneumonitis;
6) finish the study of effects of long-term administration of anti-lung serum on normal lung function. This is to be done in mice;
7) continue survey of appropriately selected patients with various forms of chronic pulmonary disease, particularly CWP, for cell mediated reactivity to soluble lung connective tissue antigen;
8) to transfer passively, cell mediated immunity to soluble lung connective tissue to normal recipients, and study these recipients for histopathologic changes in lung;

9) determine if SCT sensitivity has potentiation of a chronic infection such as tuberculosis; and
10) study the effect of adding humoral antibody to the test system in 9), if the results of 9) are positive.

RECENT RELATED PUBLICATIONS

Burrell, R., D.K. Flaherty, P.B. DeNee, J.L. Abraham, and A.H. Gelderman. 1974. The Effect of Lung Antibody on Normal Lung Structure and Function. Amer. Rev. Resp. Dis. 109:106-113.

Burrell, R. 1974. Commentary: Immunological Reflections on Asbestos. Environ. Hlth. Perspec. 9:297-298.

Cate, C.C. and R. Burrell. 1974. Lung Antigen Induced Cell-Mediated Immune Injury in Chronic Respiratory Diseases. Amer. Rev. Resp. Dis. 109:114-123.

Burrell, R. and D.M. Lewis. 1975. Further Studies on the Effect of Lung Antibodies on the Pathogenesis of Tuberculosis. J. Lab. and Clin. Med. 86:741-745.

Burrell, R.A. 1975. Immunology of Occupational Lung Disease. In: W.K.C. Morgan and A. Seatan (eds.) Occupational Respiratory Diseases. New York.

Burrell, R. and C.K. Thomas. 1977. Improved Methods of Producing Precipitating Aspergillus Antigens. Annals of Allergy 38:202-205.

UNIVERSITY OF PITTSBURGH
Pittsburgh, Pennsylvania

GRANT NUMBER: 5 R01 OH 00367-06

PRINCIPAL INVESTIGATOR

Yves C. Alarie, Ph.D.
Department of Occupational Health
Graduate School of Public Health
University of Pittsburgh
Pittsburgh, Pennsylvania 15261

TITLE

Respiratory Tract Irritants; Mechanisms and Tolerance

OBJECTIVES

The overall objective of this research proposal is to establish the mechanisms by which one category of "respiratory tract irritants," i.e., the "sensory irritants" or "upper respiratory tract irritants," exert their action and to delineate the importance of reflex reactions when they are retained in the upper respiratory tract. The aim of the present investigation is fourfold:

1) to continue the study of sensory irritation of the upper respiratory tract by various airborne chemicals and to correlate their irritant property with their chemical structure;
2) to determine the in vitro reactivity of these chemicals with SH groups;
3) to determine the mechanism of desensitization and why this appears with some but not all irritants; and
4) to study the effects of sensory irritation in animals with pulmonary impairment.

DESCRIPTION

The investigator has developed a simple method of measuring the degree of sensory irritation of the upper respiratory tract to airborne chemicals. Mice are exposed to various concentrations of aerosols or vapors of the chemicals and the decrease in respiratory rate during the exposure is measured. Since the decrease is related to the concentration, the irritant potency of chemicals can be graded and compared according to an RD50 value, i.e., the concentration necessary to reduce respiratory rate by 50% from control. The decrease in the respiratory rate has been demonstrated to be a reflex response from stimulation of the trigeminal nerve endings in the upper respiratory tract. Tolerance or desensitization results from repeated exposures to some chemical irritants. This mechanism is studied by following a fixed regime of exposure and recovery.

RECENT RELATED PUBLICATIONS

Alarie, Y. 1973. Sensory irritation of the upper airways by airborne chemicals, Toxicol. Appl. Pharmacol. 24:279-297.

Alarie, Y., I. Wakisaka, and S. Oka. 1973. Sensory irritation by sulfur dioxide and chlorobenzilidene malononitrile, Environ. Physiol. Biochem. 3: 53-64.

Alarie, Y. and L.W. Keller. 1973. Sensory irritation by capsaicin, Environ. Physiol. Biochem., 3: 169-181.

Alarie, Y., I. Wakisaka, and S. Oka. 1973. Sensory irritation by sulfite aerosols, Environ. Physiol. Biochem. 3:182-184.

Alarie, Y. 1973. Sensory irritation by airborne chemicals, CRC Critical Reviews in Toxicology 2:299-363.

Barrow, C.S., Y. Alarie, J.C. Warrick, and M.F. Stock. 1976. Sensory irritation evoked by thermal decomposition products of plasticized polyvinyl chloride, Fire and Material. 1:147-153.

Barrow, C., Y. Alarie, J. Warrick, and M. Stock. 1977. A comparison of the sensory irritation response to chlorine and hydrogen chloride in mice, Arch. Env. Health. 32:68-76.

Kane, L.E. and Y. Alarie. 1977. Sensory irritation to formaldehyde and acrolein during single and repeated exposure in mice, Amer. Indust. Hygiene Assoc. Journal 38:509-522.

HARVARD UNIVERSITY
Boston, Massachusetts

GRANT NUMBER: 5 R01 OH 00369-05

PRINCIPAL INVESTIGATOR

John M. Peters, M.D.
Harvard University
665 Huntington Avenue
Boston, Massachusetts 02115

TITLE

Epidemiology of Respiratory Disease in Firefighters

OBJECTIVES

This project seeks to determine both the acute and chronic pulmonary effects of inhalation of gaseous combustion products and smoke in firefighters. The significance of this work resides in the fact that, in the United States, the number of full-time and volunteer firefighters approaches one million and that they are subjected to unknown quantities and severities of pulmonary irritants of varying frequencies. The health consequences of these exposures, especially the chronic effects of acute inhalation or the chronic effects of chronic intermittent, and low-level exposures have hitherto not been systematically explored.

DESCRIPTION

The entire Boston Fire Department (approximately 1900 firemen) is the experimental group under survey in this essentially epidemiologic investigation with the Boston Police Department serving as the control group, under separate investigation and other support (Dr. Speizer). The screening techniques include pulmonary function tests, by means of a Stead-Wells spirometer using a fast paper speed (3.2 cm/sec.), for forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and determined expiratory flow rates. In addition, a questionnaire is employed to elicit demographic, occupational, and appropriate medical history information. The population is to be resurveyed annually. Also, all firemen who are treated in the Boston City Hospital emergency room for smoke inhalation are evaluated and the information compared with the baseline data.

A personal air sampling unit is being devised to be worn by firemen. This is to provide information on personal exposures to CO, O2, particulates, phosgene, hydrogen chloride, isocyanates, acrolein, sulfur dioxide, and other materials. The successful accomplishment of this research can be expected to result in significant and highly useful information on respiratory hazards to firemen.

RECENT RELATED PUBLICATIONS

Smith, T.J., et al. 1978. Acute Respiratory Effects of a Fire Involving

Silicone Rubber. Int. Arch. Occ. Env. Health. 41:139-145.

Musk, A. et al. 1977. Lung Function in Fire Fighters, II: A Five Year Follow-up of Retirees. Amer. J. of Public Health. 67:7:630-633.

Musk, A., et al. 1977. Lung Function in Fire Fighters, I: A Three Year Follow-Up of Active Subjects. Amer. J. of Public Health. 67:626-629.

Peters, John M., et al. 1974. Chronic Effect of Fire Fighting on Pulmonary Function. New England Journal of Medicine. 291:1320-1322.

Sidor, R., and J.M. Peters. 1974. Fire Fighting and Pulmonary Function: An Epidemiologic Study. Am. Review of Resp. Dis. 109:249-254.

Sidor, R., and J.M. Peters. 1974. Prevalence Rates of Chronic Non-Specific Respiratory Disease in Fire Fighters. Am. Review of Resp. Dis. 109:255-261.

Sidor, R., and J.M. Peters. 1973. Differences in Ventilatory Capacity of Irish and Italian Fire Fighters. Am. Review of Resp. Dis. 108:669-671.

Sidor, R., et al. 1973. A Carbon Monoxide-Oxygen Sampler for Evaluation of Fire Fighter Exposures. Am. Ind. Hyg. Assoc. Journal. 34:264-274.

NEW YORK UNIVERSITY MEDICAL CENTER
New York, New York

GRANT NUMBER: 5 R01 OH 00396-02

PRINCIPAL INVESTIGATOR

Edward D. Palmes, Ph.D.
New York University Medical Center
Institute of Environmental Medicine
550 First Avenue
New York, New York 10016

TITLE

Aerosol Deposition in Human Subjects

OBJECTIVES

This endeavor is directed toward providing a rational understanding of the underlying dynamics of inhaled aerosols as relatable to industrial dust exposures. More specifically, the effort is aimed at determining the fate of aerosols inhaled by human beings.

DESCRIPTION

This project has essentially a biphasic character:

1) an investigation of the influence of physiologic and anatomic factors on deposition of aerosols in the human respiratory tract, and
2) the development of a simple, rapid screening procedure for measuring aerosol deposition in human populations, under conditions applicable to those in working environments. The rationale of the principal direction of this project resides in the reasonable concept that any given particle of known size and shape is deposited in a shorter time if it is confined in a smaller rather than larger space.

The investigation is carried out by using breath-holding and single breath techniques in human subjects. A new type of apparatus is also used with newly developed procedures to study steady-state breathing of aerosols. Presumably these techniques and procedures are useful in screening procedures such as may be employed for emphysema and other respiratory diseases and conditions.

RECENT RELATED PUBLICATIONS

Palmes, E.D. and M. Lippmann. 1977. Influence of respiratory air space dimensions on aerosol deposition. pp.127-136. In: W.H. Walton (ed.) Inhaled Particles IV. New York.

ST. LOUIS UNIVERSITY
St. Louis, Missouri

GRANT NUMBER: 2 R01 OH 00398-04

PRINCIPAL INVESTIGATOR

Raymond G. Slavin, M.D.
Associate Professor of Internal Medicine
Director of Section of Allergy and Immunology
St. Louis University School of Medicine
St. Louis, Missouri 63104

TITLE

Pathogenesis of Allergic Pulmonary Aspergillosis

OBJECTIVES

This investigation seeks to determine the reasons for the relatively low incidence of allergic bronchopulmonary aspergillosis (ABA) in the United States compared to the high incidence in Great Britain. It also seeks to elucidate the mechanism for the pathogenesis of ABA.

DESCRIPTION

This is a renewal application to continue investigations on an animal model of allergic bronchopulmonary aspergillosis (ABA) and epidemiologic studies to determine the reasons for different incidences of ABA in two countries. Using an experimental model, ABA can be produced in the Rhesus monkey by immunization with an extract of Aspergillus fumigatus to induce precipitin formation (IgG), infused with IgE antibodies derived from a human patient with no demonstrable precipitins, and challenged with an aerosol of nonviable A fumigatus material. The studies will be expanded to include baboons. Skin tests and biopsies will also be performed. Microscopic analysis of lung tissue and cell counts of lung lavage will be analyzed (fluorescent assays for immunoglobulins, lymphocyte transformation assays and assays for inhibitor factor). The effects of chronic administration of the aerosol will be determined.

The epidemiologic studies involve determining the concentration of A. fumigatus spores in the air in selected urban areas. Asthmatics will be tested for precipitins to determine the incidence of sensitization in an allergic population. In addition, atopic and non-atopic farmers will be evaluated for immediate skin reactivity and serum precipitins to A. fumigatus.

RECENT RELATED PUBLICATIONS

Slavin, R.G., and P.A. Winzenburger. 1977. Epidemiologic aspects of allergic aspergillosis. Ann. of Allergy 38:215-218.

Slavin, R.G., et al. 1978. A primate model of allergic bronchopulmonary aspergillosis. Int'l. Arch. Allergy & Applied Immun. 56:325-333.

UNIVERSITY OF ROCHESTER
Rochester, New York

GRANT NUMBER: 5 R01 OH 00472-03

PRINCIPAL INVESTIGATOR

Frank A. Smith, Ph.D.
Associate Professor
Department of Radiation Biology and Biophysics
University of Rochester
School of Medicine and Dentistry
Rochester, New York 14642

TITLE

Exposures of Mixtures of Airborne Contaminants

OBJECTIVES

This research aims at investigating the biological effects of concurrent exposures to mixed airborne contaminants such as hydrogen fluoride (HF), particulate fluoride (insoluble rock phosphate), or soluble triple superphosphate, each at their TLV concentrations. The agents selected are those encountered in the mining and processing of rock phosphate to produce phosphoric acid and phosphate fertilizers. This study is intended to elucidate the possible synergistic or additive effects of mixed contaminant exposures and to indicate possible safety margins.

DESCRIPTION

This is a three-year project in which guinea pigs are to be used as experimental animals to test experimentally the effects of mixed airborne contaminant exposures at the calculated threshold limit values (TLV). The work is predicated on the assumption that the effects of the different agents are additive. Exposed animals and controls will be sacrificed prior to examination for skeletal changes detectable by X-ray, skeletal storage of fluoride, excretion of fluoride in urine, plasma fluoride levels, and histological changes induced in the respiratory tract and other organs.

RECENT RELATED PUBLICATIONS

Hodge, H.C. and F.A. Smith. 1977. Occupational Fluoride Exposure. J. Occup. Med. 19:12-39.

MOUNT SIANI SCHOOL OF MEDICINE
New York, New York

GRANT NUMBER: 5 R01 OH 00511-04

PRINCIPAL INVESTIGATOR

Kaye H. Kilburn, M.D.
Mount Sinai School of Medicine
Departments of Medicine and Community Medicine
New York, New York

TITLE

Prevalence, Pathogenesis and Control of Byssinosis

OBJECTIVES

This research is directed toward three principal objectives, viz.:

1) the extraction and isolation of the active ingredient of cotton textile dust responsible for byssinosis;
2) in vitro testing of chemotaxis; and
3) leucocyte recruitment assay in human beings.

DESCRIPTION

Although this is technically a renewal project for a three-year period, it is essentially a new one because of the move of the principal investigator from another institution to his current affiliation.

These investigations will involve in vitro studies, research in animal models, and finally test studies in human beings. Of the eight test materials to be used, primarily the flavonals and quinones will be used. Two separate and distinct agents from cotton have been shown to have biological activity. Pure chemicals from commercial sources, namely gossypol, quercetin, and various hydroxy-benzenes will also be used. Extractives from cotton trash will be studied. Fractionation of cotton extracts will be followed by means of a simple animal bioassay.

RECENT RELATED PUBLICATIONS

Kilburn, K.H. and W.N. McKenzie. 1978. Leukocyte recruitment to airways by aldehyde-carbon combinations that mimic cigarette smoke. Lab. Invest. 38:134-142.

Kilburn, K.H. and W.N. McKenzie. 1975. Leukocyte recruitment to airways by cigarette smoke and particle phase; cytotoxicity of vapor. Science 189:634-637.

Merchant, J.A., et al. 1974. Intervention studies of cotton steaming to reduce biological effects of cotton dust. Brit. J. Ind. Med. 31:261-274.

Kilburn, K.H., et al. 1974. Two patterns for bronchial damage from inhaled materials. Chest 65:61s-62s.

Kilburn, K.H. 1974. Acute bronchitis due to cotton plant polyphenols. Ann. N.Y. Acad. Sci. 221:335-339.

Merchant, J.A., et al. 1974. Evaluation before and after exposure - the pattern of physiological response to cotton dust. Ann. N.Y. Acad. Sci. 221:38-43.

Merchant, J.A., et al. 1973. Preprocessing cotton to prevent byssinosis. Brit. J. Ind. Med. 30:237-247.

Kilburn, K.H., et al. 1973. Byssinosis: matter from lint to lungs. Amer. J. Nurs. 73:1952-1956.

Merchant, J.A., et al. 1973. Dose response studies in cotton textile workers. J. Occup. Med. 15:222-230.

Merchant, J.A. 9173. An industrial study of the biological effects of cotton dust and cigarette smoke exposure. J. Occup. Med. 15:212-221.

Kilburn, K.H. 1973. Biological effects of cigarette smoking in the pathogenesis of pulmonary disease. J. Occup. Med. 15:198-201.

Hamilton, J.D., et al. 1973. Byssinosis in a non-textile worker. Amer. Rev. Resp. Dis. 107:464-466.

Kilburn, K.H., et al. 1973. Leukocyte recruitment through airway walls by condensed vegetable tannis and quercetin. Lab. Invest. 28:55-59.

Hamilton, J.D., et al. 1973. Differential endobronchial challenge studies in byssinosis. Arch. Envir. Health 26:120-124.

PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

GRANT NUMBER: 5 R01 OH 00538-02

PRINCIPAL INVESTIGATOR

Arian Zarkower, D.V.M., Ph.D.
Department of Veterinary Science
Pennsylvania State University
University Park, Pennsylvania 16802

TITLE

Silica Dust Inhalation and Resistance to Infections

OBJECTIVES

This research is aimed at determining the effects of silica dust inhalation on the immunologic defense mechanisms involved in the pulmonary resistance to infection.

DESCRIPTION

In groups of mice which are exposed to airborne silicon dioxide particles of respirable dust size ranges, *in vivo* and *in vitro* assessments are made of humoral and cellular immune responses to a variety of antigenic stimulations. Other groups of mice are infected intranasally with mouse-adapted influenza virus following their exposure to silica, in the attempt to relate any changes seen in the immune mechanisms to changes noticed in resistance to pulmonary infection induced by influenza virus.

By examining the effects of silica on specific cell populations and immunologic functions, the aim is to provide a model capable of predicting changes in resistance to infection resulting from toxic particle inhalation.

Preliminary experimental results of macrophage functions include indications that following silica inhalation, both spleen and alveolar macrophages had impaired abilities to stimulate antibody formation after prior exposure to antigen. The most pronounced effects of silica exposures were on the humoral immune responses. There were significant suppressions of humoral immune responses to *E. coli* lipoplysaccharide (LPS) in the mediastinal lymph nodes, the lymph nodes related to the thoracic area, and in the anatomically distant spleens. Preliminary evidence was obtained for depression of total immunoglobin in sera of exposed animals and that this depression persisted after removal of the animals from the silica exposure chambers. Other effects were observed which could also be usefully applied in the overall assessment of the ability to predict consequences of silica exposures.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF WISCONSIN
Madison, Wisconsin

GRANT NUMBER: 5 R01 OH 00569-03

PRINCIPAL INVESTIGATOR

Thomas A. Massaro, Ph.D.
Chemical Engineering Department
University of Wisconsin
Madison, Wisconsin 53706

TITLE

V/Q in Occupational Lung Disease: Basic Development

OBJECTIVES

This investigation's long-term objective is the development of an effective approach, methodology, and associated instrumentation for use in early detection and clinical monitoring of occupational lung disease including the resultant physiologic and pathologic processes involved.

DESCRIPTION

This effort aims at developing a device based on a modified medical mass spectrometer to obtain on-line, real-time, continuous in vivo measurements to assess ventilation: perfusion distribution in various lung components. After a mixture of physiologically inert gases is infused intravenously into an animal (or patient), measurements are taken directly from the expired gas and well mixed arterial blood via specially designed closed end catheters fitted with semipermeable membrane tips. Data will be compared to GC and $^{133}Xe$ lung scanning methods.

Blood gas partition coefficients are measured for the various gases tested. The optimum design of a special selectively permeable catheter is studied and fabricated from biomaterials obtained from the polymers laboratory of the University. Identical catheter units are used for both blood and gas measurements.

The system in final development will provide: continuous, on-line, real-time analysis of V/Q; very high sensitivity and rapid response; elimination of drawing and handling of blood samples; identical analytical procedures for both blood and gas samples; and unlimited detection capabilities for a wide variety of physiological and inert gases with no special procedures.

RECENT RELATED PUBLICATIONS

Mastenbrook, S.M., T.A. Massaro and J.A. Dempsey. 1977. Feasibility of Mass Spectrometry for Multiple Inert Gas Elimination Measurements. Fed. Proc. 36:609.

STANFORD UNIVERSITY
Stanford California

GRANT NUMBER: 1 R01 OH 00622-01

PRINCIPAL INVESTIGATOR

Ellis N. Cohen, M.D.
Department of Anesthesia
Stanford University Medical Center
300 Pasteur Drive
Stanford, California 94305

TITLE

Anesthetic Metabolism-Toxic Effects in OR Personnel

OBJECTIVES

The primary aim of this research is to study the metabolism and binding characteristics of two anesthetics, halothane and nitrous oxide.

DESCRIPTION

This research extends previous halothane studies and will explore the potential metabolites as proximal carcinogenic agents. In addition, the metabolism of nitrous oxide in experimental animals and in clinical volunteers will be studied. A proposed scheme for the possible metabolism of nitrous oxide to other nitro compounds or amines and its possible role in producing tumors will also be studied. The identification of halothane metabolites in the liver and studies of their binding properties will be continued. The in vitro metabolism of halothane metabolites in human liver microsomes will be made possible by using human heart transplant donors. Fresh human liver is available through the heart transplant program and studies that have been done in experimental animals can now be extended to man. Heavy isotopically labeled $^{15}$N-nitrous oxide will be used in the study of the metabolism of nitrous oxide. The use of isotope-ratio mass spectroscopy will be employed rather than tracer techniques. Where metobolites are isolated, they will be converted to molecular nitrogen via a Kjeldahl procedure.

A series of male and female rats as well as human volunteers will receive $^{15}N_2O$ and urine and feces will be collected and metabolites will be sought for. The separation of nonvolatile metabolites will be accomplished with a Sephadex gel exclusion chromatography. Consideration has been given to the quantification and the amount of potential metabolite that might be formed under the experimental conditions in animal and man.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF VERMONT
Burlington, Vermont

GRANT NUMBER: 1 R01 OH 00653-01

PRINCIPAL INVESTIGATOR

John E. Craighead, M.D., Chairman
Department of Pathology
Medical Alumni Building
College of Medicine
University of Vermont
Burlington, Vermont 05401

TITLE

Industrial Dust Interaction with Respiratory Mucosa

OBJECTIVES

Selected industrial and environmental dusts, of defined type, size, and concentration, will be studied using organ culture techniques to determine the response of the porcine bronchial mucosa and adult human bronchial mucosa to these dusts.

DESCRIPTION

The in vitro effects of exposure to carbon, fiberglass, hematite and asbestos dusts on porcine and human tracheo-bronchial mucosal cells in culture will be determined. The rationale for the study is based on the fact that, after inhalation, a large amount of the dust particles are deposited in the upper airways and are removed or trapped in the tracheo-bronchial secretions, resulting in an altered mucosa. This research may provide information regarding early responses in carcinogenesis or chronic respiratory diseases resulting from occupational dust exposures.

The tissue reactions will be studied both biochemically and morphologically to elucidate the cellular changes that take place. Studies of mucin production and composition will be done as will studies of cellular enzyme release, and mucosal cell DNA synthesis through $^{3}H$-thymidine labeling. The tissues will be examined by electron microscopy and energy dispersive x-ray spectometer. In addition, the effect of respiratory virus infections on the response to the dusts will be evaluated in the porcine organ cultures utilizing vesicular stomatitis virus type III, 3 common pig viruses, and infecting the tracheal organ cultures prior to the exposure to the dusts.

RECENT RELATED PUBLICATIONS

None

EMORY UNIVERSITY
Atlanta, Georgia

GRANT NUMBER: 3 R01 OH 00674-01S1

PRINCIPAL INVESTIGATOR

James M. Bradford, Ph.D.
Emory University Hospital
1364 Clifton Road, N.E.
Atlanta, Georgia 30322

TITLE

Byssinosis and Small Airways Diseases

OBJECTIVES

The specific objectives of this research continue to be:

1) the determination of the incidence of small airways abnormalities of an episodic as well as chronic time scale in the population of cotton mill workers;
2) determination of the incidence of byssinosis in a population of cotton mill workers;
3) the measurement of respirable dust concentrations in each working environment; and
4) determination of the relationship between small airways abnormalities and large airways abnormalities in those subjects with either acute or chronic decreases in $FEV_1$; and correlation of the incidence of small and large airways abnormalities (episodic and chronic) with respirable dust levels.

DESCRIPTION

This is an investigation of approximately 600 employees in approximately ten cotton mills, about evenly divided between cotton-textile and cotton-blend mills, located in Georgia and eastern Alabama. Approximately 200 employees are drawn from high dust areas (opening, picking, carding); 200 from low dust areas (spinning through warping); and 200 from areas that do not expose the employees to much cotton dust (offices, warehouse, supply areas).

Pulmonary function tests are performed in a mobile van with the development of computer software for later data handling by means of a control PDP8E digital computer with backup recording systems and monitoring devices. In addition to the tests, the workers are asked to complete a medical questionnaire for purposes of correlations. Prior to actual testing, workers are trained in the testing procedures so as to familiarize them with the procedures thereby minimizing a significant "leaving effect" upon repeated test administrations.

RECENT RELATED PUBLICATIONS

None

NEW YORK UNIVERSITY
New York, New York

GRANT NUMBER: 1 R01 OH 00678-01

PRINCIPAL INVESTIGATOR

Morton Lippmann, Ph.D.
Institute for Environmental Medicine
New York University
550 First Avenue
New York, New York 10016

TITLE

Pulmonary Dust Retention and Occupational Lung Disease

OBJECTIVES

This research is aimed at the characterization of the pathways, transport rates, accumulation sites, and routes for deposited particles by inhalation in the non-ciliated pulmonary regions of the lung. The purpose is to provide an improved basis for the characterization of dose associated with the inhalation of airborne contaminants.

The specific aims are to determine the:

1. alveolar clearance pathways and rates with intersubject variability for low concentrations of spherical particles which can be considered to be inert, insoluble and non-toxic,
2. intra-individual variability of clearance patterns in replicate tests,
3. effect of particle size on clearance rates in each characteristic clearance phase,
4. clearance of compact, irregular particles and flakes,
5. clearance of short fibers of glass and asbestos,
6. clearance of long fibers of glass and asbestos,
7. clearance of coal dust and its effect on the clearance of inert dust,
8. clearance of granite dust and its effects on the clearance of inert dust,
9. effect of a high concentration of inert dust on alveolar clearance of inert and cytotoxic dust,
10. effects of a high concentration of cytotoxic dust on alveolar clearance of inert and cytotoxic dust,
11. effect of low dose cigarette smoke exposure on alveolar clearance of inert and cytotoxic dust, and
12. effect of high dose cigarette smoking exposure on alveolar clearance of inert and cytotoxic dust. In each of the above aims, attention will be paid to the kinetics and pathways for the internal redistribution of the particles with particular reference to focalization in the centrilobular regions and to tracheobronchial lymph node accumulations.

DESCRIPTION

The methods will involve the use of donkeys and rabbits, because of their similarities to man. In addition, certain background information exists on the donkey which will be used primarily to determine the effects of cigarette smoking on alveolar clearance. The donkeys will be used for the repetitive *in vivo* retention tests while the smaller animals will be used for tests involving serial sacrifice and dissection. Non-toxic and toxic insoluble particles will be used. The non-toxic particles will include glass spheres and fibers, magnetite and tantalum metal flakes. The toxic dust will be asbestos, coal, and granite. All of the test aerosols will have a mass median aerodynamic particle diameter of either 3.5 or 0.5 micra. Three mass concentrations will be used: 0.1, 10, and 500 milligrams per cubic meter. Particles will be traced by using radioactive materials and tracing the retention of the particles through longitudinal scanning. Each longitudinal scan will consist of successive counts over lung and tracheal viewing fields. Scans will be made at appropriate intervals following dosing. In addition to the scanning techniques, serial sacrifices will be conducted on the small animals to characterize the particle translocation. The particle burden within the head, larynx, trachea, lymph nodes, lungs, stomach, GI tract, liver, kidney, spleen, blood, pelt, and residual carcass will be determined. The rabbit sacrifices will occur at 1, 3, 10, and 360 days to be selected on the basis of the times at which the clearance rates change.

RECENT RELATED PUBLICATIONS

None

MOUNT SINAI SCHOOL OF MEDICINE-CUNY
New York, New York

GRANT NUMBER: 1 R01 OH 00734-01

PRINCIPAL INVESTIGATOR

Arthur M. Langer, Ph.D.
Environmental Sciences Laboratory
Mount Sinai School of Medicine-CUNY
100th Street and Fifth Avenue
New York, New York 10029

TITLE

Asbestos in Brake Workers' Lungs: An Exposure Index

OBJECTIVES

This research will obtain information concerning the asbestos lung burden of automobile brake workers. The investigators will determine the asbestos fiber types and their concentrations, observed in the lung parenchyma of brake maintenance and repair workmen and those data will be compared to controls.

DESCRIPTION

In this research, lungs of each of the following groups will be examined: 25 brake workers, 25 insulation workers, 25 asbestos factory workers, and 25 white collar workers with no known asbestos exposure. Seven sections will be cut from each tissue block, stacked on slides, and ashed. Each slide will then be scanned for quantitation of fibers and ferruginous bodies. Histologic sections will be cut, stained, and the degree of fibrosis graded from 1 to 5. Sections will also be examined with an electron microscope; asbestos bodies and fibers will again be noted, and electron diffraction and microprobe technics will serve to identify the materials present. The data will be analyzed against a background of work histories which are already available in each case. The questions to be answered include the following: Is asbestos present in the lung tissues of brake workers; what are the fiber types and concentrations; what are the relative magnitudes of these exposures as compared with other exposed and unexposed populatons; and what are the physical characteristics of the fibers, such as recrystallization or physical alteration?

RECENT RELATED PUBLICATIONS

None

JOHN B. PIERCE FOUNDATION
New Haven, Connecticut

GRANT NUMBER: 7 R01 OH 00752-01

PRINCIPAL INVESTIGATOR

Arend Bouhuys, M.D., Ph.D.
Yale University Lung Research Center
33 Cedar Street
New Haven, Connecticut 06520

TITLE

Physiological Studies on Byssinosis

OBJECTIVES

The investigation aims at:

1) elucidating the mechanism of bronchoconstriction in byssinosis;
2) identifying the pharmacologic agent responsible for the bronchoconstriction;
3) studying objectively medical preventive methods and treatment of byssinotic workers;
4) contribution to the technical prevention of the disease by the removal of dust from the mill atmosphere; and
5) performing a follow-up survey of hemp workers in Spain.

DESCRIPTION

The approach to the problems is biochemical, physiologic and epidemiologic. Emphasis is put on studying long-term effects of byssinosis in cotton mill workers and attempting to correlate dust density with physiologic effects so that better control mechanisms may be affected. Although the precise chemical entity in cotton bracts responsible for bronchoconstriction has not been characterized, the pharmacologically active fraction has been isolated and associated with impaired pulmonary function. Biochemical characterization is being carried out. Carefully controlled studies have contributed to a better understanding of the problems involved and lead logically to the recognition of the need for additional pharmacologic work.

The investigators have found that cotton bracts contain a highly water soluble and heat stable substance which can release histamine from pig lung tissue in vitro and induce bronchospasm in man. The bronchospasm is delayed in onset and is tachyphylactic unless several challenges are separated by at least three days. Bronchoconstrictor activity is not removed by ion exchange chromatography or organic solvent extraction but it is completely absorbed onto activated charcoal. Gel filtration chromatography and dialysis suggest that the active material is weakly colored and has a molecular weight of less than 1000. The in vivo biological activity is associated with column effluents containing low molecular weight peptides and hexoses.

RECENT RELATED PUBLICATIONS

Buck, M. and A. Bouhyus. 1978. Byssinosis: Airway constrictor agent in cotton bracts. Fed. Proc. 37:579.

Bouhyus, A., et al. 1977. Epidemiology of chronic lung disease in a cotton mill community. Lung 154:167.

Bouhuys, A. and J.B.L. Gee. 1977. Environmental lung disease. pp.1378-1388. In: Harrison's Principals of Internal Medicine, 8th Edition.

Zuskin, E., F. Valic, and A. Bouhuys. 1976. Byssinosis and airway responses due to exposure to textile dust. Lung. 154:17.

Bouhuys, A. 1976. Byssinosis: Scheduled asthma in the textile industry. Lung. 154:3.

Zuskin, E., F. Valic, and A. Bouhuys. 1976. Effect of wool dust on respiratory function. Am. Rev. Resp. Dis. 114:705.

Bouhuys, A. and J. Ortega. 1976. Improvement of "irreversible" airway obstruction by thiazinamium (Multergan R). Pneumonologie, 153:185.

Zuskin, E. and A. Bouhuys. 1976. Protective effect of disodium cromoglycate against airway constriction induced by hemp dust extract. J. Allergy Clin. Immunol. 57:473.

Bouhuys, A. and E. Zuskin. 1976. Chronic respiratory disease in hemp workers: A follow-up study, 1967-1974. Ann. Int. Med. 84:398.

Bouhuys, A. 1975. Fibers and Fibrosis (editorial). Ann. Int. Med. 83:898.

Bouhuys, A. et al. 1975. Disabling lung disease in community and occupational groups. Bull. Physio-Path. Resp. 11:168P.

Zuskin, E. and A. Bouhuys. 1975. Byssinosis: Airway responses to textile dust exposure. J. Occup. Med. 17:357.

Zuskin, E., et al. 1975. Lung function in textile workers. Brit. J. Indust. Med. 32:283.

Bouhuys, A., et al. 1975. Disabling lung disease in textile workers. Am. Rev. Resp. Dis. 111:902.

Schoenberg, J., et al. 1975. Byssinosis in textile workers. Clin. Res. 23:428A.

OCCUPATIONAL SAFETY

UNIVERSITY OF CALIFORNIA
LaJolla, California

GRANT NUMBER: 2 R01 OH 00404-03

PRINCIPAL INVESTIGATOR

Alan M. Nahum, M.D.
University of California
225 West Dickinson
San Diego, California 92103

TITLE

Prevention of Accidental Head Injury

OBJECTIVES

The goal of this project is to reduce and/or prevent head injury resulting in pathophysiologic changes, either permanent or reversible.

DESCRIPTION

The investigators are trying to correlate postconcussive states (ranging from minimal to severe) in primates with associated impact forces and physiologic parameters of brain function. By means of examinations of cadavers, the researchers are attempting to relate their findings to man. A principal function is the attempt to develop a reproducible, experimental, and mathematical model relating head injury with the various force parameters. An innovative technique that is employed is the implantation of a floating electrode within the primate brain. This is used to determine unit discharges from central locations so as to provide electroencephalographic information which is more informative than comparable information obtained from surface electrodes.

High speed motion picture photography is used to record kinematics of impact and permit calculations of rotational acceleration. After impact, physiologic and clinical measurements of depth and duration of concussion are made continuously. Recordings of impedence, EEG, intracranial pressure, and multiple unit activity continue. Skull X-rays are also obtained.

RECENT RELATED PUBLICATIONS

Nahum, A.M. 1975. Prevention of accidental head injury. DHEW (NIOSH) 75-143 Personal Protection.

Nahum, A.M., and Smith, R.W. 1976. An experimental model for closed head impact injury. Proc. 20th Stapp Car Crash Conference.

Nahum, A.M., et al. 1977. Intracranial pressure dynamics during head impact. Proc. 21st Stapp Car Crash Conference.

Nahum, A.M. 1977. Prediction of maxillo-facial trauma. Trans. AAOO. 84:932.

CORNELL UNIVERSITY
Ithaca, New York

GRANT NUMBER: 5 R01 OH 00424-03

PRINCIPAL INVESTIGATOR

Gerald E. Rehkugler, Ph.D.
Associate Professor of Agricultural Engineering
Cornell University
204 Riley-Robb Hall
Ithaca, New York 10850

TITLE

Agricultural Tractor Operator Protection

OBJECTIVES

This research aims at providing a test procedure for evaluating the performance of agricultural tractor operator rollover protection systems (ROPS) that obviate the need for full-scale testing of all systems and tractor combinations.

DESCRIPTION

This is a project to develop a test procedure and evaluate its performance. By appropriate similitude analysis, scale model studies, and mathematical techniques, it is thought that a rational test system and evaluation procedure for ROPS can be developed. The method, when determined and developed, is expected to provide criteria for laboratory tests of ROPS and to establish the significance of and adaptations to soil and roll-over protection systems.

RECENT RELATED PUBLICATIONS

Rehkugler, G.E. et al. 1978. Simulating the Motion of Two-and Four-Wheel Drive Tractors. Agricult. Engineer. 59:17-19.

Okuno, S., and G.E. Rehkugler. 1977. Simulation of Motor-Scraper Overturns. Society of Automotive Engineers, Off-Highway Vehicle Meeting and Exhibition, Milwaukee.

Masemore, B.J., and G.E. Rehkugler. 1977. Influence of Tractor Geometry and Mass on Side Overturns. American Society of Agricultural Engineers meeting, St. Joseph, Michigan.

# OCCUPATIONAL SKIN DISORDERS

UNIVERSITY OF CALIFORNIA MEDICAL CENTER
San Francisco, California

GRANT NUMBER: 3 R01 OH 00513-02S2

PRINCIPAL INVESTIGATOR

Gerald A. Gellin, M.D.
Assistant Clinical Professor
Department of Dermatology
University of California Medical Center
San Francisco, California 94122

TITLE

Detection of Environmental Depigmenting Substances

OBJECTIVES

The aim of this proposal is to identify substances which "can and may produce leukoderm in man" by testing known depigmenting agents on guinea pigs. This work is predicated on the belief that a "practical and reliable model can be developed by a critical definition of experimental variables (animal, concentration, solvent)." The basic premise is that "agents already demonstrated to cause depigmentation in man should provide the basic materials to validate such an animal model."

DESCRIPTION

This is a screening project to investigate depigmenting chemicals in the black guinea pig. Various sequence regimes of administration, viz. I.P., I.D., and topical, over a period of several months, are to be employed. Chemicals to be included for study involve phenols and catechols currently used industrially and commercially, certain anti-oxidants and congeners, and certain quinones and their chemically-related compounds. Histologic examinations, light microscopy, and biopsy techniques will be employed in evaluating effects and loci of action.

RECENT RELATED PUBLICATIONS

Maibach, H., et al. 1975. Is the antioxidant butylated hydroxytoluene a depigmenting agent in man? Contact Dermatitis. 1:295-296.

Gellin, G.A. 1975. Prediction of Human Depigmenting Chemicals with the Guinea Pig. In: H. Maibach, Ed. Animal Models in Dermatology - Relevance to Human Dermatopharmacology and Dermatotoxicology. pp. 267-272. New York.

UNIVERSITY OF CALIFORNIA
San Francisco, California

GRANT NUMBER: 1 R01 OH 00714-01

PRINCIPAL INVESTIGATOR

Gerald A. Gellin, M.D.
Department of Dermatology
University of California
San Francisco Medical Center
San Francisco, CA 94143

TITLE

Pathomechanisms of Chemically Induced Depigmentation

OBJECTIVES

The objectives of this study are to demonstrate the depigmenting action of chemicals on mammalian skin observed in the home, community or occupational environment by use of *in vivo* and *in vitro* methods, and to develop a chemical and quantitative technique to screen chemical agents which cause depigmentation.

DESCRIPTION

The depigmenting capacity of a variety of phenolics and catecholics, and their congers will be studied using black guinea pigs and black mice. The histological, histochemical, and autoradiographic examination of normal, irritated, and depigmented animal skin with light and electron microscopy will be performed.

The investigators will:

1. Study the changes which occur in the number, size, and shape of melanocytes in guinea pigs' ears at various intervals of treatment with depigmenting chemicals by histochemical techniques.

2. Investigate in pigmented hairless mice ears whether there are changes in the number of melanocytes after treatment with the depigmenting chemicals followed by ultra-violet radiation.

3. Examine the affects of depigmenting chemicals on morphology and DNA synthesis of tissue culture melanocytes and keratinocytes by light and electron microscopy.

4. Quantitatively measure the amount of pigment present and the rate of melanin synthesis using the *in vitro* system.

5. Develop an experimental model for investigation of direct effects of depigmenting chemicals on melanin pigments or melanosomes.

6. Test the practicality of using in vitro techniques to screen newly developed chemicals for their depigmenting affect.

RECENT RELATED PUBLICATIONS

None

# REPRODUCTIVE EFFECTS OF OCCUPATIONAL HAZARDS

THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

GRANT NUMBER: 3 R01 OH 00645-01S1

PRINCIPAL INVESTIGATOR

Vilma R. Hunt, B.D.S., A.M.*
Environmental Scientist
Science Advisory Board
Environmental Protection Agency
Washington, D.C.

TITLE

Occupational Hazards for Pregnant Women

OBJECTIVES

This investigation seeks to review the occupational histories of women who participated in the Collaborative Prenatal Project of the National Institute of Neurological Diseases, Communicative Disorders and Stroke (NINDS).

DESCRIPTION

The occupational histories of women will be related to their pregnancy experience, and the development of the children born to them. Three aims of this study are to:

1) identify those in the study population who reported exposure to occupational hazards, and to establish appropriate classifications for the analysis of variables pertaining to pregnancy histories, placental characteristics, and the growth and development of the children who were born;
2) compare those mothers in each occupational exposure categories to the experience of the total study population; and
3) examine those occupational conditions which appear to show associations with outcome of the pregnancy.

RECENT RELATED PUBLICATIONS

None

*Previously at The Pennsylvania State University

MOUNT SINAI SCHOOL OF MEDICINE-CUNY
New York, New York

GRANT NUMBER: 1 R01 OH 00702-01

PRINCIPAL INVESTIGATOR

Mary S. Wolff, Ph.D.
Environmental Sciences Laboratory
Department of Community Medicine
Mount Sinai School of Medicine-CUNY
Fifth Avenue and 100th Street
New York, New York 10029

TITLE

Acrylonitrile: Pharmacodynamics and Mutagenicity

OBJECTIVES

This research will determine the uptake, distribution and elimination of acrylonitrile in animals and determine its mutagenic behavior in the Ames system.

DESCRIPTION

The uptake, distribution and elimination of acrylonitrile in rats will be investigated and the mutagenic behavior of acrylonitrile in the bacterial auxotroph reversion system will be determined. The pharmacokinetics of the compound, including tissue storage and metabolic fate, will be investigated after single and multiple low and high oral doses. Acrylonitrile will be measured in food and beverage polyacrylonitrile plastic containers to establish a suitable low dose. High doses will be set at 50-75% of the LD50. Blood levels of acrylonitrile in the rat will be measured at 5-10 minute intervals for about four hours. In separate experiments, blood and tissue levels will be measured at 2-8 hour intervals for 48 hours. Urinary acrylonitrile and metabolites will be measured in all experiments. Seven different proposed metabolites will be sought in the urine and tissues. The pharmacokinetics of the compund following the administration of several enzyme inducers will be determined to establish the role and extent of mixed function oxidase enzymes in the metabolism of acrylonitrile.

RECENT RELATED PUBLICATIONS

None

AMERICAN DENTAL ASSOCIATION HEALTH FOUNDATION
Chicago, Illinois

GRANT NUMBER: 1 R01 OH 00742-01

PRINCIPAL INVESTIGATOR

A. Carl Verrusio, Ph.D.
American Dental Association
211 East Chicago Avenue
Chicago, Illinois 60611

TITLE

Biological Effects of Nitrous Oxide Used in Dentistry

OBJECTIVES

This research will investigate the toxic effects of nitrous oxide at low levels and delineate the biochemical mechanism of this toxicity as well as determine if chronic exposure to low levels of nitrous oxide is teratogenic or mutagenic in rats and mice.

DESCRIPTION

In the teratogenic studies, mice will be exposed to compounds for various periods of time during pregnancy at levels of 10 and 20% nitrous oxide. At the same time, studies will be carried out in rats using exposures of .1 to 5% nitrous oxide. The rats or mice will be sacrificed on day 18 of pregnancy and any terata that are produced will be recorded at that time. In the mutagenicity studies, male mice or rats will be exposed to nitrous oxide for a prolonged period of time and then be allowed to mate with untreated females to test the mutagenic potential of nitrous oxide. A number of biochemical studies which are aimed at elucidating biochemical mechanisms of the poisoning will also be carried out. In this phase of the work, mice and rats will be exposed to nitrous oxide over a range of 10 to 10,000 ppm for 1, 6 and 12 weeks. At sacrifice, the animals will undergo a routine pathological examination, including clinical chemistry. In addition, a battery of drug metabolism tests will be carried out.

RECENT RELATED PUBLICATIONS

None

# OTHER INITIATIVE AREAS

HARVARD UNIVERSITY
Boston, Massachusetts

GRANT NUMBER: 5 R01 OH 00315-12

PRINCIPAL INVESTIGATOR

Sheldon D. Murphy, Ph.D.*
Division of Toxicology
University of Texas Medical School
Post Office Box 10708
Houston, Texas 77025

TITLE

Biochemical and Physiologic Response to Toxic Stress

OBJECTIVES

The broad objectives of this project are to identify and characterize biochemical or physiologic responses of exposure to industrial chemicals and environmental contaminants, and to elucidate mechanisms by which endogenous and exogenous factors modify these responses. The toxic action of a variety of chemicals such as some hepatotoxic organic solvents, irritants, neurotoxins, and cholinesterase inhibitors are being studied.

DESCRIPTION

The investigators are determining the influence of fasting, glutathione levels and other factors on the inhalation toxicity of a variety of industrial chemicals. Their studies include research on the effect of acrylamide on NAD and NADP-dependent oxidative metabolism in the brain, relationships between the tissue glutathione content and uptake of mercury compounds and other metals; and the relationship between extrahepatic effects of chemicals and the glutathione content of target tissues.

RECENT RELATED PUBLICATIONS

Johnson, E.C. and S.D. Murphy. 1977. Effect of Acrylamide Intoxication on Pyridine Nucleotide Concentrations and Functions in Rat Cerebral Cortex. Biochem. Pharm. 26:2151-2155.

Jaeger, R.J., et al. 1977. Chemical Modification of Acute Hepatotoxicity of Vinyl Chloride Monomer in Rats. Tox. and Applied Pharm. 41:597-607.

Richardson, R.J., et al. 1977. Maintenance of Glutathione Levels in Renal Cortex Slices of the Rat (39671). Proc. Society for Exper. Biol. and Med. 154:360-364.

Jaeger, R.J., et al. 1975. Vinyl Chloride Hepatotoxicity and its Alteration By Modifiers of Hepatic Biotransformation in the Rat. The Prediction of

*Previously at Harvard University

Chronic Toxicity From Short Term Studies. Proceedings of the European Society of Toxicology, Volume XVIII, Montpellier.

Richardson, R.J. and S.D. Murphy. 1975. Effect of Glutathione Depletion on Tissue Deposition of Methylmercury in Rats. Tox. and Applied Pharm. 31:505-519.

Richardson, R.J., et al. 1975. Uptake of Mercury and Mercury-Amino Acid Complexes by Rat Renal Cortex Slices (39024). Proc. Society for Exper. Biol. and Med. 150:303-307.

Jaeger, R.J., et al. 1975. Biochemical Toxicology of Unsaturated Halogenated Monomers. Envir. Health Perspect. 11:121-128.

Jaeger, R.J., et al. 1975. Short-Term Inhalation Toxicity of Halogenated Hydrocarbons. Arch. Envir. Health. 30:26-31.

Reynolds, E.S., et al. 1975. Acute Liver Injury by Vinyl Chloride: Involvement of Endoplasmic Reticulum in Phenobarbital-Pretreated Rats. Environ. Health Perspect. 11:227-233.

Richardson, R.J. and S.D. Murphy. 1974. Neurotoxicity Produced by Intracranial Administration of Methylmercury in Rats. Tox. and Applied Pharm. 29:289-300.

Jaeger, R.J., et al. 1974. Effect of 18 HR Fast and Glutathione Depletion on 1,1-Dichloroethylene-Induced Hepatotoxicity and Lethality in Rats. Exper. and Molecular Path. 20:187-198.

Moffitt, A.E. and S.D. Murphy. 1974. Effect of Excess and Deficient Copper Intake on Hepatic Microsomal Metabolism and Toxicity of Foreign Chemicals. In: D.D. Hemphill, Ed. Trace Substances in Environmental Health VII. pp.205-210. Columbia, Missouri.

Jaeger, R.J., et al. 1974. Acute Hepatic Injury by Vinyl Chloride in Rats Pretreated with Phenobarbital. Nature. 252:724-726.

Jaeger, R.J. and S.D. Murphy. 1973. Alterations of Barbituarte Action Following 1,1-Dichloroethylene, Corticosterone, or Acrolein. Arch. internationales de Pharmacodynamie et de Ther. 205:281-292.

Jaeger, R.J., et al. 1973. Biochemical Effects of 1,1-Dichloroethylene in Rats: Dissociation of Its Hepatotoxicity from a Lipoperoxidative Mechanism. Tox. and Applied Pharm. 24:457-467.

Jaeger, R.J., et al. 1973. Diurnal Variation of Hepatic Bluthathione Concentration and its correlation with 1,1-Dichloroethylene Inhalation Toxicity in Rats. Research Commun. in Chem. Path. and Pharm. 6:465-471.

Moffitt, A.E. and S.D. Murphy. 1973. Effect of Excess and Deficient Copper Intake on Rat Liver Microsomal Enzyme Activity. Ciochemical Pharm. 22:1463-1476.

Kaplan, M.D., et al. 1973. Modification of Acrylamide Neuropathy in Rats by Selected Factors. Tox. and Applied Pharm. 24:564-579.

UNIVERSITY OF FLORIDA
Gainesville, Florida

GRANT NUMBER: 5 R01 OH 00316-12

PRINCIPAL INVESTIGATOR

Kenneth C. Leibman, Ph.D.
Department of Pharmacology
Health Center Box 728
University of Florida
Gainesville, Florida 32610

TITLE

Metabolism of Industrial Toxicants

OBJECTIVES

The investigator has, as his goal, the systematic study of the metabolic reactions of the carbon-carbon double bond and the effects of substituents on vicinal carbon atoms. The aim is to permit the prediction of the qualitative and quantitative aspects of metabolic reactions of double bonds in compounds more structurally complex than the ones studied.

DESCRIPTION

This is an in vitro investigation of the ability of various biological systems (e.g., rat microsomal NADP-requiring systems) to oxidize the test substances enzymically to primary oxidation products, such as epoxides and glycols. Investigations in vitro of other biological systems are similarly carried out. Compounds of interest, initially, are alicyclic and phenylaliphatic olefins, haloolefins, styrene, indene, dihydronaphthalene, heptachlor, and aldrin. Structure - function correlations are sought in the developed data.

In this continuation grant, a number of projects have been completed, as evidenced by the publications listed below. The research on the microsomal metabolism of certain chlorinated ethylenes has been extended. Three additional projects are being developed which study the metabolism of dioxane, allyl alcohol and hexachloroethane.

RECENT RELATED PUBLICATIONS

Leibman, K.C. and E. Ortiz. 1977. Metabolism of Halogenated Ethylenes. Environ. Health Perspect. 21:91.

Ackerman, D.M. and K.C. Leibman. 1977. Effect of Experimental Diabetes on Drug Metabolism in the Rat. Drug Metab. Disp. 5:405.

Leibman, K.C. and E. Ortiz. 1976. Allylic Hydroxylation of Cyclohexene. Federation Proc. 35:666.

Leibman, K.C. and E. Ortiz. 1975. Further Studies of Metyrapone Effects upon Anilide Hydroxylation. Drug Metab. Disp. 3:507.

Leibman, K.C. 1975. Metabolism and Toxicity of Styrene. Environ. Health Perspect. 11:115.

Ackerman, D.M. and K.C. Leibman. 1975. Effect of Experimental Diabetes on Drug Metabolism. Federation Proc. 34:761.

Leibman, D.C. and E. Ortiz. 1973. New Potent Modifiers of Liver Microsomal Drug Metabolism: 1-Arylimidazoles. Drug Metab. Disp. 1:775.

Leibman, K.C. and E. Ortiz. 1973. Mammalian Metabolism of Terpenoids. I. Reduction and Hydroxylation of Camphor and Related Compounds. Drug Metab. Disp. 1:543.

Leibman, K.C. and E. Ortiz. 1973. Metyrapone and Other Modifiers of Microsomal Drug Metabolism. Drug Metab. Disp. 1:184.

Leibman, K.C. and E. Ortiz. 1973. Further Studies of Metyrapone Effects on Acetanilide Hydroxylation. Federation Proc. 32:701.

Herschleb, W.P. and K.C. Leibman. 1972. Microsomal Metabolism of Butadiene. Federation Proc. 31:559.

Naeger, L.L. and K.C. Leibman. 1972. Mechnaisms of Decaborane Toxicity. Tox. Appl. Pharmacol. 22:517.

MONTEFIORE HOSPITAL AND MEDICAL CENTER
Bronx, New York

GRANT NUMBER: 5 R01 OH 00331-07

PRINCIPAL INVESTIGATOR

Elliott D. Weitzman, M.D.
Department of Neurology
Montefiore Hospital and Medical Center
Bronx, New York 10467

TITLE

Physiological Adaptation of Shift Workers

OBJECTIVES

The objectives of this research proposal are to define the adaptations of important physiological variables to acute and chronic time shifts in working medical interns and nurses. The variables include sleep-waking, body temperature, and a group of plasma hormones under hypothalamic-pituitary control. The required duty schedules of the subjects will not be experimentally manipulated so that they may serve as models for shift workers in other occupations.

DESCRIPTION

The investigators' previous research included the study of the minute-to-minute fluctuations of blood hormone levels in relation to the sleep-wake cycle in human beings, changes in brain waves, body temperature, and hormone secretion in shift workers, employing interns and nurses going on and off night duty at the hospital where the investigator and his laboratory are located. The hormones measured were cortisol, growth hormone, LH, and prolactin. Body temperature and EEG were also measured.

The continuing research is a detailed study of a variety of concomitant rhythmic functions in individual shiftworkers. The data collection techniques include polygraphic recordings of sleep, 20 minute plasma samples for hormone concentration curves, body temperature measurements, and questionnaires concerning prior and ongoing sleep-wake behavior, well being, and performance.

The investigators hypothesize that temporal misalignments of the phases of these functions ("desynchronization") are related to the development of symptoms and performance decrements, particularly in the rotators. They are also interested in the individuality of physiological response to altered work schedules. If categories of the physiological responses of shiftworkers can be defined, simple predictors can be developed to preselect the individuals who are physiologically best suited for shiftwork.

RECENT RELATED PUBLICATIONS

Kapen, S., et al. 1975. Twenty-four Hour Secretory Patterns of Gonadotropins and Prolactin in a case of Chiari-Frommel Syndrome, J. Clin. Endocr. and Metab. 40:234.

Weitzman, E.D., et al. 1975. The Relationship of Sleep and Sleep Stages to Neuroendocrine Secretion and Biological Rhythms in Man. In: R. Greep, Ed. Recent Progress in Hormone Research 31:399-440. New York.

Weitzman, E.D., et al. 1975. Seasonal Patterns of Sleep Stages and Secretion of Cortisol and Growth Hormone During 24 Hour Periods in Northern Norway. Acta Endocrinologica. 78:65-76.

Weitzman, E.D. 1975. Neuro-Endocrine Pattern of Secretion During the Sleep-Wake Cycle of Man. Progress In Brain Research 42:93-102.

Weitzman, E.D. 1975. Effect of Sleep Wake Cycle Shifts on Sleep and Neuro-Endocrine Function. In: Behavior and Brain Electrical Activity, Seventh Annual Symposium, 1973 Houston, Texas.

Kapen, S., et al. 1975. Twenty-four hour patterns of luteinizing hormone secretion in humans: Ontogenetic and sexual considerations. In: Progress in Brain Research, 42:103-113.

Jacoby, J, et al. 1975. Altered Growth Hormone Secretory Pattern Following Prolonged Sleep Deprivation in the Rhesus Monkey. Neuroendocrinology. 18:9-15.

Boyar, R.M., et al. 1975. Ontogeny of Luteinizing Hormone and Testosterone Secretion. J. Steroid Biochem. 6:1.

Weitzman, E.D., et al. 1975. Correlative Twenty-four Hour Relationships Between Intro-Ocular Pressure and Plasma Cortisol in Normal Subjects and Patients with Glaucoma. Brit. J. Ophthal. 59:566-572.

Weitzman, E.d. 1976. Circadian Rhythms and Episodic Hormone Secretion in Man. Ann. Rev. of Medicine, 27:225-243.

Weitzman, E.D. 1976. Advances In Sleep Research, Volume II. New York.

Guilleminault, C., et al. 1975. Sleep Related Periodic Myoclonus in Patients Complaining of Insomnia. Trans. of the Amer. Neuro. Assoc. 100:1-4.

Boyar, R.M., et al. 1976. Pituitary Microadenoma and Hyperprolactinemia. NEJM 294:263-265.

Morantz, R., et al. 1976. Response to D- and L- Amphetamines in Monkeys. Endocrinology. 99:459-465.

Katz, R.S., et al. 1975. The Circadian Rhythm of The Intraocular Pressure in the New Zealand White Rabbit, Investigative Ophthalmology. 14:775-780.

Weitzman, E.D. 1977. Memory and Sleep: Neuroendocrinological Considerations, In: R. Drucker-Colin and J.L. McGaugh eds. Neurobiology of Sleep and Memory. NY.

Weitzman, E.D. 1976. Biological Rhythms and Hormone Secretion Patterns. Hospital Practice, 11:79-86.

Hoffman, D.P., et al. 1977. Response to Thyrotropin Releasing Hormone: An Objective Criterion for the Adequacy of Thyrotropin Suppression Therapy. J. of Clin. Endocrinology and Metab. 44:892-901.

Tauber, E.D., et al. 1977. Absence of Tonic Electromyographic Activity During Sleep in Normal and Spastic Non-mimetic Skeletal Muscles in Man. Annals of Neurology. 2:66-68.

Weitzman, E.D. 1975. Circadian Rhythms (Discussion), In: Shift Work and Health A Symposium, P.G. Rentos and R.D. Shepard (Eds.). Sponsored by the National Institute for Occupational Safety and Health.

UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

GRANT NUMBER: 2 R01 OH 00350-07

PRINCIPAL INVESTIGATOR

W. Dixon Ward, Ph.D.
Department of Otolaryngology
University of Minnesota
Box 461 Mayo Memorial Building
Minneapolis, Minnesota 55455

TITLE

Damage-Risk Criteria for Intermittent Noise Exposures

OBJECTIVES

The fundamental aim of this research is to test the validity of the equal energy concept in the formulation of damage-risk criteria for intermittent noise exposure.

DESCRIPTION

This is a three-year renewal project with two distinct phases: human TTS experiments and animal exposure designed to correlate TTS/PTS with cochlear pathology using exposure comparable to those used in the human phase of the experiments. Exposure paradigms will involve continuous, intermittent, and impulse noise. Seven specific aims include:

1) correct the CHABA equi TTS2 contours including the generation of new contours at 2 and 4 kHz;
2) to do the same for $TTS_{30}$ and TTS120;
3) to continue to strive to develop a single equation that will relate TTS to the noise exposure paradigms;
4) to investigate the effects of individual differences on TTS.

Specific aims based upon data to be acquired in the next three years include:

5) to determine under what conditions a pure tone correction would be appropriate for the CHABA contours of aims (1) and (2);
6) to study the interaction between steady state and impulse noise; and
7) the animal phase: to relate equally damaging TTS contours from steady, intermittent and impulse noise to cochlear integrity; and to correlate these data with similar exposures in man.

RECENT RELATED PUBLICATIONS

Ahaus, W.A., and W.D. Ward. 1975. Temporary Threshold Shift from Short-Duration Noise Bursts. J. Am. Audiol. Soc. 1:4-10.

Ward, W.D., E. Cushing, and E.M. Burns. 1976. Effective Quite and Moderate TTS: Implications for Noise Exposure Standards. J. Acoust. Soc. Am. 59: 160-165.

Ward, W.D. 1976. A Comparison of the Effects of Continuous, Intermittent, and Impulse Noise. In: The Effects of Noise on Hearing--Critical Issues, D. Henderson and R.P. Hamernik, Eds. Raven Press.

Ward, W.D., E.M. Cushing, and E.M. Burns. 1976. TTS from Neighborhood Aircraft Noise. J. Acoust. Soc. Am. 60:182-185.

CENTRO MALATTIE CARDIOVASCOLARI
Rome, Italy

GRANT NUMBER: 5 R01 OH 00362-11

PRINCIPAL INVESTIGATOR

Alessandro Menotti, M.D.
Centre For Cardiovascular Diseases
San Camillo Hospital
Via Latina 49, 00179 Italy

TITLE

Death Rates Among Italian Railroad Employees

OBJECTIVES

The principal aim of this continuing collection of epidemiologic and demographic data of Italian railroad workers is to study the relationship of physical activity to coronary heart disease in the workers.

DESCRIPTION

Since 1963, these investigators have followed mortality among a cohort of over 172,000 Italian railroad workers, in order to see whether those with jobs requiring greater physical activity develop coronary heart disease (CHD). A five-year follow-up suggests that this may be the case but the differences are not large and those doing heavier work have a greater overall mortality. CHD is generally low in Italy. This investigation continues and increases the number and kinds of observations so as to:

1) establish an age-specific cohort mortality table, by cause of death of the entire employee population of the Italian railroad system;
2) establish an age-specific cohort mortality table by level of physical activity, job responsibility, and socioeconomic class; and
3) to compare the collected and analyzed data with comparable U.S. data. (Consultation and collaboration has been provided on a continuing basis by Dr. Ancel M. Deys and Dr. H. L. Taylor of the University of Minnesota.)

RECENT RELATED PUBLICATIONS

Menotti, A., V. Puddu, M. Monti, and H.L. Taylor. 1972. Cardiopatia Coronarica E Attivita Fisica Abituale. Studio Epidemiologico. Estratto dat Defesa Sociale Aprile-Guigno Vol. II.

STATE UNIVERSITY OF NEW YORK UPSTATE MEDICAL CENTER
Syracuse, New York

GRANT NUMBER: 2 R01 OH 00364-06

PRINCIPAL INVESTIGATOR

Donald Henderson, Ph.D.
The Research Foundation of
the State Univ. of New York
Upstate Medical Center
750 East Adams Street
Syracuse, New York 13210

TITLE

The Effects of Impulse Noise on the Auditory System

OBJECTIVES

The objective of this research is to establish the relationship between the physical factors of impulse noise and their effects upon anatomical, physiological, and behavioral aspects of the ear. The physical factors to be studied include peak pressure, duration, number, repetition rate, etc.

DESCRIPTION

This is a renewal grant which has demonstrated that the effects of impulse noise are qualitatively different from those of continuous noise; that the degree of hearing loss is related not only to intensity and duration, but also to the interstimulus interval and the total number of impulses; that impulse noise may also affect the ampullae of the vestibular system; that part of the hearing loss following noise exposure can be traced to the central auditory system and that "safe" impulse noise can interact with "safe" continuous noise to produce large hearing losses. The investigators are continuing the research in an effort to formulate a comprehensive damage-risk criterion (CDR) for impulse noise. They plan to conduct parametric studies in which chinchillas are initially screened by either evoked auditory response audiometry or conditioning autiometry, systematically exposed to a set of impulses and audiometric changes followed for 30 days, at which time the animals will be sacrificed. In-depth studies of exposures in which the animals will be examined by examined by electron microscopy and histochemistry in addition to the audiometric procedures. Realistic noise exposures of either "work week" or asymptotic threshold shift regimens of impulse noise will be employed. Selected animals will also be examined for vestibular noise.

RECENT RELATED PUBLICATIONS

Woodford, C.W., et al. 1978. Effects of Combinations of Sodium Salicylate and Noise on the Auditory Threshold, Ann. of Oto Rhino, Larynagol. 87:117.

Hamernik, R.P., et al. 1976. Vestibulo-Traumatic Effects of Impulse Noise

Exposure, Proc. 13th Internat. Cong. of Audiology, Florence, Italy. 48.

Henderson, D., et al. 1976. Impulse Noise and the Equal Energy Hypothesis, Proc. 13th Internat. Cong. of Audiology, Florence, Italy. 34.

Hamernik, R.P., et al. 1976. Potentiation of Noise by Other Ototraumatic Agents. In: The Effects of Noise on Hearing, Henderson, D., et. al. Eds.

Henderson, D., et al. 1974. New Data for Noise Standards, Laryngoscope, 84:714.

Woodford, C.W., et al. 1974. The Threshold Duration Function of the Acoustic Reflex in Man, Internat. Audio. 14:53.

Hamernik, R.P., et al. 1974. Combined Impulse and Continuous Noise: Auditory Effects, J. Acous. Soc. Amer. 55:117.

Hamernik, R.P., and D. Henderson. 1974. Impulse Noise Trauma: A Study of Histological Susceptibility, Arch. of Otolaryng. 99:118.

Henderson, D., et al. 1974. Audiometric and Anatomical Correlates of Impulse Noise Exposure, Arch. of Otolaryng. 99:62.

ST. LOUIS UNIVERSITY
St. Louis, Missouri

GRANT NUMBER: 5 R01 OH 00395-03

PRINCIPAL INVESTIGATOR

Donald I. Tepas, Ph.D.
Professor of Psychology
St. Louis University
221 N. Grand Boulevard
St. Louis, Missouri 63103

TITLE

The Sleep of Shift Workers

OBJECTIVES

This work seeks to identify, in a series of quantitative studies, the impact of various work schedules on human beings. The research is directed toward an evaluation of the influence of shift-work on the sleep of workers in various occupations.

DESCRIPTION

This is a planned three-year investigation to examine sleep patterns, auditory evoked Responses, vigilance, urine chemistry, oral temperature and subjective assessment of sleep quality in 8 sets (N=6) of paid industrial workers, matched on several variables, classified for heavy or sedentary work, and for four types of work shift schedules. There are two additional groups to control for the effects of auditory stimulation on sleep. All subjects are volunteers.

In addition to the laboratory measures, each subject undergoes psychological evaluation consisting of objective questionnaires such as the MMPI or the Cornell Medical Index and a diagnostic interview. The tests are selected and administered by the staff of the Psychological Clinic and are the basis for screening out subjects with significant medical or psychiatric disorders and for studies of individual differences in response to various work schedules.

The laboratory measures taken during four consecutive sessions include sleep EEGs, classified by stages of sleep, using standard scoring procedures. The validity of the average evoked response for discriminating among sleep states is examined. There is evidence to suggest that electrocortical responsiveness is a useful adjunct to EEG in the analysis of sleep, and that the average evoked response might substitute for EEG in classifying sleep stages. The performance measure administered before and after laboratory sleep is the Wilkinson Vigilance Task. This test has proved to be extremely sensitive to small amounts of sleep deprivation, and to variations in circadian biological rhythms. The urine samples obtained before and after sleep are analyzed for catecholamines, sodium and potassium by the Department of Physiology. These substances were chosen because their circadian variability in normally sleeping

subjects is known. Furthermore, changes in circulating catecholamines and their metabolites could reflect stress effects associated with particularly adverse schedules.

Circadian big rhythms are remarkedly resistant to change. Work schedules which call for sleep at times other than the night require workers to sleep out of phase with their usual circadian rhythms. This appears to make rest and good sleep difficult. Since it is known that acute and chronic sleep deprivations, as well as circadian biological cycles, can have substantial effect on performance (which could result in increased accident potential), it is important to learn whether some shift schedules are more adverse than others and whether some workers adjust more readily than others.

RECENT RELATED PUBLICATIONS

Tepas, D.I. 1976. Methodological pitfalls of shift work research. In: Shift Work and Health. HEW Publication No. (NIOSH) 76-203. pp. 218-228.

Tepas, D.I., J.K. Walsh, and C.P. Browman. 1976. Sleep Bulletin, UCLA Brain Information Service, No. 144. pp. 17-18.

Browman, C.P., G.C. Gordon, D.I. Tepas, and J.K. Walsh. 1977. Reported sleep and drug habits of workers: A preliminary report. In: M.A. Chase, et al. (Eds.). Sleep Research, pp. 111-112.

JOHNS HOPKINS UNIVERSITY
Baltimore, Maryland

GRANT NUMBER: 5 R01 OH 00449-04

PRINCIPAL INVESTIGATOR

Genevieve M. Matanoski, M.D.
Department of Epidemiology
Johns Hopkins University
Baltimore, Maryland 21205

TITLE

A Cohort Study of Cancer Mortality in Virologists

OBJECTIVES

This project is directed toward testing the clinical observation that virologists appear to have an increased risk of dying of cancer.

DESCRIPTION

This is a proposal to study a large group of physician virologists belonging to five medical societies. Physicians will be identified among lists of deceased members. Cancer deaths and controls will be selected from this group. The causes of death of physicians who have worked with oncogenic viruses will be noted and compared with those of physicians in clinical activities. Virologists and nonvirologists are to be identified from lists of their publications. This study is expected to indicate whether there is, or is not, an increased risk of cancer from occupational exposure to viruses and could also suggest which particular groups of viruses produce human disease. Thus far, the studies indicate that excess deaths may be indicated for lymphoma, leukemia, and brain and kidney cancers.

RECENT RELATED PUBLICATIONS

None

JOHNS HOPKINS UNIVERSITY
Baltimore, Maryland

GRANT NUMBER: 2 R01 OH 00465-05

PRINCIPAL INVESTIGATOR

Genevieve M. Matanoski, M.D.
Department of Epidemiology
Johns Hopkins University
Baltimore, Maryland 21205

TITLE

Current Trends in Survivorship of Radiologists

OBJECTIVES

The overall objective of the project is to continue the study of mortality of radiologists in order to determine whether the more recent levels of exposure to radiation in the younger members of the specialty are still producing an excess of deaths from all causes, from leukemia, and from cancer of specific sites.

DESCRIPTION

The life-shortening and carcinogenic effects of ionizing radiation as an occupational hazard of exposed physicians has been indicated through studies of mortality rates of radiologists. Physicians from other specialities with a lower risk of exposure represent an optimum comparison population since both groups enjoy similar socio-economic and medical advantages which can prolong life. A previous study by Drs. Seltser and Sartwell utilizing such a population confirmed that radiologists had a lower life expectancy than other specialists. Quantitative exposure data on low dose ionizing radiation assumed for contemporary radiologists will be obtained.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF DAYTON RESEARCH INSTITUTE
Dayton, Ohio

GRANT NUMBER: 5 R01 OH 00479-02

PRINCIPAL INVESTIGATOR

Gregory J. Landrum, B.A.*
University of Dayton Research Institute
300 College Park Avenue
Dayton, Ohio 45469

TITLE

Effects of Vibration on Human Comfort and Performance

OBJECTIVES

This investigation is directed at the safe testing of human volunteer subjects in a man-carrying vibration machine for the purpose of improving and refining human vibration standards.

DESCRIPTION

In this two-year project, it is planned to construct a device for testing, in selected, healthy, young men, the effects of specific low frequency vibration levels in the range of from 1 to 80 Hz. The vibration intensities recommended in the TSO Exposure Limits will not be exceeded. A subjective severity scale will be used to measure the effects. It is also proposed to examine selected but undefined performance and evaluate results of electrophysiological tests performed for various vibration levels.

RECENT RELATED PUBLICATIONS

None

*Presently with the National Institute for Occupational Safety and Health, Cincinnati, Ohio.

UNIVERSITY OF ILLINOIS AT THE MEDICAL CENTER
Chicago, Illinois

GRANT NUMBER: 3 R01 OH 00525-03S2

PRINCIPAL INVESTIGATOR

Henry M. Gelfand, M.D., M.P.H.
Director, Epidemiology Program
School of Public Health
University of Illinois at the Medical Center
Post Office Box 6998
Chicago, Illinois 60680

TITLE

Association of Leukemia with Agricultural Occupation

OBJECTIVES

By means of a retrospective epidemiologic study, the investigators seek to investigate the association of leukemia with agricultural occupation, particularly occupational contact with poultry; and also propose to study the occurrence of human infection with Marek's Disease Virus (MDV), a DNA-herpes virus, wide-spread in poultry.

DESCRIPTION

This is a three-year investigation using death certificates as a means of identifying deaths due to leukemia or lymphoma. Questionnaires and interviews with surviving family members will also be used. The maximum size of the proposed retrospective study comprises a case/control group of about 42,000 death certificates consisting of a detailed study group of 25,600 and a less detailed study subgroup of 11,400. Three general exposure categories may be considered:

1) adults, primarily males, with varying durations of direct occupational involvement;
2) adults, primarily females, with varying durations of indirect or part-time involvement; and
3) children, with shorter durations or indirect contact. The investigators hope to identify a dose-response relationship for leukemia.

RECENT RELATED PUBLICATIONS

None

DUKE UNIVERSITY MEDICAL CENTER
Durham, North Carolina

GRANT NUMBER: 2 R01 OH 00534-03

PRINCIPAL INVESTIGATOR

Myron L. Wolbarsht, Ph.D.
Department of Ophthalmology
Duke University Medical Center
Post Office Box 3802
Durham, North Carolina 27710

TITLE

Safe Ocular Levels for Near IR Occupational Exposures

OBJECTIVES

The safe range of exposures to IR irradiation in the region from 700-2000 nm and power levels at which frank cataract formation occurs will be determined. The possible etiology of cataracts following exposure to infrared radiation in the region from 700-2000 nm by examining the lens for leakage of proteins or the presence of abnormal molecules (or changes in concentration of normally occurring molecules) following exposure to the infrared will be investigated.

DESCRIPTION

It has been stated that infrared radiation has no direct effect on the lens but is absorbed by the iris and that it is the heat derived from the iris which subsequently affects the lens. This research proposes:

1) to establish infrared exposure safety levels for cataract formation, and;
2) to determine by optical methods what molecular changes occur in the lens as a result of such irradiation.

The investigator believes that infrared radiation acts directly on the lens, pointing out that melanin does not absorb in the near infrared (greater than 800) and, therefore, chronic exposure of infrared would not be likely to heat the iris and indirectly cause the lens opacification.

RECENT RELATED PUBLICATIONS

None

PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

GRANT NUMBER: 2 R01 OH 00583-02

PRINCIPAL INVESTIGATOR

Eliezer E. Kamon, Ph.D.
Professor of Applied Physiology & Ergonomics
Laboratory for Human Performance Research
Pennsylvania State University
119 Noll Laboratory
University Park, Pennsylvania 16802

TITLE

Evaluation of Stresses of Exposure to Heat

OBJECTIVES

The broad objectives of this effort are:

1) to follow the physiologic strain in man exposed to various levels of heat stress;
2) to define heat stress;
3) to use the findings with respect to the physiological mechanisms that underlie the adjustments to work in the heat for the development of a strain predictor; and
4) to provide a predictive formula for heat strain and for a recommended pattern of work-rest that will ensure the well-being of workers exposed to hot conditions.

DESCRIPTION

During this project, the following three studies will be undertaken: 1) apply our understanding of the physiological responses to heat to the scheduling of work-rest under heat stressing ambient conditions; 2) define the safe limits of exposure to high ambient air temperatures and suggest predictive formulae for men or women at risk; and 3) further test the heat stress meter designed under past work in the project.

RECENT RELATED PUBLICATIONS

Pandolf, K.G. and E. Kamon. 1974. Respiratory responses to intermittent and prolonged exercise in a hot-dry environment. Life Sciences 14:187-198.

Kamon, E. and N.L. Ramanathan. 1974. Estimation of maximal aerobic power using stairclimbing-a simple method suitable for industry. Amer. Indust. Hygiene Assoc. Journal 35:181-188.

Kamon, E. 1974. Instrumentation for work physiology. Transactions N.Y. Acad. Sci. 36:625-639.

Kamon, E. 1975. Ergonomics of heat and cold. Texas Reports on Biology and Medicine, 33:145-182.

Kamon, E. 1976. Empirical definition of limit to work in hot environments for women. Proc. of the 6th Congress of the International Egonomic Association. pp. 290-293.

Kamon, E. 1976. Acclimation processes by daily exercise stints at temperate conditions followed by short heat exposures. Aviat. Space Environ. Med. 47:20-25.

Kamon, E. and B. Avellini. 1976. Physiologic limits to work in the heat and evaporative coefficient for women. J. Appl. Physiol. 41:71-76.

Kamon, E. 1978. Physiological and behavioral responses to the stresses of desert climate. In: G. Golany, Ed. Urban Planning for Arid Zones: American Experience and Direction. New York. pp.41-60.

POLYTECHNIC INSTITUTE OF NEW YORK
Brooklyn, New York

GRANT NUMBER: 1 R01 OH 00610-01

PRINCIPAL INVESTIGATOR

Yoshiyuki Okamoto, Ph.D.
Research Associate Professor of Chemistry
Polytechnic Institute of New York
333 Jay Street
Brooklyn, New York 11201

TITLE

Contamination of Polymers with Unreacted Monomers

OBJECTIVES

This project seeks to relate the methods and conditions of polymerization with the entrapment of unreacted monomeric materials and of low molecular weight compounds (e.g. dimers, trimers, etc.). The specific aims include:

1. correlation of the methods and conditions of polymerization of acrylonitrile and styrene with the degree of entrapment of unreacted monomers;
2. determination of the amounts of oligomer produced during polymerization of monomers above and vinyl chloride;
3. determination of the diffusion rates of entrapped monomer; and
4. determination of the amounts of low molecular weight compounds (oligomers), their structures and physical characteristics from the polymerization process.

DESCRIPTION

Bench scale versions of commercial processes including bulk suspension and emulsion polymerizations using different initiators are investigated. Commercial and laboratory polymers are compared for entrapped monomer. Release of entrapped monomer under various conditions of storage (desiccator, air, or plastic bags) is evaluated at timed intervals using gas chromatographic and mass spectrographic techniques. The effects of various storage temperatures also are evaluated. Light and electron microscopy are employed to determine particle size and structure.

Polymers are dissolved in suitable solvents and the molecular weight distributions are determined by gel permeation chromatography. Low molecular weight fractions are collected and characterized by infrared spectrometry and GC-mass spectrometry methods. In all cases involving polymerization of acrylamide, acrylonitrile, styrene, and vinyl chloride under various conditions, significant amounts of unreacted monomers were found to be entrapped in the corresponding polymers, depending upon the polymerization process and purification conditions. As much as 1000 ppm of acrylamide monomer was found

in the polymer product. Diffusion rates of monomers were found to be complex functions of the nature of the product polymers, e.g. molecular weights and their distributions and the degree of cross linkages. Preliminary results however, showed that the rats of diffusion decreased in the order of vinyl chloride, styrene, acrylonitrile, and acrylamide. Oligomers were found to be formed in significant quantities and were then trapped in the polymeric substance. Preliminary work to investigate the biological consequences of monomer entrapment using an *in vitro* assay of microsomal mixed function oxidase will be continued.

RECENT RELATED PUBLICATIONS

None

AMERICAN HEALTH FOUNDATION
Valhalla, New York

GRANT NUMBER: 5 R01 OH 00611-02

PRINCIPAL INVESTIGATOR

John H. Weisburger, Ph.D.
Vice President for Research
American Health Foundation
Hammond House Road
Valhalla, New York 10595

TITLE

Mechanism of Action: Carcinogenico-Methylarylamines

OBJECTIVES

This research seeks to develop information on mode of carcinogenic action or rational explanation for specific target affinities of certain ortho methyl substituted aromatic amines of commercial importance.

DESCRIPTION

This is a metabolic investigation in vivo and in vitro involving syntheses, isolations, and structure determinations of metabolites of certain aromatic amines which have been shown to be carciongenic. Specific compounds to be studied in rats, hamsters and mice include o-toluidine, 4-chloro-o-toluidine, 3-methyl-2-naphthylamine, and 2', 3-dimethyl-4-aminobiphenyl. The compounds are labeled with carbon-14 in the methyl group. Metabolites are examined in expired air, in bile, in urine and feces. The role of the intestinal microflora is examined. Covalent binding to cellular components, particularly DNA, is studied. Related studies on the metabolism of these compounds in vitro in a number of tissues (liver, small intestine, large intestine, and urinary bladder) are carried out.

These investigations seek to determine in experimental animals why ortho-toluidine is carcinogenic whereas aniline, m- and p-toulidines are not. Also ortho methyl substitution in 2-naphthylamine or 4-biphenylamine enhances carcinogenicity and affects diverse target tissues. Preliminary studies indicate that there is little or no oxidative demethylation in male CDF rats administered 14C labeled O-methyl-2-naphthylamine. The N-glucuronide is found to be the principal metabolite, excreted in the bile of the experimental animals.

RECENT RELATED PUBLICATIONS

None

COLORADO STATE UNIVERSITY
Fort Collins, Colorado

GRANT NUMBER: 1 R01 OH 00620-01

PRINCIPAL INVESTIGATOR

Roy M. Buchan, Dr. P.H.
Occupational Health and Safety Section
Institute of Rural Environmental Health
Department of Microbiology
Colorado State University
Fort Collins, Colorado 80523

TITLE

Evaluation of Protein Particles in Grain Elevator Air

OBJECTIVES

The objective of this research is to utilize a ninhydrin protein particle staining technique to determine particulate protein concentrations and size distributions in the grain elevator industry and compare these parameters of air contamination to outside ambient conditions.

DESCRIPTION

This study will investigate the concentration and particle size distribution of protein particles in the breathing zone air in grain elevators. The procedure to be employed utilizes standard air sampling procedures using cellulose ester membrane filters for quantitative determination of protein particles by subsequent staining with ninhydrin. Particle size distribution will be determined using a statistically based method of selecting and counting fields in a stratified manner. Grain elevator atmospheres will be evaluated by taking a minimum of 30 paired air samples from within the work area and a corresponding number of outside ambient air samples upwind from the grain elevator for comparison. Data will be evaluated using a non-parametric technique known as the Wilcoxon Matched Pair Rank Sign Test with significance judged at the 0.05 level. Should significant concentrations of respirable size particulate protein be found, a follow-up study will be proposed to determine if there is a correlation between the concentration of protein particles and the incidence of grain workers' pneumoconiosis.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

GRANT NUMBER: 1 R01 OH 00632-01

PRINCIPAL INVESTIGATOR

Harry B. Mark, Jr., Ph.D.
Department of Chemistry
University of Cincinnati
Cincinnati, Ohio 45221

TITLE

In Situ Sampling Techniques in Environmental Air Analysis

OBJECTIVES

A new approach to sampling and analytical measurement of inorganic and organic pollutants occurring in the natural and occupational environments will be developed.

DESCRIPTION

The investigators propose to develop on-site chemically selective preconcentration sampling systems to use in analysis of the atmosphere for trace inorganic and organic pollutants. The practical rationale is to avoid those errors, primarily human, often involved in sampling and subsequent analysis, and to make possible sampling on demand using relatively unskilled personnel without fear of subsequent degradation of samples before analysis. In addition it is claimed that the selective preconcentration technique can yield information on chemical "speciation" of various pollutants. As an additional benefit the research should yield substantial information on surface reactions. The sampling systems proposed are based on porous glass bead surfaces which are chemically derivatized to provide chemically selective surface reaction sites.

RECENT RELATED PUBLICATIONS

None

JOHN B. PIERCE FOUNDATION LABORATORY
New Haven, Connecticut

GRANT NUMBER: 1 R01 OH 00647-01

PRINCIPAL INVESTIGATOR

Jan A. J. Stolwijk, Ph.D.
Associate Director
John B. Pierce Foundation Laboratory
290 Congress Avenue
New Haven, Connecticut 06519

TITLE

Continuous Optical Monitoring of Asbestos in Air

OBJECTIVES

This research will develop an instantaneous and continuous monitor for the identification and counting of asbestos fibers and will evaluate the performance of the monitor against the more conventional asbestos monitoring techniques.

DESCRIPTION

The investigators plan to develop and test a continuous monitor for the identification and counting of asbestos fibers in the ambient air, and in the occupational and residential environment. The instrument determines the size and asymmetry of dilute suspension of particles largely compared with the wavelength of incident polarized light by measuring the scattering, birefringence or dichroism of the particle as it is aligned, through an external moderate-sized electric field, first parallel to and then perpendicular to the incident polarized light. The instrumental technique is based upon theoretical considerations of the behavior or particles in an induced electric field and the ability of a material to become polarized. The determination of these characteristics may be translated into particle identification, dimension and their absolute amounts.

RECENT RELATED PUBLICATIONS

None

LOUISIANA STATE UNIVERSITY
Agricultural and Mechanical College
Baton Rouge, Louisiana

GRANT NUMBER: 5 R01 OH 00666-02

PRINCIPAL INVESTIGATOR

Philip W. West, Ph.D.
Boyd Professor of Chemistry
Louisiana State University-A&M College
111 Coates Laboratories
Baton Rouge, Louisiana 70803

TITLE

Compact Personal Monitor for Organic Air Pollutants

OBJECTIVES

The principal aim of this work is the development of reliable, light, compact, and inexpensive personal monitors (dosimeters) for the determination of time-weighted average exposures to a number of workplace organic air pollutants.

DESCRIPTION

The personally worn monitors are of the approximate size of a radiation safety badge. The monitors are designed to function for specified periods of time--several hours to several days. The total analytic process is designed to give a sensitive and essentially specific response to the individual pollutant determined. The sampling device is based on the quantitative collection of gases permeated through calibrated silicone membranes and absorbed by suitable absorbants. The absorber material is removed after sampling and analyzed by gas chromatography.

A personal monitor weighing no more than 30-35 grams, with an effective range of 5 ppb to 50 ppb is being developed for vinyl chloride. Plans are being implemented for the development of monitors for the following volatile industrially important materials: chloroprene, 1,1-and 1,2-dichloroethylene, methyl chloride, methylene chloride, chloroform, butadiene, acetylene, ethylene, acrylonitrile, and acetonitrile.

RECENT RELATED PUBLICATIONS

Nelms, L.H., K.D. Reiszner, and P.W. West. 1977. Personal Vinyl Chloride Monitoring Device with Permeation Technique for Sampling. Analyt. Chem. 49:994-998.

TEXAS TECH UNIVERSITY
Lubbock, Texas

GRANT NUMBER: 1 R01 OH 00667-01

PRINCIPAL INVESTIGATOR

Philip R. Morey, Ph.D.
Department of Biological Sciences
Post Office Box #4149
Texas Tech University
Lubbock, Texas 79409

TITLE

Trash Analysis in the Cotton Garnetting Industry

OBJECTIVES

This research is designed to determine the content of bract, seed coat, seed embryo, and other gross trash materials in linters, picker, and other raw materials used in cotton garnetting and to determine how readily bract, seed coat, and seed embryo micronize into respirable (airborne) dust during garnetting.

DESCRIPTION

Using microscopic techniques, various raw materials used in cotton garnetting (linters, pickers) at different stages for the amount and nature of gross particulate vegetal contaminants will be examined in this research. Bract, seed coat and seed embryo trash particles will be labeled with a fluorescent dye and added separately to garnetting raw materials. Dust will then be collected at the workplace and analyzed by fluorescence microscopy for its content of fluorescent particles, in order to determine to what extent these different contaminants give rise to airborne dust particles.

RECENT RELATED PUBLICATIONS

None

MOUNT SINAI SCHOOL OF MEDICINE-CUNY
New York, New York

GRANT NUMBER: 1 R01 OH 00690-01

PRINCIPAL INVESTIGATOR

William J. Nicholson, Ph.D.
Environmental Sciences Laboratory
Mount Sinai School of Medicine - CUNY
100th Street and Fifth Avenue
New York, New York 10029

TITLE

Cohort Mortality Study of Dimethylnitrosamine Workers

OBJECTIVES

A cohort of workers exposed to dimethylnitrosamine will be evaluated as to their mortality patterns, compared to known environmental measurements of their exposures.

DESCRIPTION

This study will establish, trace, and maintain surveillance of a cohort of over 500 individuals employed in supervision, research, development, production, and equipment maintenance of facilities to produce the rocket fuel, unsymmetrical dimethylhydrazine, using dimethylnitrosamine as an intermediate chemical. Employment rosters and union records will be used for the identification of the cohort and the tracing of the members of the cohort will be done through the year 1977 with the subsequent years of the grant used for observation. The full mortality experience of the cohort will be studied and expected and observed rates of death by cause will be tabulated in search for unusual mortality patterns. Cause of death will be verified by obtaining a review of appropriate hospital and medical records and available pathological material. The expected rates of death by cause will be calculated using appropriate age, sex, race, calendar period, and location specific data from the National Office of Vital Statistics on a person years-at-risk basis. The calculated rates will be compared with those observed at yearly intervals during the course of this research. The individuals in the study will be characterized according to exposure categories defined by company environmental measurements, by the data from periodic blood analysis for SGOT and SGPT, and by descriptions of work activities and circumstances.

RECENT RELATED PUBLICATIONS

None

NEW MEXICO STATE UNIVERSITY
Las Cruces, New Mexico

GRANT NUMBER: 1 R01 OH 00727-01

PRINCIPAL INVESTIGATOR

Warren H. Teichner, Ph.D.
Department of Psychology
New Mexico State University
Post Office Box #5095
Las Cruces, New Mexico 88003

TITLE

Behavioral Tests for Health Hazard Evaluation

OBJECTIVES

This research will develop a battery of behavioral screening tests for toxicological health hazard evaluation studies and a battery of diagnostic tests for clinical and research use.

DESCRIPTION

The development of test batteries for behavioral and diagnostic screening tests for toxicological health hazard evaluation studies will be applicable to individuals between the ages of 5 to 65; separate batteries will be developed for the range of 5 to 17 and 18 to 65. Empirical validity and sensitivity will be determined with the use of college students. Independent of validity, sensitivity will be defined by the threshold level of blood alcohol concentration sufficient to produce a change in the rate measure for half of a sample of subjects from a standard population. Once the diagnostic tests are completed, the use of the test as a screening test will be developed and made available for field use. Normative data will not be obtained until all of the screening tests are fully developed. The subject population will include, during the development stages, college students and children in the local school system. The test areas under consideration include choice reaction time, the Sternberg binary classification test, short-term memory, motor memory, Stroop test, dual task capacity, attention shifting, and central processing. Developmental tests for children will be similar to these adult tests, but modified or eliminated when their appropriateness is determined.

RECENT RELATED PUBLICATIONS

None

# RESEARCH MEETINGS

UNIVERSITY OF CALIFORNIA
San Francisco, California

GRANT NUMBER: 1 R13 OH 00602-01

PRINCIPAL INVESTIGATOR

Howard I. Maibach, M.D., Chairman
Department of Dermatology
University of California
1003 HSE
San Francisco, California 94143

TITLE

Occupational Dermatology

OBJECTIVES

This is an international conference that will bring together worldwide dermatologic and occupational health workers to disseminate knowledge on the diagnosis, prevention, amelioration, and treatment of occupational dermatitis.

DESCRIPTION

A four day occupational dermatology conference will include two days of presentations of formal papers, one day of approximately 100 five-minute reports on new material, and a one-day workshop to further refine standardized terminology and testing techniques. The conference will stress prevention and treatment of occupational dermatitis.

RECENT RELATED PUBLICATIONS

None

UNIVERSITY OF IOWA
Iowa City, Iowa

GRANT NUMBER: 1 R13 OH 00694-01

PRINCIPAL INVESTIGATOR

L. W. Knapp, Jr., M.S.
Director, International Studies Program
Institute of Agricultural Medicine
and Environmental Health
University of Iowa
Oakdale, Iowa 52319

TITLE

VII International Congress of Rural Medicine

OBJECTIVES

This Congress will focus attention on the occupational safety and health problems of people employed in agricultural operations, both in the U.S. and abroad.

DESCRIPTION

The Congress will provide a forum and means to accumulate the latest worldwide research and expertise in occupational health related to agriculture. It will define occupational differences in agricultural enterprises, examine rural health statistics and the delivery of health care for farm workers, identify types of body insults and the engineering aspects of design of operator stations, personal protective equipment and environmental controls. A compendium of the present state of the art concerning occupational safety and health, nationally and internationally, will be published.

RECENT RELATED PUBLICATIONS

None

RESEARCH AND DEMONSTRATION GRANTS IN FISCAL YEAR 1977-78

| Grant Number | Institution and Principal Investigator | Budget Period | FY 1977-78 Award |
|---|---|---|---|
| 5 R01 OH 00315-12 | Harvard University<br>Murphy, S.D. | 01-01-75<br>12-31-77 | - |
| 5 R01 OH 00316-12 | University of Florida<br>Leibman, K.C. | 01-01-77<br>12-31-77 | - |
| 5 R01 OH 00320-11 | Mount Sinai School of Medicine<br>Selikoff, I.J. | 07-01-77<br>06-30-78 | - |
| 5 R01 OH 00331-07 | Montefiore Hospital<br>Weitzman, E.D. | 07-01-75<br>12-31-76 | - |
| 5 R01 OH 00340-07 | University of Washington<br>Frank, R. | 12-01-75<br>03-31-77 | - |
| 2 R01 OH 00350-07 | University of Minnesota<br>Ward, W.D. | 04-01-76<br>08-31-77 | - |
| 5 R01 OH 00352-08 | Stanford University<br>Robin, E.D. | 05-01-77<br>04-30-78 | - |
| 5 R01 OH 00356-07* | University of Cincinnati<br>Christian, R.T. | 09-01-76<br>08-31-77 | - |
| 2 R01 OH 00360-07 | West Virginia University<br>Burrell, R. | 09-01-77<br>08-31-78 | 41,783 |
| 5 R01 OH 00362-11 | San Camillo Hospital, Rome Italy<br>Menotti, A. | 08-01-74<br>10-31-76 | - |
| 2 R01 OH 00364-06 | Upstate Medical Center, NY<br>Henderson, D. | 11-01-75<br>10-31-76 | 91,828 |
| 5 R01 OH 00367-06 | University of Pittsburgh<br>Alarie, Y.C. | 10-01-76<br>09-30-77 | 44,612 |
| 5 R01 OH 00368-05 | University of California Berkeley<br>Spear, R.C. | 3-01-76<br>2-28-77 | - |
| 5 R01 OH 00369-05 | Harvard University<br>Peters, J.M. | 10-01-76<br>09-30-77 | 62,233 |

*Energy Funds

| | | | |
|---|---|---|---|
| 5 R01 OH 00395-03 | St. Louis University<br>Tepas, D.I. | 11-01-76<br>10-31-77 | 91,998 |
| 5 R01 OH 00396-02 | New York University<br>Palmes, E.D. | 08-01-73<br>01-31-77 | - |
| 2 R01 OH 00398-04 | St. Louis University<br>Slavin, R.G. | 04-01-76<br>03-31-77 | 58,324 |
| 2 R01 OH 00404-03 | University of California,<br>San Diego<br>Nahum, A.M. | <br>03-01-75<br>07-31-77 | 48,300 |
| 5 R01 OH 00424-03 | Cornell University<br>Rehkugler, G.E. | 05-01-76<br>04-30-77 | - |
| 2 R01 OH 00442-04 | North Carolina State<br>University, Raleigh<br>Emerson, P.D. | <br>04-01-76<br>08-31-77 | 165,606 |
| 5 R01 OH 00449-04 | Johns Hopkins University<br>Matanoski, G.M. | 07-01-76<br>06-30-77 | 46,668 |
| 2 R01 OH 00465-05 | Johns Hopkins University<br>Matanoski, G.M. | 07-01-76<br>02-28-78 | - |
| 5 R01 OH 00470-03 | University of Texas, Austin<br>Reynolds, D.D. | 09-01-75<br>12-31-76 | - |
| 5 R01 OH 00472-03 | University of Rochester<br>Smith, F.A. | 05-01-76<br>04-30-77 | - |
| 3 R01 OH 00479-02S1 | University of Dayton<br>Landrum, G.J. | 05-01-75<br>10-31-76 | - |
| 5 R01 OH 00511-04 | University of Missouri<br>Kilburn, K.H. | 04-01-76<br>03-31-77 | - |
| 3 R01 OH 00513-02S1 | University of California,<br>San Francisco<br>Gellin, G.A. | <br>05-01-75<br>05-31-77 | - |
| 2 R01 OH 00514-03 | University of Illinois<br>Schultz, A.B. | 02-01-77<br>01-31-78 | 76,396 |
| 2 R01 OH 00518-03 | Temple University<br>Tansy, M.F. | 02-01-77<br>01-31-78 | 38,799 |
| 3 R01 OH 00525-03S2 | University of Illinois<br>Gelfand, H.M. | 04-01-76<br>03-31-78 | - |

| | | | |
|---|---|---|---|
| 2 R01 OH 00534-03 | Duke University<br>Wolbarsht, M.L. | 12-01-76<br>11-30-77 | 33,757 |
| 5 R01 OH 00535-02 | Albert Einstein College of Medicine<br>Spencer, P.S. | 11-01-76<br>10-31-77 | 71,628 |
| 5 R01 OH 00538-02 | Pennsylvania State University<br>Zarkower, A. | 01-01-77<br>12-31-77 | 36,438 |
| 5 R01 OH 00545-02 | Texas Tech University<br>Ayoub, M.M. | 03-01-76<br>12-31-77 | - |
| 5 R01 OH 00562-02 | University of Kentucky<br>Smith, S.D. | 09-29-765,879<br>08-31-77 | |
| 2 R01 OH 00565-03 | Colorado School of Mines<br>Schowengerdt, F.D. | 09-01-76<br>08-31-77 | - |
| 5 R01 OH 00569-03* | University of Wisconsin<br>Massaro, T.A. | 09-01-76<br>08-31-77 | 24,280 |
| 2 R01 OH 00583-02 | Pennsylvania State University<br>Kamon, E.E. | 11-01-75<br>11-01-77 | - |
| 1 R13 OH 00602-01 | University of California<br>Maibach, H.I. | 05-01-78<br>04-30-79 | 25,616 |
| 1 R01 OH 00610-01 | Polytechnic Institute of New York<br>Okamoto, Y. | 02-01-77<br>07-31-78 | 43,801 |
| 5 R01 OH 00611-02 | American Health Foundation<br>Weisburger, J.H. | 12-01-77<br>11-30-78 | - |
| 5 R01 OH 00616-02 | University of California, Los Angeles<br>Baloh, R.W. | 09-01-77<br>08-31-78 | 158,271 |
| 1 R01 OH 00620-01 | Colorado State University<br>Buchan, R.M. | 08-01-77<br>07-31-78 | 34,137 |
| 1 R01 OH 00622-01 | Stanford University<br>Cohen, E.N. | 06-01-77<br>05-31-78 | 192,388 |
| 1 R01 OH 00626-01 | University of Miami<br>Davies, J.E. | 07-01-77<br>06-30-78 | 118,641 |
| 1 R01 OH 00631-01 | University of Minnesota<br>Halberg, F. | 08-01-77<br>07-31-78 | 121,527 |

*Energy Funds

| | | | |
|---|---|---|---|
| 1 R01 OH 00632-01 | University of Cincinnati<br>Mark, H.B. Jr. | 08-01-77<br>07-31-78 | 43,515 |
| 3 R01 OH 00645-01S1 | Pennsylvania State University<br>Hunt, V. | 07-01-76<br>12-31-77 | 14,561 |
| 1 R01 OH 00647-01 | John B. Pierce Foundation<br>Stolwijk, J.A.J. | 09-15-77<br>08-31-78 | 42,346 |
| 1 R01 OH 00653-01 | University of Vermont<br>Craighead, J.E. | 08-01-77<br>07-31-78 | 74,626 |
| 1 R01 OH 00659-01 | St. Luke's Hospital<br>Kindwall, E.P. | 09-15-77<br>08-31-78 | 17,517 |
| 5 R01 OH 00666-02 | Louisiana State University<br>A&M College<br>West, P.W. | 02-01-77<br>01-31-78 | 48,912 |
| 1 R01 OH 00667-01 | Texas Tech University<br>Morey, P.R. | 06-01-77<br>05-31-78 | 25,325 |
| 3 R01 OH 00674-01S1 | Emory University<br>Bradford, J.M., Jr. | 05-01-76<br>04-30-77 | 4,578 |
| 1 R01 OH 00678-01 | New York University<br>Lippmann, M. | 04-01-77<br>03-31-78 | 80,162 |
| 5 R01 OH 00679-02 | University of Michigan<br>Chaffin, D.B. | 09-01-77<br>04-30-78 | 22,311 |
| 1 R01 OH 00690-01 | Mount Sinai School of<br>Medicine<br>Nicholson, W.J. | 06-01-77<br>05-31-78 | 52,556 |
| 1 R13 OH 00694-01 | University of Iowa<br>Knapp, L.W., Jr. | 03-01-76<br>02-28-79 | 6,815 |
| 1 R01 OH 00702-01 | Mount Sinai School of<br>Medicine<br>Wolff, M.S. | 07-01-77<br>06-30-78 | 51,001 |
| 1 R01 OH 00707-01 | University of Michigan<br>Langolf, G.D. | 04-01-77<br>03-31-78 | 58,769 |
| 1 R01 OH 00714-01 | University of California,<br>San Francisco<br>Gellin, G.A. | 07-01-77<br>06-30-78 | 62,283 |

| | | | |
|---|---|---|---|
| 1 R01 OH 00727-01 | New Mexico State University | 09-01-77 | 112,430 |
| | Teichner, W.H. | 08-31-78 | |
| 1 R01 OH 00730-01 | University of California, | | 37,013 |
| | Los Angeles | 07-01-77 | |
| | Gonick, H.C. | 06-30-78 | |
| 1 R01 OH 00734-01 | Mount Sinai School of | | 83,578 |
| | Medicine | 08-01-77 | |
| | Langer, A.M. | 07-31-78 | |
| 1 R01 OH 00740-01 | Temple University | 03-01-78 | 31,360 |
| | Innes, D.L. | 02-28-79 | |
| 1 R01 OH 00742-01 | American Dental Association | | 52,529 |
| | Health Foundation | 03-01-78 | |
| | Verrusio, A.C. | 02-28-79 | |
| 1 R01 OH 00745-01 | University of Vermont | 03-01-78 | 146,288 |
| | Frymoyer, J. | 02-28-79 | |
| 7 R01 OH 00752-01 | Yale University | 02-01-78 | 133,358 |
| | Bouhuys, A. | 01-31-79 | |

RESEARCH AND DEMONSTRATION GRANTS SUMMARY BY PROGRAM AREA

| PROGRAM AREA | NO. OF ACTIVE GRANTS | FISCAL YEAR 1977-78 SUPPORT NO. | AMOUNT |
|---|---|---|---|
| Control Technology for Occupational Hazards | 3 | 2 | 284,337 |
| Occupational Musculoskeletal and Back Disorders | 7 | 5 | 328,391 |
| Occupational Neurologic Disorders | 8 | 7 | 517,367 |
| Occupational Respiratory Disease | 19 | 12 | 836,360 |
| Occupational Safety | 2 | 1 | 48,300 |
| Occupational Skin Disorders | 2 | 1 | 62,283 |
| Reproductive Effects of Occupational Hazards | 3 | 3 | 118,091 |
| Other Iniative Areas | 22 | 12 | 667,293 |
| Research Meetings | 2 | 2 | 32,431 |

RESEARCH AND DEMONSTRATION GRANTS DISTRIBUTION BY REGION


| REGION | NUMBER OF GRANTS | TOTAL AMOUNT |
|---|---|---|
| I | 6 | $ 458,851 |
| II | 13 | 474,554 |
| III | 9 | 254,241 |
| IV | 6 | 388,551 |
| V | 12 | 416,844 |
| VI | 5 | 186,667 |
| VII | 4 | 157,137 |
| VIII | 2 | 34,137 |
| IX | 9 | 523,871 |
| X | 1 | - |
| FOREIGN | 1 | - |
| | 68 | $2,894,853 |

RESEARCH AND DEMONSTRATION GRANTS DISTRIBUTION BY STATES

| STATE | NUMBER OF INSTITUTIONS | NUMBER OF PROJECTS | FY '77-78 AMOUNT |
|---|---|---|---|
| California | 4 | 9 | 523,871 |
| Colorado | 2 | 2 | 34,137 |
| Connecticut | 1 | 1 | 175,704 |
| Florida | 2 | 2 | 118,641 |
| Georgia | 1 | 1 | 4,578 |
| Illinois | 2 | 3 | 128,925 |
| Iowa | 1 | 1 | 6,815 |
| Kentucky | 1 | 1 | 65,879 |
| Louisiana | 1 | 1 | 48,912 |
| Maryland | 1 | 2 | 46,688 |
| Massachusetts | 1 | 2 | 62,233 |
| Michigan | 1 | 2 | 81,080 |
| Minnesota | 1 | 2 | 121,527 |
| Missouri | 2 | 3 | 150,322 |
| New Mexico | 1 | 1 | 112,430 |
| New York | 8 | 14 | 474,554 |
| North Carolina | 2 | 2 | 199,453 |
| Ohio | 2 | 3 | 43,515 |
| Pennsylvania | 3 | 6 | 165,770 |
| Texas | 2 | 3 | 25,325 |
| Vermont | 1 | 2 | 220,914 |
| Washington | 1 | 1 | - |
| West Virginia | 1 | 1 | 41,783 |
| Wisconsin | 2 | 2 | 41,797 |
| Foreign | 1 | 1 | - |

INDEX OF PRINCIPAL INVESTIGATORS

# INDEX OF GRANTEE INSTITUTIONS

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
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