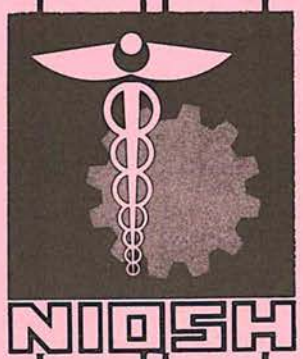
OCCUPATIONAL SAFETY AND HEALTH

RESEARCH & DEMONSTRATION GRANTS

1972



U.S. Department of Health, Education, and Welfare
Public Health Service
Health Services and Mental Health Administration
National Institute for Occupational Safety and Health

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Title VI of the Civil Rights Act of 1964 states:

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This publication is available on request from the Office of Extramural Activities, National Institute for Occupational Safety and Health, Room 501 U.S. Post Office Building, 5th. and Walnut Streets, Cincinnati, Ohio 45202

OCCUPATIONAL SAFETY AND HEALTH

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GRANTS

1972

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration
National Institute for Occupational Safety and Health
Office of Extramural Activities
Cincinnati, Ohio 45202

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 & Safety Act of 1969 and the Occupational Safety & 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, the 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.

Marcus M. Key, M.D.
Assistant Surgeon General
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 non-profitmaking 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 fields 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, diagnoses, therapy, disease processes and mechanisms, and interpretations of abnormalities are apropos. Specific subjects of interest include: effects (acute, subacute, chronic) of toxic chemicals, metals, dusts, fumes, gases and other fluids, mists and aerosols, acting upon any organ or body system; effects of physical agents, including heat, cold, electromagnetic energy of certain wavelengths, noise, vibration, and pressure changes; effects of living disease agents under conditions of major emphasis on the occupational involvement in the transmission or modification of human physiologic or behavioral response. 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 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. Research on methods development, evaluation, and application for the sampling, analysis, measurement or other objective appraisals of chemical, physical, biological, motivational and behavioral, and other components of the occupational environment and of the extent of exposure to these components. 5. Epidemiologic, biometric, and demographic studies of morbidity and/or mortality of human beings exposed to occupational and industrial hazards and the development, evaluation, and application of methods for diagnosing and measuring the effects of such hazards. 6. Investigations of capacities of workers to withstand and deal with occupational stresses in their work environments, and the development and evaluation of methods for protection of workers from such harmful environmental factors. 7. Investigations of interrelationships between employment conditions and the onset, development, and course of chronic diseases. 8. Studies on the nature of fatigue and its role in worker susceptibility to accidents and occupational illness. 9. Investigations of socio-economic factors related to, or arising from, occupational disease. 10. Studies on absenteeism and its causes.

11. Studies of the factors involved in the development, function, and utilization of occupational health programs.

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:

Director, Office of Extramural Activities
National Institute for Occupational Safety and Health
5th and Walnut Streets- Post Office Building, Rm. 501
Cincinnati, Ohio 45202

Grateful acknowledgement is made to all who contributed to the preparation of this booklet.

Benjamin H. Bruckner, Ph.D.
Deputy Director, Office of
Extramural Activities

Alan D. Stevens, D.V.M.
Assistant Director, NIOSH
for Extramural Activities

BEHAVIORAL AND MOTIVATIONAL FACTORS

STANFORD UNIVERSITY
Stanford, California

Grant Number: 2 R01 OH-00327-04

Principal Investigator:

Rodney R. Beard, M.D., M.P.H.
Stanford University
School of Medicine
Stanford, California 94305

Title:

Carbon Monoxide and Human Information Processing

Objectives:

By means of behavioral effects studies, this research seeks to investigate in men and in lower animals, effects of exposures to carbon monoxide. What is sought, particularly, is resultant impairments of behavior which are not heralded by symptoms. Developed information may be useful in setting standards for air quality.

Description:

This is an investigation of behavioral effects resulting from exposure to carbon monoxide. In man, small concentrations and brief exposures are investigated as affecting vision (including absolute and relative thresholds), acuity, and critical fusion frequency. In monkeys, chronic exposures are used to study the same behavioral effects. Research is also performed with rats on free operant schedules of reinforcement, principally those that require temporal discrimination.

Publications:

1. Laties, V.G., R.R. Beard, B.D. Dinman, and J.H. Schulte: Behavioral Aspects of Carbon Monoxide Poisoning. Nat'l. Acad. of Sciences, Nat'l. Acad. of Engineering, Washington, D.C. (1969).

2. Beard, R.R. and N. Grandstaff: Carbon Monoxide Exposure and Cerebral Function. Ann. of N.Y. Acad. of Sci. 174: 385-395 (October 5, 1970).

3. Goldsmith, J.R., R.R. Beard, and B.D. Dinman: Epidemiologic Appraisal of Carbon Monoxide Effects. Paper.

4. Beard, R.R., and G.A. Wertheim: Behavioral Manifestations of Carbon Monoxide Absorption. XVI Int'l. Congr. Occup. Hlth. 224-226, Tokyo (1969).

5. Beard, R.R.: Toxicological Appraisal of Carbon Monoxide. APCA J. 19: (9) 772-729 (September 1969).

6. Beard, R.R. and N. Grandstaff: Behavioral Responses to Carbon Monoxide in Low Dosage. Interim Report to National Research Council, Committee on Motor Vehicle Emissions (February 10, 1972).

UNIVERSITY OF MIAMI
Coral Gables, Florida

Grant Number: 5 R01 OH-00346-02

Principal Investigator:

Earl L. Wiener, Ph.D.
University of Miami
Coral Gables, Florida 33124

Title:

Computer-Based Training for Watchkeeping Tasks

Objectives:

This project is directed toward demonstrating the feasibility of automated training for monitoring or vigil-keeping tasks.

Description:

Watchkeeping or monitoring tasks are those for which an operator must maintain a vigil over a system which may display signals or signs of abnormalities or dangerous conditions. Training sessions are automated by use of a computer-based system which schedules and delivers critical signals and non-critical stimuli, allows the trainee to elect certain options regarding his own trainings, and permits him to test himself. The system allows for adaptive training in which the difficulty of the training task can be linked automatically to the performance of the operator, thereby permitting him to progress rapidly toward a desired performance level when his responses merit it. Simpler problems and tutorial instruction may be administered when warranted; that is when performance level does not indicate satisfactory progress.

Publications: none

UNIVERSITY OF SOUTH DAKOTA
Vermillion, South Dakota

Grant Number: 1 R01 OH-00365-01

Principal Investigator:

Norman W. Heimstra, Ph.D.
Dept. of Psychology
University of South Dakota
Vermillion, South Dakota 57069

Title:

Noise and Human Performance

Objectives:

This research has, as its end purpose, the experimental evaluation on human performance of novel sounds and "meaningful" noise as contrasted with meaningless noise. A goal of these investigations is the determination, if possible, of a set of personality characteristics which can predict whether or not an individual is susceptible to noise effects.

Description:

This psychologic investigation of noise effects on human performance uses graduate students as experimental subjects. Conditions are identified which seek to explain the effects of noise complicated by meaningfulness (significance to the subject) to the 40 subjects under consideration. Guidelines are being developed for relating meaningful noise to "on-the-job" situations and conditions which may produce unpleasant and distracting meanings for sounds heard on the job. Experimental procedures include measurements of sound pressure levels.

Publications: none

UNIVERSITY OF MISSOURI-ROLLA
Columbia, Missouri

Grant Number: 1 R01 OH-00366-01

Principal Investigator:

Harold D. Warner, Ph.D.
Dept. of Psychology
University of Missouri - Rolla
Rolla, Missouri 65401

Title:

Effects of Three Sound Environments on Human Behavior

Objectives:

The purpose of these investigations is to evaluate the effects on extended human performance, in simulated "real-life" situations, of noise conditions or sound environments selected on the basis of their actual occurrence and feasibility of implementation.

Description:

The acoustic stimuli (noise, music, silence) effects on extended human performance are calculated to provide predictive patterns relatable to actual work situations. Using human subjects (40 male college-age volunteers) in selected and controlled experimental groups, for various stimuli, the simulated assembly-line inspection tasks and duration of periods of observation are designed to overcome deficiencies of similar studies in that the tasks are not abstract and that the duration of performance is not transitory. The results of these studies are expected to have significance in their application to the specification of noise conditions of work that affect performance.

Publications: none

UNIVERSITY OF ROCHESTER
Rochester, New York

Grant Number: 1 R13 OH-00430-01

Principal Investigator:

Victor G. Laties, Ph.D.
Dept. of Radiation & Biophysics
University of Rochester School
of Medicine and Dentistry
Rochester, New York 14642

Title:

Conference on Behavioral Toxicology

Objectives:

This is an international conference to consider, in some depth, the subtle and long-term deleterious effects of pharmaceuticals, alone or in combination, applied therapeutically or present as environmental contaminants. Subjects covered in special specific detail include: toxicity of inhaled substances and behavioral toxicology considered from the standpoint of cholinergic mechanisms.

This conference represents a continuation of an ongoing successful program at the University of Rochester.

BIO-ENVIRONMENTAL SAMPLING AND ANALYSIS

UNIVERSITY OF CALIFORNIA
Berkeley, California

Grant Number: 1 R01 OH-00368-01

Principal Investigator:

Thomas H. Milby, M.D.
University of California
108 Earl Warren Hall
Berkeley, California 94720

Title:

Occupational Exposure to Organophosphorous Compounds

Objectives:

This research is designed to identify and assess the biochemical and other parameters of organophosphorus 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).

Description:

This is a systematic, triphasic investigation of agricultural workers and their pesticide-treated workplaces: 1. to develop analytic, toxicologic, air sampling, skin sampling, bioassay, recording systems, and resuspension of weathered residue methods, 2. to apply the developed methods to the study of organophosphorus exposed workers, and 3. to establish controlled conditions for the study of workers and to develop procedures for amelioration of the hazards.

Publications: none

DERMATOLOGY

UNIVERSITY OF PENNSYLVANIA
Philadelphia, Pennsylvania

Grant Number: 5 R01 OH-00303-14

Principal Investigator:

M. H. Samitz, M.D.
University of Pennsylvania Hospital
Duhring Laboratory Building
Philadelphia, Pennsylvania 19104

Title:

Clinical and Laboratory Studies of Metal Sensitivity

Objectives:

This research project is designed to investigate the biochemical reactions of chromium, nickel, cobalt, and mercury ions with skin proteins, mucopolysaccharides, and synthetic polypeptides. Included are studies of the diffusion of metallic ions through the skin and investigations, in guinea pigs, of the immunologic properties of antigens prepared *in vitro*.

Description:

Both *in vitro* and *in vivo* (animal) studies are performed to elucidate the role of heavy metal ions in metallic sensitivity. Emphasis has been on investigations involving chromium although nickel, cobalt, and mercury are included. Some insights on protective chemical agents have been developed against industrial chromate hazards. These have been pursued with the aim of correlating information with the mechanism of allergic eczematous chromium dermatitis.

Publication:

Samitz, M.H.: Ascorbic Acid in the Prevention and Treatment of Toxic Effects from Chromates. Acta. Derm. (Stockholm) 50: 59-64 (1970).

UNIVERSITY OF WASHINGTON
Seattle, Washington

Grant Number: 2 ROl OH-00321

Principal Investigator:

John E. Milner, M.D.
Dept. of Environmental Health and
Community Medicine
University of Washington
Seattle, Washington 98105

Title:

In Vitro Studies of Occupational Dermatitis

Objectives:

This research is directed toward the development of in vitro tests describing cellular responses characterizing the delayed hypersensitivity skin reaction to 2,4-dinitrochlorobenzene. The aim is to devise a practical method of diagnosing clinical contact hypersensitivity in vitro, thereby avoiding many of the inherent limitations and dangers of the standard patch test of applying suspected contact allergens to the skin of the patient.

Description:

The basic protocol of this project includes the lymphocyte transformation system of guinea pigs sensitized to 2,4-dinotrochlorobenzene and dinitrochlorobenzene - skin protein conjugates. The endpoint being measured consists of counting the proportion of blast cells after appropriate incubation, in vitro, as well as incorporation of tritiated thymidine. Applications to human beings will be sought after guinea pig data are satisfactorily definitive.

Publications:

1. Milner, J.E.: In Vitro Lymphocyte Responses to Contact Hypersensitivity. J. Investi. Derm. 55: (1) 34-38 (1970).

2. Milner, J.E.: In Vitro Lymphocyte Responses to Contact Hypersensitivity II. J. of Investi. Derm. 56: (5) 349-352 (1971).

EPIDEMIOLOGY

MOUNT SINAI SCHOOL OF MEDICINE
New York, New York

Grant Number: 2 R01 OH-00305-07

Principal Investigator:

Irving J. Selikoff, M.D.
Mount Sinai School of Medicine
of the SUNY
Fifty Avenue and 100 Street
New York, New York 10029

Title:

Asbestos Exposure and Cancer in the General Population

Objectives:

The principal research aim is to answer the broad question, "Is there a relationship between asbestos exposure and cancer in the general population?" Subsidiary and specific objectives are to determine: 1) the quantity of chrysotile asbestos in the lungs of New York City residents who come to post mortem; 2) the direct and indirect occupational, familial, and residency contributions to exposure in the study population and their relationships to chrysotile content of the lung; 3) the association between asbestos lung content and presence of various diseases, as found at autopsy, in the 3,000 study cases; 4) whether or not there has been any change in chrysotile lung content between the years 1910 and 1970; 5) what are some of the likely sources of asbestos exposure in urban dwellers, at the present time; and 6) whether there is a multiple factor effect associated with a combination of asbestos inhalation and cigarette smoking.

Description:

This investigation combines the study of collected data from approximately 3,000 autopsies with statistical and epidemiological data. Light and electron microscopy are applied in identifying and characterizing chrysotile asbestos bodies in lung tissue. Appropriate analytical methodology has been developed. Results to date have been found in small lung samples of post mortem cases in 24 of 28 consecutive New York City autopsies.

MOUNT SINAI SCHOOL OF MEDICINE

Publications:

1. Selikoff, I.J. and E.C. Hammond: Community Effects of Non-Occupational Environmental Asbestos Exposure. Am. J. Public Hlth. 58: 1658 (1968).

2. Selikoff, I.J.: Asbestos. Environment 11: (2) 3 (1969).

3. Langer, A.M.: Electron Microprobe Analysis: Study of Asbestos Fibers and Bodies from Lung Tissue in: Laboratory Diagnosis of Diseases Caused by Toxic Agents. E.F.W. Sunderman and F.W. Sunderman, Jr. (1970).

HARVARD UNIVERSITY
Boston, Massachusetts

Grant Number: 3 R01 OH-00310-12S1

Principal Investigator:

Benjamin G. Ferris, Jr., M.D.
Harvard University
665 Huntington Avenue
Boston, Massachusetts 02115

Title:

Respiratory Disease and Environmental Exposures

Objectives:

The investigation is directed toward developing dose-response curves, for human beings, for various air-borne pollutant substances.

Description:

This is a prospective study of population groups, their exposures to various air-borne pollutants, and their concomitant impaired pulmonary function and respiratory disease. Random populations and occupationally-exposed groups in Berlin, New Hampshire are surveyed and compared with comparable populations in Canada and England. In addition to data obtained from questionnaires, respirometry and other tests of forced vital capacity are performed. A major observation, to date, is that smoking habits appear much more important than ambient air pollutants, in causing respiratory disease.

Publications:

1. Ferris, B.G.: Use of Pulmonary Function Tests in Epidemiologic Surveys, Ext. du Bull. de Physio-Path. Resp. 6: 579-594 (1970).

2. Ferris, B.G.: Tests to Assess Effects of Low Levels of Air Pollutants on Human Health. Arch. Env. Hlth. 21: 553-558 (October 1970).

3. Ferris, B.G.: Effects of Air Pollution on School Absences and Differences in Lung Function in First and Second Graders in Berlin, New Hampshire. January 1966 - June 1967. Am. Rev. Resp. Dis. 102: 591-606 (1970).

4. Ferris, B.G.: Correlation of Anthropometry and Simple Tests of Pulmonary Function. Arch. of Env. Hlth. 22: 672-676 (1971).

5. Ferris, B.G., J.M. Peters, and W.A. Burgess: Prevalence of Chronic Respiratory Disease. Arch. Env. Hlth. 23: 220-225 (September 1971).

6. Ferris, B.G., I.T.T. Higgins, M.W. Higgin, J.M. Peters, W.F. Van Ganse, and M.D. Goldman: Chronic Non-Specific Respiratory Disease in Berlin, New Hampshire, 1961-1967: A Cross-Sectional Study. Am. Rev. Resp. Dis. 104: 232-244 (1971).

7. Ferris, B.G., F.E. Speizer, J. Worcester, and W.Y. Chen: Adult Mortality in Berlin, New Hampshire, from 1961-1967. Arch. Env. Hlth. 23: 434-439 (December 1971).

8. Van Ganse, W.F., B.J. Ferris, and J.E. Cotes: Cigarette Smoking and Pulmonary Diffusing Capacity (Transfer Factor) Am. Rev. Resp. Dis. 105: 30-41 (1972).

UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

Grant Number: 2 R01 OH-00353-02

Principal Investigator:

James H. Stebbings, Jr.
Division of Epidemiology
School of Public Health
University of Minnesota
1158 Mayo Memorial Building
Minneapolis, Minne

Title:

Cardiorespiratory Changes in an Employed Population

Objectives:

The goal of this effort is the analysis and assessment of epidemiologic information acquired in a study of chronic respiratory disease in 2,300 New York City Transit workers.

Description:

This study involves the examination of medical records and case histories of a specialized employed population, that is New York City Transit workers. The following points are considered:

1. The patterns of change in the electrocardiographic abnormalities related to chronic pulmonary disease and the relationship to changes in respiratory symptoms and pulmonary function values.

2. The usefulness of industrial absenteeism records in predicting early chronic respiratory disease and, conversely, the degree to which industrial absenteeism may be predicted on the basis of pulmonary function tests and standard respiratory questionnaire responses.

Publications: none

CENTRO MALATTIE CARDIOVASCOLARI
Rome, Italy

Grant Number: 2 R01 OH-00362

Principal Investigator:

Vittorio Puddu, M.D.
Via Savoia 80
Rome, 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 socio-economic 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. Keys and Dr. H. K. Taylor of the University of Minnesota).

Publications: none

ERGONOMICS

UNIVERSITY OF CALIFORNIA
Irvine, California

Grant Number: 5 R01 OH-00328-02

Principal Investigator:

Gordon G. Globus, M.D.
101 South Manchester Avenue
Orange, California 92668

Title:

Biologic Aspects of Host Factors in Accidents

Objectives:

The aim of this research is to determine whether human performance, during times when normally the subject would be asleep, is influenced (impaired) by the sub-circadian biorhythm associated with sleep stages, especially the D-state of REM (Dreaming-Rapid Eye Movement). Specific hypotheses to be tested are that: 1) behavior on a number of perceptual, cognitive, and psychomotor performance tasks studied all night long will show rhythmic variations with time; and 2) clock times of maximal impairment in these waking behaviors will be coincident with clock times associated with the occurrence of the D-State onset during sleep.

Description:

Young, healthy, adult human male subjects are tested under conditions of D-REM sleep stages and wakefulness. Observations are made in the performance of five tasks which measure attention or vigilance, time estimation (10 second intervals), information translation, choice reaction time, and ideation under sensory deprivation conditions. The applied interest here is with night driving and the possibility that one may be able to identify particularly dangerous periods. All research is conducted in the laboratory with suitable EEG, EOG, and EMG monitoring devices and a variety of basic performance tests, as specified.

Publications: none

MONTEFIORE HOSPITAL AND MEDICAL CENTER
Bronx, New York

Grant Number: 5 ROl OH-00331-03

Principal Investigator:

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

Title:

The Sleep-Waking Cycle and Its Neuro-Endocrine Correlates

Objectives:

This project seeks to determine the pattern and time course changes in the sleep-wake cycle subject to a number of measured variables such as changes in sleep intervals and patterns in a controlled laboratory environment. The rational of this research is based on the similarities in responses to manipulations of circadian parameters and to certain work stresses.

Description:

Investigations are conducted with human beings in controlled laboratory situations.

Analyses are made of sleep-wake cycles and sleep-stage patterns by means of electrical recordings, measurements of corticoids and growth hormone in plasma and urine, as well as measurements of body temperature, urine volume, electrolytes, and creatinine. Psychological variables are also examined during the manipulations of sleep-wake patterns.

Publications:

1. Hellman, L., E.D. Weitzman, H. Roffwarg, D.K. Fukushima, K. Yoshida, and T.G. Gallagher: Cortisol is Secreted Episodically in Cushing's Syndrome. J. Clin. Endoc. and Metab. 30: (5) 686-689 (May 1970).

2. Hellman, L., E.D. Weitzman, H. Roffwarg, D.K. Fukushima, K. Yoshida, B. Zumoff and T.G. Gallagher: Effect of o,p'-DDD on Cortisol Secretory Pattern in Cushing's Syndrome. J. Clin. Endoc. and Metab. 31: (2) 227-230 (August 1970).

MONTEFIORE HOSPITAL AND MEDICAL CENTER

3. Rosenfeld, R.S., L. Hellman, H. Roffwarg, E.D. Weitzman, D.K. Fukushima, and T.G. Gallagher: Dehydroisoandrosterone is Secreted Episodically and Synchronously with Cortisol by Norman Man. Paper (1970).

4. Weitzman, E.D., D.F. Kripke, J. Kream, P. McGregor, and L. Hellman: The Effect of a Prolonged Non-Geographic 180° Sleep-Wake Cycle Shift on Body Temperature - Plasma Growth Hormone & Cortisol and Urinary 17-OHCS. To be presented at the 10th Meeting of the Association of Psychophysiological Study of Sleep (APSS) (March 1970).

5. Shaywitz, B., J. Finkelstein, L. Hellman, and E.D. Weitzman: HGH in New-Born Infants During Sleep-Wake Periods. To be presented at the 10th annual Meeting of the APSS (March 1970).

HEAD AND BODY PROTECTION

VILLANOVA UNIVERSITY
Villanova, Pennsylvania

Grant Number: 2 R01 OH-00300-03

Principal Investigator:

George N. Quam
Department of Chemistry
Villanova University
Villanova, Pennsylvania 19085

Title:

Protection of Eyes, Face and Body Against High Impacts

Objectives:

This research seeks the development of effective protective shields to be worn by workers to safeguard the eyes, face, and body against hazards in chemical laboratories and plants. The effort is directed toward developing and fabricating various kinds and designs of protective materials and exploring techniques in their use.

Description:

Investigations have been carried out on a variety of materials, including plastics, ceramics, metals, wood, and ballistic fabric to determine their protective properties against explosions and missile impact. Various configurations of protective materials, including laminates, were subjected to stresses from a "glass-missile" cannon, air gun, and a .22 caliber rifle.

Results indicated that for face and eye shields, double-window laminated layers of 0.125-inch clear polycarbonate sheeting was perferable to the single thickness of 0.250-inch material recommended by experts. For body shields, laminated layers of mixed ballistic nylon and polycarbonate plastic provided greater protection than the single materials above. For freedom in working, effective shields should be wearable and comfortable.

Publications:

1. Quam, G.N.: Waste Disposal from Academic Laboratories. 17th Campus Safety Conference. University of California - Santa Barbara, June 25, 1970. Published in N.S.C. Monograph No. 27 (1970) pp. 1-7.

2. Quam, G.N. and J. Shea: An Investigation of High Impact Shields for Eyes and Face. Env. Con. & Sfty. Mgmt. (February 1971).

3. Quam, G.N.: Safety Shielding in the Chemical Laboratory. Sixth Middle Atlantic ACS Regional Meeting, Baltimore, Maryland (Rebruary 1971).

4. Quam, G.N. and J. Shea: Protection of Eyes and Face Against High Impact. Env. Con. & Sfty. Mgmt. 141: 24-25 (February 1971).

5. Quam, G.N. and J. Shea: XCI. An Investigation of High Impact Body Shields, Safety 49: (5) A295-6 (May 1972).

SNELL MEMORIAL FOUNDATION INCORPORATED
North Tarrytown, New York

Grant Number: 5 R01 OH-00301-02

Principal Investigator:

George G. Snively, M.D.
2315 Stockton Blvd.
Sacramento, California 95817

Title:

Head Protection of Industrial Workers

Objectives:

There's a threefold objective in this research: 1) to study the head protection afforded by present day helmets (hard hats); 2) to develop methods for realistically testing the afforded protection under dynamic conditions; and 3) to develop appropriate principles for head protection in industrial conditions which will afford superior protection especially from side or glancing blows.

Description:

Current protective headgear is designed on the premise that falling objects constitute the major industrial head hazards. There is evidence to the contrary. Consequently, determinations are made of the characteristics of industrial helmets with respect to accelerated impacts; attenuation properties; and impacts other than direct crown blows. Investigations are also made of head injuries in industrial situations so as to evaluate relationships inherent in injury site, magnitude of energy applied, and other factors involved.

Prototype helmets of various materials such as honeycombed aluminum, stainless steel, or formed polystyrene and other foams are investigated under dynamic conditions.

Publications:

1. Snively, G. G.: Racing Helmet Design, Testing & Standardization: The Snell Standards for Protective Headgear. Soc. of Automotive Engineers #700 600, Los Angeles, California (August 27, 1970) p. 7-9.

2. Snively, G. G.: Linear Acceleration of Impact Type. AGARD Conf. Proc. No. 88, (1971).

3. Snively, G. G.: Evaluation and Testing of Protective Head Gear. AGARD Conf. Proc. No. 88 on Linear Acceleration of Impact Type. AGARD-CP-88-71 (pp. D41-7), NATO Meeting, Porto, Portugal (June 1971).

STANFORD RESEARCH INSTITUTE
Menlo Park, California

Grant Number: 2 R01 OH-00343-02

Principal Investigator:

George N. Bycroft, Ph.D.
Stanford Research Institute
333 Ravenwood Ave.
Menlo Park, California 94025

Title:

Mathematical Models of Head Injuries

Objectives:

This project is aimed at understanding the relationship between skull and brain damage and mechanical stress waves resulting from a blow to the head.

Description:

A mathematical model, utilizing a computer code, of the skull and brain represented as an elastic spherical shell filled with a visco-elastic medium which is not attached to the shell, is developed to permit calculators of stress waves generated by an impulsive load normal to the shell surface. This work is useful in testing the "cavitation theory" for cerebral concussions as well as the validity of related explanations for other manifestations of brain injury resulting from head blows. The use of the computer code, which was developed at Stanford Research Institute, permits numerical calculations of the size of impact necessary to imitate rupture of the "brain" as well as of the "skull."

Publications: none

UNIVERSITY OF CALIFORNIA
LaJolla, California

Grant Number: 1 R01 OH-00404-01

Principal Investigator:

Alan M. Nahum, M.D.
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 post-concussive 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 implentation 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.

Publications: none

INSTRUMENTATION

UNIVERSITY OF ARIZONA
Tucson, Arizona

Grant Number: 1 R01 OH-00344-01

Principal Investigator:

Stuart A. Hoenig, Ph.D.
Department of Electrical Engineering
The University of Arizona
Tucson, Arizona 85721

Title:

A New Detector for Carbon Monoxide in Air

Objectives:

This project is aimed at the development of a portable carbon monoxide detector for use in the field.

Description:

This is clearly a development project based on the observation by the investigator that the positive ion current emanating from a palladuim wire heated to about 850°C is proportional to the ambient partial pressure of carbon monoxide. Carbon dioxide, elemental nitrogen, and methane gases apparently do not interfere. Matters of sensitivity and significance of suitable detector devices for three ranges of interest, that is source testing, industrial hygiene, and atmospheric research and monitoring, are points of interest which perhaps need additional attention. Stability and durability of instrument components as well as other practical considerations of hardware development remain to be resolved.

Publications: none

LOUISIANA STATE UNIVERSITY
New Orleans, Louisiana

Grant Number: 5 R01 OH-00345-03

Principal Investigator:

George G. Guilbault, Ph.D.
Louisiana State University
Chemistry Department
New Orleans, Louisiana 70122

Title:

Use of Solid State Detectors in Air Pollution Research

Objectives:

The aim of this research is to adapt and use the solid state devices such as the piezoelectric crystal and the contact potential detectors for the detection and determination of inorganic and organic substances of significance in air pollution.

Description:

This research involves the adaptation of solid state gas chromatographic detectors for applications in air pollution investigations. Various adsorbents are coated onto piezoelectric crystals and contact potential detectors. These devices are then exposed to specific pollutants, the adsorption of which causes a change in the contact potential. Specific detectors are sought for such materials as HF, O_3, SO_2, NO, NO_2, CO, various metals, and hydrocarbons. Measurements which are made of detector response, include sensitivity, linearity of response, accuracy, speed of response, limits of detection, stability, simplicity of design, and selectivity of response.

Publication:

Guilbault, G.G. and A. Lopez-Roman: Use of Sodium Tetrachloromercuriate As A Substrate for the Determination of SO_2 on the Piezocrystal Detector. Envir. Letters 2: (1) 35-45 (1971).

OCCUPATIONAL RESPIRATORY DISEASE

DUKE UNIVERSITY
Durham, North Carolina

Grant Number: 5 R01 OH-00302-02

Principal Investigator:

Kaye H. Kilburn, M.D.
Duke University Medical Center
Durham, North Carolina 27710

Title:

Prevalence Pathogenesis and Control of Byssinosis

Objectives:

This project seeks: 1) to determine the prevalence of reactor subjects to cotton textile dust and the correlation with symptoms and decreases in pulmonary function; 2) to establish the relationship between reactors to cotton dust and chronic bronchitis, asthma, emphysema, and allergic disease by epidemiologic and pathologic methods; 3) to isolate and characterize the biologic agent responsible for byssinosis; 4) to determine the mechanism of action of the causative agent, with emphasis on immunopathogenesis; and 5) to select and assess methods for reducing or eliminating reactions to the agent.

Description:

The approach to the problem is essentially epidemiologic. Field studies include investigations of prevalence of reactors in textile plants with high, moderate, and low airborne dust levels. There are comparisons with control populations comprised of workers in plants in which there is no exposure to cotton dust. Chemical and immunologic methods are applied to studies comparing acute decrement in ventilatory function with decrements occurring over a three year period in selected cohorts. These chemical and immunologic methods are also applied to studies of adults, in a small mill town, to determine the prevalence of reactions to cotton dust among those currently employed in the mill, those previously employed, and those who have never been so employed. Included in the project is an historical prospective study utilizing Social Security information and death certificates. This involves development of control methods. The project represents a cooperative endeavor which includes Duke University, the State Department of Health, members of the USPHS, and a large segment of the textile industry.

Publication:

Ayer, H.E., M. Battigelli, D.A. Fraser, J.D. Hamilton, K.H. Kilburn, J. Lumsden, J.R. Lynch, J.A. Merchant, and A.D. Stevens: The Status of Byssinosis in the United States. Arch. Env. Hlth. 23: 230-234 (1971).

JOHN B. PIERCE FOUNDATION
New Haven, Connecticut

Grant Number: 5 R01 OH-00304-08

Principal Investigator:

Arend Bouhuys, M.D., Ph.D.
John B. Pierce Foundation Laboratory
290 Contress Avenue
New Haven, Connecticut 06519

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; and 4) contributing to the technical prevention of the disease by the removal of dust from the mill atmosphere.

Description:

The approach to the problems is 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 effected. 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. 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.

Publications:

1. Clement, J. and K.P. van de Woestijne: Pressure Correction in Volume and Flow Displacement Body Plethysmography. J. Appld. Phys. 27: 845-847 (1969).

2. Bouhuys, A., V.R. Hunt, B.M. Kim, and A. Zopletal: Maximum Expiratory Flow Rates in Induced Bronchoconstriction in Man. J. Clin. Investi. 48: 1159-1168 (1969).

JOHN B. PIERCE FOUNDATION

3. Dennis, M.W., J.S. Douglas, J.U. Cosby, J.A.J. Stolwijk, and A. Bouhuys: On-Line Analog Computer for Dynamic Lung Compliance and Pulmonary Resistance. J. Appld. Phys. 26: 248-252 (1969).

4. Bouhuys, A., R.L. Wolfson, J.D. Brain, D.W. Horner, and E. Zuskin: Byssinosis in Cotton Textile Workers. Ann. Int. Med. 71: 257-269 (1969).

5. Bouhuys, A., A. Barbero, R.S.F. Schilling, and K.P. van de Woestijne: Chronic Respiratory Disease in Hemp Workers. Am. J. Med. 46: 526-537 (1969).

6. Zuskin, E., I. Zolle, D.V. Proctor, S. Permutt, and A. Bouhuys: Exposure to 131 I-labeled Viscose Rayon Fibers. Arch. Env. Hlth. 19: 648-653 (1969).

7. Jaeger, M. and A. Bouhuys: Loop Formation in Pressure vs. Flo Diagrams Obtained by Body Plethysmographic Techniques. Prog. Resp. Res. 4: 116-130 (1969).

8. Bouhuys, A.: Byssinosis in Textile Workers. Int'l. Conf. on Pneumo., in Johannesburg, South Africa (April 1969).

9. van de Woestijne, K.P. and A. Bouhuys: Spirometer Response and Pressure Correction in Body Plethysmography. Prog. Resp. Res. 4: 64-74 (1969).

10. Bouhuys, A., R.S.F. Schilling, and K.P. van de Woestijne: Cigarette Smoking Occupational Dust Exposure and Ventilatory Capacity. Arch. Env. Hlth. 19: 793-797 (1969).

11. Zuskin, E., R.L. Wolfson, G. Harpel, J.W. Welborn, and A. Bouhuys: Byssinosis in Carding and Spinning Workers. Prevalence in the Cotton Textile Industry. Arch. Env. Hlth. 19: 666-673 (1969).

12. Douglas, J.S. and A. Bouhuys: Bronchoconstrictor Responses and Anesthesia in Guinea Pigs. Clin. Res. 17: 617 (1969).

13. Douglas, J.S., M.W. Dennis, Zuskin, E. and A. Bouhuys: Quantitative Determination of Effects of Bronchoactive Agents in Spontaneously Breathing Guinea Pigs. 4th Int'l. Congr. on Pharm., Basel, Switzerland (July 14-18, 1969).

14. Bouhuys, A. and J.M. Peters: Control of Environmental Lung Disease. New Eng. J. of Med. 283: 573-582 (September 10, 1970).

15. Bouhuys, A. and K.P. van de Woestijne: Respiratory Mechanics and Dust Exposure in Byssinosis. J. Clin. Investi. 49: 106-118 (1970).

JOHN B. PIERCE FOUNDATION

16. Bouhuys, A.: Airway Dynamics and Bronchoactive Agents in Man. Airway Dynamics: Physiology and Pharmacology. Charles C. Thomas, Springfield, Illinois, pp. 263-282 (1970).

17. Dennis, M.W. and J.S. Douglas: Control of Bronchomotor Tone in Spontaneously Breathing, Unanesthetized Guinea Pigs. Charles C. Thomas, Springfield, Illinois, pp. 253-262 (1970).

18. Bouhuys, A.: Byssinosis in the Textile Industry. Arch. Env. Hlth. 21: 475-478 (October 1970).

19. Bouhuys, A.: Byssinosis in the United States. Trans. of Nat'l. Conf. of Cotton Dust and Health. (May 2, 1970).

20. Bouhuys, A.: Control of Environmental Lung Disease. New Eng. J. of Med. 283: 573-582 (September 10, 1970).

21. Bouhuys, A. and K.P. van de Woestijne: Mechanical Consequences of Airway Smooth Muscle Relaxation. J. of Appld. Phys. 30: (5) 670-676 (May 1971).

22. Bouhuys, A., J.S. Douglas, and A.R. Guyatt: Pharmacological Modification of Histamine-Mediated Airway Responses. J. Clin. Investi. 50: (6) ABST. (June 1971).

23. Piscitelli, D.M. and A. Bouhuys: Histamine Release from Human Lung by A Component of Cotton Bracts. Fed. Procs. 30: (2) ABST. (March-April 1971).

24. Popa, V., J.S. Douglas, and A. Bouhuys: Anaphylaxis and Response to Histamine, Acetylcholine, and Propranolol in Guinea Pigs. Fed. Procs. 30: (2) ABST. (March-April 1971).

25. Popa, V., J.S. Douglas, and A. Bouhuys: Airway Responses to Antigen, Histamine, Acetycholine, and Propranolol in Actively Sensitized Guinea Pigs. Chest 60: (3) 301 (September 1971).

26. Bouhuys, A.: Byssinosis - Airway Responses Caused by Inhalation of Textile Dusts. Arch. Env. Hlth. 23: 405-407 (December 1971).

27. Hitchcock, M., D.M. Piscitelli, and A. Bouhuys: Histamine Release from Human Lung by 48/80 and Methyl Piperonylate. Procs. Int'l. Union of Phys. Sci's. IX: XXV Int'l. Congress of Physiological Sciences.

UNIVERSITY OF NOTRE DAME
Notre Dame, Indiana

Grant Number: 2 R01 OH-00342

Principal Investigator:

Morris Pollard, Ph.D.
Lobund Laboratory
University of Notre Dame
Notre Dame, Indiana 46556

Title:

Effects of Environmental Pollutants in Germfree Rodents

Objectives:

This project seeks to examine, in lungs of germ-free rats, effects of silica dust, coal dust, and combinations of these dusts and to compare the results with those observed in commercially-bred animals and in germ-free animals in non-sterile environments.

Description:

This is a collaborative effort with Lobund and the Division of Laboratories and Criteria Development (NIOSH) in Cincinnati, Ohio. Comparative studies are performed using germ-free rats maintained in a sterile environment, comercially-bred rats which have endemic infectious diseases, and germ-free rats maintained in a non-sterile environment. Animals are subjected to silica and coal dusts separately and in combination. Lung reactions are investigated. This work has specific relevance to "black lung" problems as well as the tentatively-held view that infection is suspect as an important factor in the pathogenesis of pneumoconiotic fibrosis.

Publications:

1. Reddy, B.S. and M. Pollard: Effect of Germfree Status on Hepatic Xanthrene Oxidase Activity and on Bone Mineral Composition During Development and Senescence in Rats. J. Nutrition 102: 299-305 (1972).

2. Pollard, M. and N. Sharon: Irradiation Induced Lesions in Germfree Rats. J. Nat. Cancer Inst. 47: 229-234 (1971).

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 1 R01 OH-00355

Principal Investigator:

Harold G. Petering, Ph.D.
Kettering Laboratory
College of Medicine
Eden and Bethesda
Cincinnati, Ohio 45219

Title:

Interaction of Coal Dust with Essential Metals

Objectives:

These investigations seek to explore the biological effects of metal-binding ligands in coal dust and coal tar on essential and trace metals such as copper, zinc, and iron. The rationale of this study is the concept that metal-binding ligands in coal dust and coal tar might, *in situ*, alter essential and trace metal metabolism thereby contributing to some of the observed epidemiological evidence of altered disease patterns in coal miner populations. Examples of such altered disease patterns include cardiovascular disease, obesity, and hypercholesterolemia. It is also known that copper and zinc are essential for the development and maintenance of a healthy cardiovascular system.

Description:

Both *in vitro* and *in vivo* experiments are conducted. Extractions are performed to isolate metal-binding ligands from coal, analagously as from tobacco tar. Rats with specific nutritional deficiencies in zinc and copper are used so that slight aberrations in the metabolism of these metals can be magnified and more easily detected. In addition, the action of isolated ligands and their complexes on intact biological systems such as lung macrophages and tissue preparations are studied. The methods used include liquid extraction and liquid chromatography.

Publication:

Sorenson, J., H. Petering, P. Eller, and V. Finelli: Studies on Coal as a Source of Trace Metals and Metal Binding Ligands. Paper

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 1 R01 OH-00356

Principal Investigator:

Robert T. Christian, Ph.D.
Kettering Laboratory
College of Medicine
University of Cincinnati
Cincinnati, Ohio 45219

Title:

Cellular Response to Coal Dust in Vitro CWP

Objectives:

The purpose of this research is the determination of: 1) the fractions of coal mine dust which are cytotoxic; 2) the mechanism of cellular injury by the cytotoxic fractions; and 3) the relationship between the toxic processes and coal workers' pneumoconioses (CWP).

Description:

This is an investigation in vitro at the cellular level using growing cell cultures and coal mine dust obtained from NIOSH. Part of the purpose of these studies is to develop a screening test to determine which fractions of coal mine dust are cytotoxic and then to investigate how the cytotoxicity is responsible for cellular injury.

Coal mine dust fractions are inoculated on primary and continuous-line human and other mammalian cell lines. Observations are then made of cell morphology, growth, and synthesis of collagen. Alveolar macrophages and primary lung cells are used to determine effects of the test materials on host defense mechanisms. Techniques of cytochemistry, phagocytosis, and bactericidal potential are employed as is time-lapse cinematography. Stimulation and inhibition of interferon are studied.

The effects on collagen production of the test materials on cultures of fibroblasts are determined. Tissue cultures are exposed to certain toxic fractions and then tested for syntheses of DNA and RNA using standard techniques.

Publications: none

OHIO STATE UNIVERSITY
Columbus, Ohio

Grant Number: 1 R01 OH-00358

Principal Investigator:

Gary Warren Davis, D.V.M., Ph.D.
Dept. of Veterinary Pathology
The Ohio State University
1925 Coffey Road
Columbus, Ohio 43210

Title:

Pathophysiology of Coal Dust Pneumoconiosis in Equidae

Objectives:

This study is designed to establish whether or not the mine pony is a suitable model for the study of coal workers' pneumoconiosis (CWP). The technical objectives are: 1) to characterize the physiological parameters, primarily pulmonary and cardiovascular, in spontaneous coal penumoconiosis and emphysema and in experimentally-induced pneumoconiosis in equidae exposed to coal dust; 2) to characterize the pathological changes in spontaneous coal pneumoconiosis and emphysema and in experimentally induced pneumoconiosis in the equidae; 3) to correlate the physiological parameters and the pathological findings in equidae exposed to coal dust; 4) to compare spontaneous coal pneumoconiosis and emphysema and the experimentally induced diseases in mine ponies with the naturally-occurring diseases in man and other animals; and 5) to establish the feasibility of using the mine pony as a model for future investigations in preventive, diagnostic, and therapeutic measures in the management of pneumoconiosis in man.

Description:

Using mine ponies which had been worked in coal mines and had thus been exposed to coal dust for periods of up to 15 to 20 years, a variety of cardiopulmonary and pathological investigations are carried out. It is known from other work that British mine ponies do develop lesions similar to CWP. Control animals and other experimental animals given intratracheal injections of coal dust slurry are also used in the investigations. Post mortem examinations are also performed. Measurements are made of cardiovascular, blood, and pulmonary functional parameters. Dynamic pulmonary compliance and morphometric analyses, to determine total alveolar surface and volume and pulmonary capillary surface and volume, are

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made. Quantitation of silica and histopathologic studies are performed. It is anticipated that the CWP in ponies will be found to be an ideal model for the condition in human beings.

Publications: none

NEW YORK ACADEMY OF SCIENCES
New York, New York

Grant Number: 1 R13 OH-00361-01

Principal Investigator:

Irving J. Selikoff, M.D.
Mt. Sinai School of Medicine of CUNY
5th Avenue and 100 Street
New York, New York 10029

Title:

Conference on Coal Workers Pneumoconiosis

Objectives:

This is a conference which is designed to review the overall status of work in coal workers' pneumoconiosis, assess the rate of progress in understanding the conditions and in applying ameliorating measures, examine current experiences in the United States and abroad, examine mechanisms of the disease, consider radiologic aspects, consider clinical aspects, and consider principles of control.

MARSHFIELD CLINIC FOUNDATION
Marshfield, Wisconsin

Grant Number: 2 ROl OH-00306-12

Principal Investigator:

Dean A. Emanuel, M.D.
Marshfield Clinic Foundation for
Medical Research and Education
510 North St. Joseph's Ave.
Marshfield, Wisconsin 54449

Title:

Farmer's Lung - An Experimental Investigation

Objectives:

Research aims are directed principally toward: 1) the isolation and characterization of the etiologic agents (thermophylic actinomycetes) of farmer's lung disease; 2) the investigation of the callular response in this hypersensitivity disease; 3) the determination of the disease incidence in the U.S. and Canada; 4) the description of an immune process in animals; and 5) the characterization of farmer's lung either as a true delayed hypersensitivity or perhaps a modified Arthus reaction. Secondary objectives include, 1) attempts to correlate the amount of rainfall during the haying season and the incidence of disease in the following Spring, and 2) the attempted characterization of the antigens in farmer's lung.

Description:

This is largely an experimental investigation to identify and characterize the causative organisms of farmer's lung disease and to describe the associated immunology. A fluorescent antibody technique which has been developed for the identification of Thermopolyspora polyspora, one of the agents involved in the disease, is being adapted for studying other similar organisms in the lung tissue of patients with farmer's lung disease. The incidence of sensitivity has been found to be 13 per cent, from a study of more than 1000 patients. Elucidation of environmental factors involved in farmer's lung disease should be very helpful in the development of effective preventive methods.

Publications:

1. Wenzel, F.J., D.A. Emanuel, and P.M. Zygowicz: Simplified Serologic Test for Farmer's Lung. Am. J. of Clin. Path. 49: (2) 183-185 (1968).

2. Emanuel, D.A.: Farmer's Lung - Historical Review and Current Concepts. (May 8, 1968).

3. Hursma, J.R., D.A. Emanuel, F.J. Wenzel and R.L. Gray: Farmer's Lung in a 10 Year Old Giel. J. of Peditc. 75: (4) 704-706 (October 1969).

4. Gray, R.L., F.J. Wenzel, and D.A. Emanuel: Immunofluorescence Identification of Thermopolyspora polyspora, The Causation Agent of Farmer's Lung. Appld. Micro. 17: (3) 454-456 (March 1969).

5. Wenzel, F.J., D.A. Emanuel, and R.L. Gray: Farmer's Lung, Its Geographic Distribution. J. Occ. Med. 12: (12) 493-496 (December 1970).

6. Wenzel, F.J., D.A. Emanuel and R.L. Gray: Immunofluorescent Studies in Patients with Farmer's Lung. J. Allergy & Clin. Immuno. 48: (4) 224-229 (October 1971).

MOUNT SINAI SCHOOL OF MEDICINE
New York, New York

Grant Number: 2 R01 OH-00320

Principal Investigator:

Irving J. Selikoff, M.D.
Mt. Sinai School of Medicine
City University of New York
5th Ave. and 100 St.
New York, New York 10029

Title:

Relation of Smoking to Neoplasia in Asbestos Workers

Objectives:

This prospective study of some 18,000 asbestos insulation workers is designed to test earlier observations that cigarette smoking is highly related to the very great excess of asbestos lung cancers in asbestos workers, as compared with non-cigarette-smoking asbestos workers who may also have a somewhat elevated risk of neoplasia.

Description:

The investigations include detailed case history studies of some 450 men whose occupational exposure to asbestos had begun some 20 years prior to the onset of this study. Medical and physical examinations as well as case histories and questionnaires are used in the epidemiological investigation. 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.

Publications:

1. Selikoff, I.J. and E.C. Hammond: III Community Effects of Non-Occupational Environmental Asbestos Exposure. Am. J. Pub. Hlth. 58: (9) 1658-1666 (September 1968).

2. Selikoff, I.J.: Asbestos. Environment 11: (2) 1-7 (March 1969).

3. Langer, A.M., I. Rubin, and I.J. Selikoff: Electron Microprobe analysis of Asbestos Bodies. Pneumo., Proc. Int'l. Conf., Johannesburg, p. 57-69 (1969).

4. Selikoff, I.J. and E.C. Hammond: Asbestos Bodies in the New York City Population in Two Periods of Time. Pneumo., Proc. Int'l. Conf., Johannesburg, p. 99-105 (1969).

5. Hammond, E.D. and I.J. Selikoff: The Effects of Air Pollution - Epidemiological Evidence. Pneumo., Proc. Int'l. Conf., Johannesburg, p. 368-373 (1969).

6. Selikoff, I.J., E.C. Hammond, and J. Churg: Mortality Experiences of Asbestos Insulation Workers - 1943/1968. Pneumo., Proc. Int'l. Conf., Johannesburg, p. 180-186 (1969).

7. Langer, A.M. and I.J. Selikoff: Chrysotile Asbestos in Lungs of Residents of New York City. Procs. of 2nd Int'l. Clean Air Congress, p. 161-164 (1971).

8. Langer, A.M., V. Baden, E.C. Hammond, and I.J. Selikoff: Inorganic Fibers, Including Chrysotile, in Lungs at Autopsy: Preliminary Report. Inhaled Particles III, Proc. Int. Symp. 2: London 683-694 (1971).

9. Selikoff, I.J., E.C. Hammond, and H. Heimann: Critical Evaluation of Disease Hazards Associated with Community Asbestos Air Pollution. Proc. 2nd Int'l. Clean Air Congress, p. 165-171 (1971).

10. Langer, A.M., I.J. Selikoff, and A. Saster: Chrysotile Asbestos in the Lungs of Persons in New York City. Arch. Env. Hlth. 22: 348-361 (March 1971).

WAYNE STATE UNIVERSITY
Detroit, Michigan

Grant Number: 9 R01 OH-00323-04

Principal Investigator:

Andrew L. Reeves, Ph.D.
1400 Chrysler Freeway
Detroit, Michigan 48207

Title:

Experimental Asbestos Carcinogenesis

Objectives:

The aims of this research project, in the investigation of experimental asbestos exposures, are: to characterize physically, chemically, and biologically the dusts before, and after, dissemination and to compare them with the UICC (International Union Against Cancer) referenced standards; to identify specific types of asbestos in situ; to examine biological changes in lung tissue; and to study detectable changes in pulmonary function in exposed animals.

Description:

This is a chemical, biological, physical, and pathological investigation of asbestos and its forms, (i.e. amosite, chrysotile, and crocidolite) and a study of possible associated induction of pulmonary cancer and malignant pleural mesothelioma. Dose-response relationships are studied. Electron microscope examinations of asbestos bodies are performed for analysis and characterization.

Publications: none

INDUSTRIAL HYGIENE FOUNDATION
Pittsburgh, Pennsylvania

Grant Number: 5 R01 OH-00326-04

Principal Investigator:

Paul Gross, M.D.
Industrial Health Foundation, Inc.
5231 Centre Ave.
Pittsburgh, Pennsylvania 15232

Title:

Asbestos Dusts: Their Pathogenic Components

Objectives:

This investigation is directed toward defining the possible factors responsible for the biologic activity of dusts of the three most commonly used forms of asbestos, chrysotile, amosite, and crocidolite. The rationale of this study is based on the belief that the biologic activity of asbestos is not inherent in the hydrated silicate molecule nor in its fibrous morphology. Instead, it is believed that much of the biologic activity resides in some factors that become added to the mineral after it has been mined. During the crushing process of separating the mineral from extraneous rock and during the further crushing for "opening" the fibers, extensive, intimate, and forceful contact is made with steel alloys which may transfer to the asbestos fibers metallic additives such as iron, nickel, cobalt, chromium, and manganese. These may be somehow implicated in carcinogenesis since the prevalence of lung cancer among nickel and chromium workers is generally recognized.

Description:

This is an investigation in experimental animals (rats and hamsters) of the carcinogenic effects of asbestos fibers contaminated with several heavy metals and with hydrocarbons. Results indicate that asbestos fibers of the three most commonly employed minerals, chrysotile, amosite, and crocidolite, when contaminated with nickel, chromium, and cobalt, produced a "high prevalence of lung cancers" in rats while fibers not so contaminated did not produce malignancies.

Publications: none

INDUSTRIAL HEALTH FOUNDATION
Pittsburgh, Pennsylvania

Grant Number: 1 R01 OH-00354-01

Principal Investigator:

Paul Gross, M.D.
5231 Centre Avenue
Pittsburgh, Pennsylvania 15232

Title:

Dose Effect Relationship of Asbestos Dust

Objectives:

The aim of this investigation is to determine the differences which may exist in the lungs of two series of rats which had been dosed with asbestos some years earlier, in a previous study and: 1) developed primary lung cancer following inhalation or intratracheal injection of chrysotile asbestos, and 2) did not develop lung cancer following the administration of chrysotile asbestos under identical conditions.

Description:

The previously dosed animal lungs, which have been preserved in formalin for several years, are examined for asbestos content. A total of 132 rats are involved. All animals were dosed by inhalation or intratracheal injection, with chrysotile asbestos. Of these, 71 also received intratracheal applications of five percent sodium hydroxide solution which damaged the clearance mechanism of the lungs. These animals showed a 48 percent cancer rate as contrasted with a 24 percent rate in the rats which did not receive the sodium hydroxide treatment.

The preserved rat lungs are examined for concentrations of asbestos dust in those organs of animals that inhaled the dust and in those which received the dust by intratracheal injection. Comparasins are made of asbestos content in the cancerous and non-cancerous lungs and in the lungs of sodium hydroxide-treated and non-treated animals. Dose-effect relationships are sought.

Publications: none

INDUSTRIAL HYGIENE FOUNDATION
Pittsburgh, Pennsylvania

Grant Number: 2 R01 OH-00333-02

Principal Investigator:

Paul Gross, M.D.
Industrial Hygiene Research Laboratory
Old Mellon Institute Building
3941 O'Hara Street
Pittsburgh, Pennsylvania 15213

Title:

Biologic Activity of Lipid Coated Quartz Dust

Objectives:

By means of a systematic study of the role of endogenous lipids in the evolution of silicotic inflammation, it is sought to determine whether these endogenous lipids tend to inhibit or enhance the development of silicosis.

Description:

Two current theories implicate endogenous lipids, associated with silicotic nodules, as causative agents. The earlier theory suggests that lipids in silicotic nodules are irritants, in response to which the nodules are evolved. More recently, the theory has been proposed that macrophages ingesting quartz particles develop metabolic disturbances which lead to the formation of lipid-carbohydrate-protein complexes. Following the death and disintegration of the dust-filled macrophages, the lipid complexes which are liberated, serve as antigens to cause antibody formation.

This research is based on the hypothesis that a very high concentration of quartz dust rapidly deposited in the lungs produces a vigorous macrophage mobilization and that these factors prevent alveolar clearance. This animal study is being carried on to test this hypothesis. Rats are injected intratracheally with silica particles coated with lipids which have been extracted from the lungs of other rats which have developed the acute type silicosis. At designated intervals, the injected rats are killed and the lungs examined histologically for the presence of nodules and collagen, and analyzed chemically for collagen, quartz, and lipids. Some promising results have been reported.

Publications: none

TULANE UNIVERSITY SCHOOL OF MEDICINE
New Orleans, Louisiana

Grant Number: 1 R01 OH-00387-02

Principal Investigator:

Morton M. Ziskind, M.D.
Department of Medicine
Tulane University School of Medicine
1430 Tulane Avenue
New Orleans, Louisiana 70112

Title:

Accelerated Silicosis in Sandblasters

Objectives:

The aim of this investigation is to characterize the accelerated form of the disease (as contrasted with the classical chronic form) in terms of its clinical course, roentgenographic, pulmonary functional, pathologic and immunologic features and their relationship to intensity and duration of exposure.

Description:

This is essentially a clinical investigation of "accelerated" or rapidly progressive occupational silicosis. Populations of silicosis sufferers which are investigated are screened by means of a standard interview, chest x-ray, and basic pulmonary function studies. Epidemiologic data are collected and correlated with occupational exposures and diagnoses. An extensive follow up of subjects is contemplated.

Publications: none

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 8 R01 OH-00335-03

Principal Investigator:

E. Bingham Mattheis, Ph.D.
Kettering Laboratory
Eden & Bethesda Avenues
Cincinnati, Ohio 45219

Title:

Response of Alveolar Macrophages to Metals

Objectives:

The aim of this investigation is to explore the relationship that may exist between disturbances of the pulmonary macrophage system and resultant impairment of the natural human resistance to typical industrial exposures to metals, specifically, lead, nickel, and zinc.

Description:

This investigation which is conducted in rats, is designed to investigate the influence of lead, nickel, and zinc particulates on the number and biological activity of alveolar macrophages as well as the dose-response relationships, and reversibility and specificity of response. Soluble and unsoluble metal or metal salt particulates are administered to laboratory animals via the respiratory exposure route. Viability, phagocytic index, and production of interferon of alveolar macrophages are measured. Studies on the stimulation of interferon involve inoculation of alveolar macrophage cultures with parainfluenza virus or synthetic interferon inducer, harvesting the interferon at various time intervals, and titrating against vaccinia virus.

Publications: none

MARQUETTE SCHOOL OF MEDICINE
Milwaukee, Wisconsin

Grant Number: 5 R01 OH-00338-03

Principal Investigator:

Hollis G. Boren, M.D.
Veterans Administration Center
Wood, Wisconsin 53193

Title:

Autoradiographic Response of Lung to Inhaled Agents

Objectives:

This research seeks to relate acute cellular effects in lung tissue with inhalation exposures to polluting atmospheres containing nitrogen dioxide (NO_2), iron oxide (Fe_2O_3), titanium dioxide (TiO_2), and cigarette smoke.

Description:

This is an investigation in hamsters involving individual, repetitive, and sequential exposures to atmospheric pollutants. Cellular response is measured by autoradiographic techniques as exemplified by measurement of tritiated thymidine uptake in lung tissue cells. Animals which are exposed to the pollutants are subsequently killed and then injected intraperitoneally with tritiated thymidine which is incorporated into the DNA of dividing cells. Thus, cell replacement or turnover in the lungs and other organs can be determined. These investigations are relevant to considerations involving air quality standards, disease related to inhaled agents, and to fundamental studies of factors involved in DNA syntheses.

Publications:

1. Boren, H.G.: The Development of a Molecular Model of Lung. Arch. Intern. Med. 126: 491-495 (September 1970).

2. Boren, H.G.: Pulmonary Cell Kinetics After Exposure to Cigarette Smoke. Paper

WEST VIRGINIA UNIVERSITY
Morgantown, West Virginia

Grant Number: 1 R01 OH-00360

Principal Investigator:

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

Title:

Immune Injury in Occupational Respiratory Diseases

Objectives:

The twofold aims of this work are: 1) to assess the role of lung connective tissue antibody in the pathogenesis of selected infectious diseases and its role on normal lung, as measured by histological and pulmonary function techniques, and 2) to attempt to establish an experimental model of extrinsic allergic alveolitis using fungal spores and ovalbumin as antigens. An assessment of the possible role of an Arthus mechanism in such diseases is emphasized by quantitative precipition analysis, immunofluorescence, and pulmonary function studies.

Description:

This is a bipartite but interrelated study in the attempt to develop an animal model system of the role of lung antibody in chronic pulmonary disease characterized by fibrosis and irreversible parenchymal changes. The information obtained from the model system is used to attempt interpretations of the same type of changes caused by inhalation of materials such as coal dust, silica, etc. (pneumoconioses). The effects of anti-lung sera on the pulmonary function of normal animals is also studied. Earlier work has indicated that anti-lung antibodies are produced in chronic lung disease and may be involved in the continuation of the fibrotic process.

The second aspect of this study is the attempt to define the immune reaction in the so-called extrinsic allergic alveolitis, a term proposed for those chronic lung diseases caused by the inhalation of organic dusts. Penicillium is used as the sensitizing agent in the animal model, in the attempt to determine whether or not an Arthus mechanism is involved. Precipitating antibody levels and lung histologic changes are determined.

WEST VIRGINIA UNIVERSITY

In addition, two sub-projects are described. In an animal system, the determination is made whether or not delayed hypersensitivity is involved in berylliosis. Secondly, the determination is attempted to characterize the type of immune process in byssinosis.

Publication:

Burrell, R. and C.C. Cate., The Effect of Lung Reactive Antibodies on the Pathogenesis of Tuberculosis. Clin. & Exper. Immuno. 9: (6) 809-819 (1971).

UNIVERSITY OF SOUTH FLORIDA
Tampa, Florida

Grant Number: 5 R01 OH-00435-02

Principal Investigator:

Hollis G. Boren, M.D.
Veterans Administration Center
Tampa, Florida

Title:

Autoradiographic Response of Lung to Inhaled Agents

Objectives:

This research aims to develop information on effects of exposures to atmospheres of nitrogen dioxide (NO_2), iron oxide (Fe_2O_3), titanium dioxide (TiO_2), and cigarette smoke with the objective of relating the information to considerations of air quality standards, to human diseases related to inhaled agents, and to fundamental factors controlling DNA synthesis.

Description:

This is an animal experimental study in golden hamsters with the specific technical objectives of: 1) the determination of which cell populations respond to different types of inhaled agents; 2) the assessment of the relationship of the duration of increased labeling found during recovery from exposure to the parameters of the exposure; and 3) the determination of the relationships of the labeling response to the functional capacities of the lung. Animals are exposed to the pollutant atmospheres containing the substances specified. The exposures are individual, repetitive, and sequential. Cellular response is measured autoradiographically using tritiated thymidine which is injected intraperitoneally prior to killing the animals for assay. The labeled compound is incorporated into the DNA of dividing cells. Cell replacement or turnover in the lungs or other organs following exposures is thus measured and evaluated.

Publications: none

PHYSICAL AGENTS

PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

Grant Number: 5 R01 OH-00341-02

Principal Investigator:

Paul L. Michael, Ph.D.
Pennsylvania State University
Box 30
State College, Pennsylvania 16801

Title:

An Objective Method for Evaluating Ear Protectors

Objectives:

This endeavor is aimed at the "development of a device" (artificial model head) and techniques for use in the measurement of effectiveness of ear protectors, "objectively."

Description:

The investigator is testing ear-muff and ear-insert devices for effectiveness in ear protection against excessive noise. Factors such as adequate fit and design are examined. Comparasins are made with the current American Standard Method.

Publication:

Michael, P.L. and D.F. Bolka: Personal Ear Protection Evaluation - Present and Future. Am. Indus. Hyg. Assoc. J. 32: (11) 753-756 (November 1971).

UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

Grant Number: 5 R01 OH-00350-02

Principal Investigator:

W. Dixon Ward, Ph.D.
University of Minnesota
Box 461 Mayo
Minneapolis, Minnesota 55455

Title:

Damage-Risk Criteria for Intermittent Noise Exposures

Objectives:

This research seeks to validate the proposed hypothesis that any pattern of noise exposure over an eight hour period of time is safe if the resultant auditory fatigue (temporary threshold shift or TTS) has disappeared after 16 hours of rest.

Description:

Normal-hearing young adult human beings (10 students) are exposed for eight hours to simulated industrial noise patterns with duty cycles of 2, 10, and 50 minutes and on-fractions of 0.5, 0.25, and 0.125. The intensity level for each pattern is gradually increased in successive sessions until that TTS is produced which is just barely recoverable in 16 hours. The resultant data are meant to improve the definition of noise which leads to permanent threshold shift (PTS).

Publications: none

STATE OF NEW YORK UPSTATE MEDICAL CENTER
Syracuse, New York

Grant Number: 1 R01 OH-00364-01

Principal Investigator:

Donald Henderson, Ph.D.
Upstate Medical Center
Department of Otolaryngology
750 E. Adams Street
Syracuse, New York 13210

Title:

The Effects of Impulse Noise on Auditory System

Objectives:

This investigation seeks to determine the relationship between the physical parameters of an impulse noise (i.e. amplitude, duration, spectral content, etc.) and the concomitant psychophysiological effects on the inner ear and on hearing. The goal is the establishment of safe damage-risk criteria for impulse noise.

Description:

This is an animal experimental investigation using the chinchilla. Changes in the anatomy and physiology of the inner ear, of exposed animals, are monitored by means of phase contrast microscopy and surface preparation of the cochlea. Sonic booms are also used as stimuli. In addition to anatomic and physiologic changes, observations are made of temporary threshold shifts (TTS) resulting from exposures to the stimuli.

Publications: none

PHYSICAL AND CHEMICAL ANALYSIS

MASSACHUSETTS DEPARTMENT OF LABOR AND INDUSTRIES
Boston, Massachusetts

Grant Number: 2 ROl OH-00309-14

Principal Investigator:

Harvey B. Elkins, Ph.D.
39 Boylston Street
Boston, Massachusetts 02116

Title:

Factors Affecting the Excretion of Industrial Poisons

Objectives:

This very practically oriented investigation seeks to correlate industrial exposures to noxious materials with analytical determinations of corresponding metabolic products which may be found in the urine. This is directed toward the industrial health hazards for which data are either lacking or are unreliable.

Description:

In this applied laboratory and field program, urine is studied as the indicator fluid in industrial toxin exposures. Foundry workers' urine is examined for excretion of lead, zinc, and copper as compared with the urine of appropriate control populations not exposed to the metals. Similarly, metabolic products of such industrial chemicals as tricholoroethylene, methy ethyl ketone, acetone, and other organic solvents are investigated in urine and correlated with temporal occupational exposures. Stainless steel welders' urine is examined for excretion of nickel and other metals. The developed results can serve useful purposes in control and elimination of recognized industrial poison hazards.

Publications:

1. Elkins, H.B.: Exposure Tests in Industrial Toxicology. J. Int'l. Union of Pure and Appld. Chem. 18: 143-150 (1969).

2. Pagnotto, L.D. and C.B. Killian: Measurement of Tritiated Organic Compounds in the Presence of Tritiated Water in Urine. Am. Indus. H. Assn. J. 30: 407-412 (August 1969).

3. Elkins, H.B. and L.D. pagnotto: The Specific Gravity Adjustment in Urinalysis. Arch. Env. Hlth. 18: 996-1001 (June 1969).

MASSACHUSETTS DEPARTMENT OF LABOR AND INDUSTRIES

4. Holland, H.D.: Benzene Exposure of Furniture Strippers. Report: Commonwealth of Mass., Dept. of Labor & Industries, Div. of Occup. Hyg., Boston (July 1971).

5. Cuzacq, G., M. Comproni and H.L. Smith: Mercury Contamination in the Dental OH Office. J. of Mass. Dental Soc. (Fall 1971).

WOFFORD COLLEGE
Spartanburg, South Carolina

Grant Number: 5 R01 OH-00324

Principal Investigator:

B.G. Stephens, Ph.D.
Department of Chemistry
Wofford College
Spartanburg, South Carolina 29301

Title:

Extraction of Metal Complexes by Propylene Carbonate

Objectives:

The aim of this project is to establish propylene carbonate as a metal extractant of general utility, thereby replacing several more toxic solvents such as chloroform, carbon tetrachloride, diethylether, and nitrobenzene.

Description:

In straightforward chemical extraction procedures, the investigator uses propylene carbonate, under a wide variety of conditions, to extract metal and non-metal chelate complexes. Recognized analytical methods, techniques, and instruments are employed to collect data which have applicability not only for toxicology but also for analytical chemistry.

Publication:

Stephens, B.G.: Propylene Carbonate Extraction of Tris (pentan-2,4-dione)-ion (III) from Aqueous Solution: Application to the Spectrophotometric Determination of Iron. Analyst 96: 230-234 (March 1971).

UNIVERSITY OF NEVADA
Reno, Nevada

Grant Number: 8 R01 OH-00332-03

Principal Investigator:

Ross W. Smith, Ph.D.
University of Nevada
Reno, Nevada 89507

Title:

Aqueous Surface Chemistry of Asbestos Minerals

Objectives:

These investigations have as their goal the elucidation of the origin of charges of silicates in aqueous media so as to provide insights to their physiological behavior.

Description:

The researchers are conducting measurements of the various properties of silicate minerals, particularly as these properties relate to the surface chemical behavior of the minerals in aqueous solution and suspension. Composition, morphology, physical chemistry, including electrophoretic characteristics, and colloidal properties of charged particulates are being investigated. Turbidimetry (light scattering) as well as dispersion characteristics are being studied. It is anticipated that the information developed will have relevance to the behavior of asbestos particles *in vivo*.

Publications: none

UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

Grant Number: 1 R01 OH-00336-01

Principal Investigator:

Edward A. Boettner
1621 School of Public Health
The University of Michigan
Ann Arbor, Michigan 48104

Title:

Analysis of Quartz and Other Minerals in Dusts by DTA

Objectives:

The specific purpose of this project is to apply differential thermal analysis (DTA) to the quantitative determination of quartz and other minerals in samples that may differ greatly in particle size and composition. The aim is to provide a convenient analytical method for quartz in dusts which may be implicated in silicosis.

Description:

Dust samples of various particle sizes are examined for quartz content by x-ray diffraction analysis, petrographic analysis, and differential thermal analysis. Cristobolite and other asbestos minerals are also examined. The basis of the quantitative DTA procedure for quartz is the heat absorption peak exhibited by quartz at 573^{o}C in undergoing an A to B transition.

Publications: none

PHYSIOLOGY

NEW YORK UNIVERSITY
New York, New York

Grant Number: 5 R01 OH-00317

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:

Study of Lung Structure and Function with Aerosol

Objectives:

The overall objective of this project is to establish a useful index of the size of the intrapulmonary spaces so that the information may be used as a diagnostic tool in studies of emphysema or other chronic lung diseases.

Description:

The investigations involve measurement of the effective size of the intrapulmonary gas spaces of normal human subjects and of patients with chronic obstructive lung disease. The method involves the inhalation of monodisperse aerosols and breath holding for varying time internals up to about 30 seconds. Since the physical properties of the aerosol particles are known, the length of time a particle will remain airborne in a confined space is predictable. By the proper selection of aerosol size and time of breath holding, the rate of deposition of the aerosol is calculated. This is used to establish an index of size of the intrapulmonary spaces.

Publications:

1. Wang, C.S., B. Altshuler, and E.D. Palmes: The Distribution and Deposition of Particles Suspended Between Parallel Plane Surfaces. J. of Colloid & Interface Sci. 26: 41-44 (1968).

2. Palmes, E.D.: Use of Aerosols to Measure Pulmonary Dimensions. APCA J. 18: (10) 671 (October 1968).

3. Altshuler, B.: Behavior of Airborne Particles in the Respiratory Tract. CIBA Fdn. Symposium on Circulatory and Respiratory Mass Transport, p. 215-231 (1969).

4. Palmes, E.D., R.M. Goldring, C.S. Wang, and B. Altshuler: Effect of Chronic Obstructive Pulmonary Disease on Rate of Deposition of Aerosols in the Lung During Breath Holding. Inhaled Particles III 1: 125-130 (1971).

5. Palmes, E.C. and C.S. Wang: An Aerosol Inhalation Apparatus for Human Single Breath Deposition Studies. Am. Indus. Hyg. Assoc. J. 32: 43-46 (January 1971).

NEW YORK UNIVERSITY MEDICAL CENTER
New York, New York

Grant Number: 5 R01 OH-00318-10

Principal Investigator:

Roy E. Albert, M.D.
New York University
Medical Center
550 First Avenue
New York, New York 10016

Title:

Pulmonary Deposition and Clearance of Dust in Man

Objectives:

The overall purpose of this project is to characterize the rates of pulmonary dust deposition in miniature donkeys and in healthy human beings as well as those with various lung diseases.

Description:

Systematic examinations are made to determine the physiological and physical parameters which control deposition and clearance of inhaled particles. These include size, density, shape, and charge of the particles. Mode of breathing (nose or mouth), respiratory rate, depth of breathing, and effects of posture and exercise are examined. The investigation includes the fabrication and use of an aerosol generator capable of producing monodisperse submicron particles which are then employed in the deposition and other studies. Effects of low-levels of air pollutants are also investigated.

Publications:

1. Albert, R.E., J. Spiegelman, M. Lippmann, and R. Bennett: The Characteristics on Bronchial Clearance in the Miniature Donkey. Arch. Env. Hlth. 17: 50-58 (July 1968).

2. Spiegelman, J.R., G.D. Hanson, A. Lazarus, and R.J. Bennett, M. Lippmann, and R.E. Albert: Effect of Acute SO_2 Exposure on Bronchial Clearance in the Donkey. Arch. Env. Hlth. 17: 321-326 (September 1968).

3. Lippmann, M. and R.E. Albert: Use of Monodisperse Aerosols for Studies on Respiratory Tract Deposition and Clearance. J. APCA 18: 672-674 (October 1968).

NEW YORK UNIVERSITY MEDICAL CENTER

4. Albert, R.E., J.R. Spiegelman, S. Shatsky, and M. Lippmann: The Effect of Acute Exposure to Cigarette Smoke on Bronchial Clearance in the Miniature Donkey. Arch. Env. Hlth. 18: 30-41 (January 1969).

5. Albert, R.E., M. Lippmann, and W. Briscoe: The Characteristics of Bronchial Clearance in Humans and the Effects of Cigarette Smoking. Arch. Env. Hlth. 18: 738-755 (May 1969).

6. Lippmann, M. and R.E. Albert: The Effect of Particle Size on the Regional Deposition of Inhaled Aerosols in the Human Respiratory Tract. AIHA J. 30: 257-275 (May-June 1969).

UNIVERSITY OF ROCHESTER
Rochester, New York

Grant Number: 8 R01 OH-00334-03

Principal Investigator:

Juraj Ferin, Ph.D.
University of Rochester
Department of Radiation Biology & Biophysics
Rochester, New York 14620

Title:

Influence of Airborne Factors on Lung Clearance

Objectives:

This project is designed to investigate the normal mechanisms of clearance of particles from the respiratory tract and the influence of various airborne factors and some drugs on clearance. The information developed is anticipated to be useful in determining the biological effects of air pollutants.

Description:

Investigations in animals, under controlled conditions, are conducted with test aerosols of specific particulate sizes and other characteristics. Measurements are made, immediately on exposure and at later times, of amounts deposited and their locations in the respiratory tract.

The amount of the test aerosol deposited is determined chemically in the case of TiO_2 and SiO_2 and by radioisotopic methods in the case of $Fe_2{}^{59}O_3$. Histologic examinations are performed using both light and electron microscopy and the electron microprobe. The materials under investigation include asbestos, coal and cement dusts, cigarette smoke, and various irritant vapors. Drugs of interest are those which affect the reticuloendothelial system.

Publications:

1. Ferin, J.: Papain-Induced Emphysema and the Elimination of TiO_2 Particulates from the Lungs. AIHA J. 32: 157-162 (March 1971).

2. Ferin, J.: Emphysema in Rats and Clearance of Dust Particles. University of Rochester, New York (1971).

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 1 R01 OH-00357

Principal Investigator:

Eula B. Mattheis
Dept. of Environmental Health
University of Cincinnati
Kettering Laboratory
Cincinnati, Ohio 45219

Title:

Fate of Inhaled Coal Dust

Objectives:

The aim is to evaluate the fate of inhaled coal dust in relation to lung storage, translocation to the G.I. tract, body tissues and fluids, and extraction of coal components by body fluids.

Description:

This is an experimental animal investigation using normal rabbits and rats and animals with papain-impaired lungs (emphysema). The rabbits and rats are exposed to high and extremely high concentrations of coal dust in test chambers which simulate concentrations of coal dust to be encountered by miners in coal mines. Coal samples are characterized as to size, shape, surface area, and content of silica, beryllium, vanadium, cobalt, titanium, total volatiles, polynuclear aromatic hydrocarbons, and ash. After exposures, observations are made in the normal and lung-impared animals. Quantitative differences are measured of the relative fates of the dust in the normal and abnormal animals. Determinations are made after a three-month's exposure period and after an additional three month's clearance period. Solubilities of coal fractions are determined in lung fluid, serum, and urine and extractibles are measured and identified.

Publications: none

UNIVERSITY OF PITTSBURGH
Pittsburgh, Pennsylvania

Grant Number: 1 R01 OH-00367-01

Principal Investigator:

Yves C. Alarie, Ph.D.
University of Pittsburgh
Dept. of Occupational Health
Graduate School of Public Health
130 DeSoto Street
Pittsburgh, Pennsylvania 15213

Title:

Respiratory Tract Irritants: Mechanisms & Tolerance

Objectives:

This work is aimed at delineating the mechanisms of sensory irritation and stimulation and the development of tolerance with frequent and repeated exposures to airborne chemicals. The work also seeks to demonstrate the importance of the "nasal trigeminal chemoreception phenomenon" in initiating protective mechanisms (relevant to man) to airborne chemical irritants.

Description:

This is an experimental animal investigation (rabbits and mice) of: 1) the correlation between chemical structures and their abilities to stimulate nerve endings in the upper respiratory tract; 2) the characteristics of the sensory stimulation of the trigeminal nerve by the various chemicals; 3) the persistence of the respiratory and cardiovascular reflexes induced by o-chlorobenzylidene malononitrile, beta-nitrostyrene, and diphenylaminochloroarsine during prolonged exposures to these chemicals; 4) the possible synergistic actions of various chemicals in stimulating the endings of the nasociliary nerve; 5) the possible induced tolerance by repeated exposures of aerosols of capsicaine on the nasociliary nerve; and 6) the specificity of this tolerance to the inducing chemical.

This work has considerable public health significance in that it may make possible the identification of those gases that produce a tolerance to irritation.

Publications: none

UNIVERSITY OF PITTSBURGH
Pittsburgh, Pennsylvania

Grant Number: 8 R01 OH-00308-16

Principal Investigator:

Harwood S. Belding, Ph.D.
Graduate School of Public Health
University of Pittsburgh
130 DeSoto Street
Pittsburgh, Pennsylvania 15213

Title:

Evolution of Stresses of Exposure to Heat

Objectives:

The long-range objectives are threefold: 1) to acquire better quantitative understanding of the factors determining the physiologic stresses resulting from exposure to hot environments and physical activity; 2) to relate the physical stresses so determined for man to the physiologic strains and overstrains resulting from exposure; and 3) to apply the generated information to the solution of health problems of populations at risk because they work or reside in hot climates.

Description:

This project deals essentially in generating information in the broad area of thermal physiology. There is both a practical as well as theoretical component to the effort. Practically, the role and influence of clothing in modifying thermal exchanges is investigated, whereas, on a theoretical level, consideration is devoted to studying the interrelationships which obtain between local and general stimuli and associated responses to thermal loads.

Publications:

1. Kamon, E. and H.S. Belding: Heat Uptake and Dermal Conductance in Forearm and Hand when Heated. J. Appld. Physiol. 24: 277-281 (1968).

2. Belding, H.S.: Work in Hot Environments. In Industrial Hygiene Highlights, Pittsburgh - Industrial Hygiene Foundation of America, pp. 214-228 (1968).

3. Kamon, E. and H.S. Belding: Dermal Blood Flow in the Resting Arm During Prolonged Leg Exercise. J. Appld. Phys. 26: 317-320 (1969).

4. Belding, H.S. (et al.): Health Factors involved in Working Under Conditions of Heat Stress. WHO Tech. Rept. Series #412 (32 pages) (1969).

5. Belding, H.S., E. Kamon, and G. Larson: Physiologic Cost of Load Carrying (Under Comfortable and Hot Conditions). Am. Indus. Hyg. Assoc. J. 30: 104 (1969).

6. Belding, H.S.: The Search for a Universal Heat Stress Index. in Physiological and Behavioral Temperature Regulation, J.D. Hardy and A.P. Gagge, editors. Thomas; Springfield, Illinois, Ch. 13, pp. 193-212 (1970)

7. Kamon, E.: Negative and Positive Work in Climbing a Laddermill. J. Appld. Physiol. 29: 1-5 (1970).

8. Kamon, E. and H.S. Belding: The Physiological Cost of Carrying Loads in Temperate and Hot Environments. Human Factors 13: 153-161 (1971).

UNIVERSITY OF PITTSBURGH
Pittsburgh, Pennsylvania

Grant Number: 5 R01 OH-00325-04

Principal Investigator:

David Minard, M.D., Ph.D.
University of Pittsburgh
130 DeSoto Street
Pittsburgh, Pennsylvania 15213

Title:

Physiologic Responses to Work Stress in Steelworkers

Objectives:

The aim of this study is to provide information on physiological criteria for assessing job demands and for matching these with the physiological capacities of steelworkers, with particular reference to hot occupational environments.

Description:

Experimental and control groups of steelworkers are studied from the standpoint of physiological stress of muscular work, heat exposure, and resultant physiological effects. Such quantities as heart rate, aerobic capacity, cardiac rhythm, body temperature, and fatigue are studied before and after stress. Heat acclimatization and "job-conditioning" are investigated for their significance to the stress-effect relationship.

Publications:

1. Minard, D. and R. Goldsmith: Heart Rate Responses to Industrial Heat Stress. Symposium Int'l., p. 342-345 (1970).

2. Minard, D., R. Goldsmith, P.H. Farrier, and B.H. Lambiotte: Physiological Evaluation of Industrial Heat Stress. AIHA J. 32: 17-28 (January 1, 1971).

3. Minard, David: Physiological Responses to Industrial Heat Stress. ASHRAE Symposium on Air Conditioning, Climatology and Health, Washington, D.C. (August 22, 1971).

INDUSTRIAL HEALTH FOUNDATION
Pittsburgh, Pennsylvania

Grant Number: 1 R13 OH-00382-01

Principal Investigator:

Robert T.P. deTreville, M.D., Sc.D.
Industrial Health Foundation
5231 Centre Avenue
Pittsburgh, Pennsylvania 15232

Title:

Industrial Contributions to Standards for Hot Jobs

Objectives:

This is a symposium convened as a follow-up of an earlier short workshop session in June 1971 which produced a Summary of Proceedings and a Guide for Assessing Heat Stress and Strains. The aim is to collect and assess human experience data both within and outside of American industry and to try to develop useful criteria and recommendations for useful safety and health standards for hot jobs.

TOXICOLOGY AND PATHOLOGY

UNIVERSITY OF OKLAHOMA MEDICAL CENTER
Oklahoma City, Oklahoma

Grant Number: 5 R01 OH-00312

Principal Investigator:

Carl A. Nau, M.D.
Department of Environmental Health
University of Oklahoma Medical Center
800 Northeast 13th Street
Oklahoma City, Oklahoma 73104

Title:

Occupational Health Hazards of Rubber Dust

Objectives:

This investigation, principally in laboratory experimental animals is designed to: 1) evaluate the biological effects of ingested rubber dust; 2) determine the long-term exposure effects of inhaled rubber dust; 3) elucidate the biochemical mechanisms involved in rubber dust exposures and consequent effects; and 4) improve the quantification of analytical methods and the associated interpretation of results.

Description:

Appropriately dispersed rubber dust has been successfully prepared and administered to monkeys, mice, and hamsters, in inhalation studies. Ingestion studies were performed in mice which were fed 10 per cent rubber dust mixed with their Rockland Chow. Paired feeding studies in rats is projected. Results of feeding studies indicated a shortening of life-span as well as a depression in growth, despite an increase in food consumption. This work, which has possible applicability to general environmental exposure as well as to occupational exposure of workers in garages and vehicular tunnels, is amenable to further quantitative and specific analyses and interpretations.

Publications:

1. Smith, C.G., C.A. Nau, and C.H. Lawrence: Separation of Identification of Polycyclic Hydrocarbons in Rubber Dust. Am. Indus. Hyg. Assoc. J. (29: pages 242-247 (May-June 1968).

2. Smith, C.W., S.H. Wender, and C.A. Nau: Growth and Free Proline Content of Tobacco Callus and HeLa Cells Exposed in Vitro to Rubber Dust and Carbon Black. Am. Indus. Hyg. Assoc J. 30: 402-406 (July-August 1969).

PAN AMERICAN HEALTH ORGANIZATION
Washington, D.C.

Grant Number: 5 R01 OH-00313-09

Principal Investigator:

Mena Ismael, M.D.
Pan American Health Organization
525 23rd Street, N.W.
Washington, D.C. 20037

Title:

Manganese Poisoning - A Metabolic Disorder

Objectives:

These investigations of the metabolic role of manganese are directed toward: 1) developing an understanding of the factors involved in manganese poisoning in miners; 2) delineating common characteristics of manganism and Parkinson's Disease; 3) promoting a rationale for effective biochemical therapy for both manganism and Parkinson's Disease.

Description:

This project effectively combines basic experimental sciences with clinical investigations. The effective utilization of the pharmaceutical, L-DOPA (3,4 - dihydroxy-L-phenylalanine), and 5-hydroxytryptophan in the experimental treatment of Parkinsonism offers promise in the treatment of manganese poisoning in human beings. Experiments are performed in laboratory animals to evaluate the effect of manganese on drug response as well as to study the dynamics of absorption of manganese oxide and manganese salts in healthy and in anemic animals. Chemical balance studies are performed in hospitalized miners on various therapeutic regimens including apomorphine, which has been demonstrated to be effective in the temporary improvement of miners. Alpha-methyl-DOPA-hydrazine is being investigated as a potentiator of the therapautic effects of L-DOPA.

Publications:

1. Cotzias, G.C., P.S. Papavasiliou, and R. Gellene: Modification of Parkinsonism in Chronic Treatment with L-Dopa. New Eng. J. of Med. 280: 337-345 (February 13, 1969).

2. Cotzias, G.C., K. Horiuchi, S. Fuenzalida, and I. Mena: Chronic Manganese Poisoning Clearance of Tissue Manganese Concentrations with Persistence of the Neurological Factor. Naurology 18: (4) 336-382 (April 1968).

3. Papavasiliou, P.S., S.T. Miller, and G.C. Cotzias: Role of Liver in Regulating Distribution and Excretion of Manganese, Am. J. Phys. 211: (1) 211-216 (July 1968).

4. Papavasiliou, P.S., S.T. Miller, and G.C. Cotzias: Functional Interactions Between Biogenic Amines, 3,5-Cyclic AMP and Manganese. Nature 220: (5172) 74-75 (October 5, 1968).

5. Cotzias, G.C.: Metabolic Modification of Some Neurologic Disorders, JAMA 210: (7) 1255-1262 (November 17, 1969).

6. Mena, I., K. Horiuchi, K. Burke, and G.C. Cotzias: Chronic Manganese Poisoning Individual Susceptibility and Absorption of Iron. Neurology 19: (10) 1000-1006 (October 1969).

7. Mena, I.: Perspectivas de la L. Dopa en la Enfermedad de Parkinson. ACTAS Io SIMPOSIO SUDAMERICANO SOBRE EL ESTADO ACTUAL DEL TRATAMIENTO EN LA ENFERMEDAD DE PARKINSON Y PARKINSONISMO, pp. 54-59 (1970).

8. Court, J., J.C. Kase, E. Palacious, and I. Mena: Tratamiento del Parkinsonismo Con L-Dopa. Rev. Med. Chile 99: 399-401 (1971).

HARVARD UNIVERSITY
Boston, Massachusetts

Grant Number: 2 ROl OH-00315-09

Principal Investigator:

Sheldon D. Murphy, Ph.D.
665 Huntington Ave.
Boston, Massachusetts 02115

Title:

Biochemical and Physiologic Response to Toxic Stress

Objectives:

The overall objective of this project is to increase understanding of effects of, and physiological responses to, the toxic action of a variety of chemicals such as some hepatotoxic organic solvents, irritants, neurotoxins, and cholinesterase inhibitors. More specifically, the aim is to determine, in experimental animals, the nature of the stresses imposed by exposure to toxic chemicals and the animal's capacity to adapt to its environment as a consequence.

Description:

This is a four-phase experimental investigation of toxic stress and its consequent biochemical and physiologic responses. Phase 1 is a characterization of the properties of liver alkaline phosphatase after the administration of various toxic agents. Phase 2 is the comparasin of effects of adrenocortical hormones (and of the adrenal gland itself) on acute toxicity, hepatotoxicity, and metabolism of aliphatic halogenated hydrocarbons. Phase 3 is the exploration of the relationship between anticholinesterase action of organophosphate insecticides and increased adrenocortical activity. Phase 4 is an investigation of drug effects and associated stress upon acrylamide neurotoxicity and an attempt to obtain biochemical "markers" to peripheral neuropathy.

Publications:

1. Murphy, S.D., and S. Malley: Stress-Inducible Liver Enzymes in Rats Given Hepatotoxic Chemicals. Tox. Appld. Pharm. 12: 317-318 (1968).

2. Szor, R.J. and S.D. Murphy: Effects of Phenobarbitol and Dexamethasone on the Adrenocortical Response of Rats to Toxic Chemicals and Other Stress. Tox. Appld. Pharm. 14: 515-616 (1969).

3. Murphy, S.D.: Some Relationships Between Effects of Insecticides and Other Stress Conditions. Ann. of N.Y. Acad. of Sci. 160: (1) 366-377 (June 1969).

4. Murphy, S.D. and S. Malley: Effect of Carbon Tetrachloride on Induction of Liver Enzymes of Acute Stress or Corticosterone. Tox. & Appld. Pharm. 15: 117-130 (1969).

5. Szot, R.J.: Phenobarbital and Dexamethasone Inhibition of the Adrenocortical Response of Rats to Toxic Chemicals and Other Stresses. Tox. and Appld. Pharm. 17: 761-773 (1970).

6. Szor, R.J. and S.D. Murphy: Relationships Between Toxic Chemical Stress and Circadian Changes in Adrenocortical Activity. Fed. Procs. 29: (1970).

UNIVERSITY OF FLORIDA
Gainesville, Florida

Grant Number: 5 R01 OH-00316-07

Principal Investigator:

Kenneth C. Leibman, Ph.D.
University of Florida College of Medicine
Dept. of Pharmacology & Therapeutics
Gainesville, Florida 32601

Title:

Metabolism of Hydrocarbons and Related 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 a rather straightforward investigation in vitro of the ability of various biological systems (e.g. rat microsomal NADPH-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 styrene, indene, dihydronaphthalene, heptachlor, and aldrin. Structure - function correlations are sought in the developed data.

Publications:

1. Leibman, K.C. and E. Ortiz: A Colorimetric Method for Determination of Glycols. Analyt. Chem. 40: (1) 251-252 (January 1968).

2. Leibman, K.C.: Actions of Insecticides on Drug Activity. Int. Anes. Clin. 6: (1) 251-260 (Spring 1968).

3. Leibman, K.C. and E. Ortiz: Oxidation of Indene in Liver Microsomes. Molec. Pharm. 4: (3) 201-207 (May 1968).

UNIVERSITY OF FLORIDA

4. Sunderman, F. and K. Leibman: Nickel Carbonyl Inhibition of Induction of Aminopyrine Demethylase Activity in Liver and Lung. Can. Res. 30: 1645-1650 (June 1970).

5. Leibman, K.C. and E. Ortiz: Oxidation of Cycloalkenes in Liver Microsomes. Biochem, Pharm. 20: 232-236 (1971).

6. Leibman, K.C. and E. Ortiz: Epoxide Intermediates in Microsomal Oxidation of Olefins to Glycols. J. Pharm. & Exper. Therap. 172: (3) 242-246 (February 1971).

7. Leibman, K.C. and R.W. Estabrook: Effects of Extraction with Isooctane Upon Properties of Liver Microsomes. Molec. Pharm. 7: (1) 26-32 (January 1971).

8. Chapman, S.K. and K.C. Leibman: The Effects of Chlordane, DDT, and 3- Methylcholanthrene Upon the Metabolism and Toxicity of Diethyl-4-Nitrophenyl Phosphorothionate (Parathion). Tox. & Appld. Pharm. 18: 977-987 (1971).

9. Leibman, K.C.: Reduction of Ketones in Liver Cytosol. Xenobiotica 1: (1) 97-107 (1971).

10. Leibman, K.C.: Studies on Modifiers of Microsomal Drug Oxidation. Chem. Biol. Interac. 3: 289-290 (1971).

11. Leibman, K.C. and E. Ortiz: Reduction and Hydroxylation of Terpene Ketones in Liver. Fed. Proc. 30: 226 (1971). ABST.

12. Leibman, K.C. and E. Ortiz: New Potent Inhibitors of Microsomal Drug Oxidations: The 1-Arylimidazoles. Pharmacol. 13: 223 (1971). ABST.

HARVARD UNIVERSITY
Boston, Massachusetts

Grant Number: 9 R01 OH-00322-04

Principal Investigator:

John M. Peters, M.D.
665 Huntington Ave.
Boston, Massachusetts 02115

Title:

Health Hazards of the Di-Isocyanates

Objectives:

The general goals of this project are: to investigate the relationship between exposure to diisocyanates (toluene diisocyanate) and the development of acute and chronic respiratory disease; to define the patho-physiological lesion involved and to determine the toxic mechanism related to the exposure; to identify hypersensitive workers; and to define "safe" exposure levels.

Description:

This is a prospective monitoring study of workers exposed to diisocyanates and the attempt to correlate findings with past work history and future work experience. The investigations are interested, in addition to developing the information indicated in the objectives, in the possible effects of chronic diisocyanate exposure, the inter-relationships, if any, with smoking, and in carrying out various immunological studies to see whether or not sensitized workers demonstrate the presence of antibodies. Non-occupational exposures are also of interest. The permanence or reversibility of chemical changes and changes in ventilatory capacity are also studied.

Publications:

1. Peters, J.M., R.L.H. Murphy, L.D. Pagnotto, and W.F. Van Ganse: Acute Respiratory Effects in Workers Exposed to Low Levels of Toluene Diisocyanate (TDI). Arch. Env. Hlth. 16: 242-247 (May 1968).

2. Peters, J.M., R.L.H. Murphy, and B.G. Ferris: Ventilatory Function in Workers Exposed to Low Levels of Toluene Diisocyanate (TDI): A Six Month Follow-Up. Brit. J. Indus. Med. 26: 115 (1969).

3. Peters, J.M., J. Mead, and W.F. Van Ganse: A Single Flow Volume Device for Measuring Ventilatory Function in the Field. Am. Rev. Resp. Dis. 99: 617-622 (1969).

4. Peters, J.M., R.L.H. Murphy, L. Pagnotto, and J.L. Whittenburger: Respiratory Impairment in Workers Exposed to "Safe" Levels of Toluene Diisocyanate (TDI) Arch. Env. Hlth. 20: 364-368 (March 1970).

GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia

Grant Number: 5 R01 OH-00329-03

Principal Investigator:

Clyde Orr, Jr., Ph.D.
Engineering Experiment Station
225 North Avenue, N.W.
Atlanta, Georgia 30332

Title:

Formation of Nonvolatile Particulates from Organic Vapors

Objectives:

It has been observed earlier, by Professor Pfefferkorn in Germany, that very small particulates (called "droplets" because they appear to be liquid and are generally, spherical) are formed from organic vapors on the surfaces of larger particles and crystals under the influence of x-rays and ultraviolet light. Vapors from which particulates are known to be derived include benzene, alcohol, benzaldehyde, and carbon tetrachloride. This research seeks to describe the conditions of particulate formation, their composition, and their possible deleterious influences, if ingested.

Description:

The composition of particulates formed under the influence of x-rays or ultraviolet light is not known. Nor is the mechanism of formation known. The rate of formation is greatest and the particulates largest, when the water content is highest. The conditions of droplet formation and their characterization are investigated and analyzed by chemical and physical means including scanning electron microscopy. This research is directly relevant to a growing understanding of how aerosols arise in polluted atmospheres.

Publications: none

UNIVERSITY OF OKLAHOMA
Oklahoma City, Oklahoma

Grant Number: 5 R01 OH-00330-02

Principal Investigator:

Ronald L. Coleman, Ph.D.
Department of Environmental Health
University of Oklahoma Medical Center
800 N.E. 13th Street
Oklahoma City, Oklahoma 73104

Title:

Measuring Carbon Monoxide Effect with Trace Metals

Objectives:

This research project aims at assessing and evaluating the translocations of trace metals by carbon monoxide exposure, through the modification of enzyme metabolism.

Description:

Based on the hypothesis that exposure to carbon monoxide alters enzyme metabolism, resulting in trace metal translocations, investigations are conducted to measure the degree and effect of chronic exposure to carbon monoxide by means of evaluating the translocations of copper, cobalt, zinc, iron and magnesium in brain, heart, liver, lungs, kidney, spleen, blood serum, erythrocytes, and urine. Rats are the experimental organisms subjected to prolonged exposures for protracted periods of time.

Publications: none

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 8 R01 OH-00337-03

Principal Investigator:

Harold G. Petering, Ph.D.
Kettering Laboratory
Eden and Bethesda Aves.
Cincinnati, Ohio 45219

Title:

A Study of Mechanics of Occupational Cadmium Toxicity

Objectives:

This investigation is directed toward understanding the toxicity of cadmium and its interrelationships with copper and zinc metabolism. More specifically, definitive information is sought on the biological effects of cadmium in rats under carefully controlled conditions of suboptimal and excessive intakes of zinc and copper.

Description:

Using rats as the experimental animals, experiments on cadmium toxicity are performed in which the intakes of copper and zinc are carefully controlled at suboptimal and excessive levels. The effect of both quality and quantity of protein on cadmium toxicity, are also examined, including especially the significence of sulfur containing amino acid, in protein metabolism. Biochemical and pathologic studies, which include complete tissue and blood analyses, some representative metalloenzyme determinations, respiratory activity and oxidative phosphorylation, and potassium transport in liver tissues, are carried out. Additional aspects of the project include gross pathology, organ histology, and electron microscopy of selected tissues.

Publications:

1. Petering, H.G., M.A. Johnson, K.L. Stemmer: Studies of Zinc. Metabolism in the Rat. Arch. of Env. Hlth. 23: 93-101 (1971).

2. Petering, H.G.: Studies in Zinc Metabolism IV Interactions of Zinc and Cadmium. Preliminary Reports in the Dept. of Env. Hlth., Univ. of Cinn., Annual Report (1971).

3. Petering, H.G.: Cadmium in Tobacco and Its Fate During Smoking. Preliminary Reports in the Dept. of Env. Hlth., Univ. of Cinn., Annual Report (1971).

4. Petering, H.G.: Direct Determination of Cadmium and Lead in Diluted Plasma. Preliminary Reports in the Dept. of Env. Hlth., Univ. of Cinn., Annual Report (1971).

5. Petering, H.G.: In Vitro Distribution of Cadmium and Lead in Rat's Blood. Preliminary Reports in the Dept. of Env. Hlth., Univ. of Cinn., Annual Report (1971).

6. Sell, J.E. and H.G. Petering: Effect of Buffer System on Carbonic Anhydrase Activity in the Presence of EDTA or Peptone. Proc. of 2nd Central Regional Meeting of Amer. Chem. Soc., Columbus, Ohio, ABST. NO. 16, p. 27 (June 3-5, 1970).

UNIVERSITA DEGLI STUDI DI MILANO
Milan, Italy

Grant Number: 5 R01 OH-00339-02

Principal Investigator:

Enrico C. Vigliani, M.D.
Via S Barnaba, 8
20122 Milan, Italy

Title:

Chromosome Studies in Human Lead Poisoning

Objectives:

The investigators are seeking, in human populations occupationally exposed to abnormal lead absorption, to correlate cytogenetic results with those in matched normal control subjects. This work is prompted by a report in mice of chromosomal damage in experimental lead poisoning. (Muro, L.A. and Goyer, R.A., "Chromosome Damage in Experimental Lead Poisoning," Arch. Path. 87, 660 (1969)).

Description:

This is a cytogenetic investigation of cultured human lymphocytes derived from populations with plumbism (industrial lead exposure only) as compared with control subjects with no known lead exposure. A retrospective cancer study in storage battery workers and a lead-tissue culture study, in vitro, are included.

Publications: none

UNIVERSITY OF WASHINGTON
Seattle, Washington

Grant Number: 5 R01 OH-00340-03

Principal Investigator:

Nedd R. Frank, M.D.
University of Washington
Dept. of Preventive Medicine
Seattle, Washington 98105

Title:

Respiratory Effects of Inhaled Gases and Aerosols

Objectives:

This effort is directed toward investigating effects in vivo of low levels of ozone, nitrogen dioxide, and aerosols.

Description:

In animals (rabbits), which have been experimentally altered so as to have produced unilateral emphysematous-like lung disease by means of papain administration, procedures are performed to measure comparative factors of pulmonary mechanics and ozone uptake. Xe^{133} is used to measure distribution of ventilation and perfusion in control and diseased lung.

Measurements are also made of effects and changes in inspired oxygen and carbon dioxide administered in vivo to rabbits, on the number, lysosomal enzyme content, phagocytic activity (measured in vitro), and ultrastructure appearance of alveolar macrophages.

Publications:

1. Yokoyama, E., R. Yoder, and N.R. Frank: Distribution of ^{35}S in the Blood and Its Excretion in Urine of Dogs Exposed to $^{35}SO_2$. Arch. Env. Hlth. 22: 389-395 (March 1971).

2. Frank, N.R., J.P. Flesch, and J.D. Brain: Effect of Ozone on Elastic Behavior of Excised Lungs of Dogs. Environ. Res. 4: (4) 343-354 (October 1971).

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 5 R01 OH-00347-02

Principal Investigator:

Phyllis D. Kaplan, Ph.D.
University of Cincinnati
Eden and Bethesda Avenues
Cincinnati, Ohio 45219

Title:

Biological Interactions of Environmental Metals

Objectives:

This research effort seeks an understanding of the underlying mechanisms of the toxicologic effects (roles) of cadmium and chromium.

Description:

Investigations are made of subcellular distributions, locations, and state(s) of cadmium and chromium in the lung tissue of dogs following inhalation exposures. Emphasis is on the molecular structure surrounding the metal. This is investigated by means of nuclear magnetic resource (NMR) and electron paramagnetic resonance (EPR) techniques. Modern physical and chemical procedures are used to determine: 1) number of metal atoms per unit molecular weight of interacting material (probably protein); 2) the number of binding sites available to the metal; 3) the ease of exchange of the metal with other atoms; 4) the percentage of total metal concentration present in a paramagnetic state; and 5) the available sites on the metal for ligand exchange. This information is correlated with other toxicologic studies on these metals.

Publications: none

UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

Grant Number: 5 R01 OH-00348-02

Principal Investigator:

Herbert H. Cornish, Ph.D.
The University of Michigan
3550 School of Public Health
Ann Arbor, Michigan 48104

Title:

Enzyme Induction and Environmental Toxicants

Objectives:

The research has as its end purpose the elucidation of the role of induced liver microsomal enzyme activity on the effects of low-level, sub-acute and chronic exposures to various organic chemical solvent vapors such as carbon tetrachloride, chloroform, benzene, and others.

Description:

It has been demonstrated on an acute basis that induced enzyme activity markedly potentiates the toxicity of carbon tetrachloride and chloroform. Experiments are performed in which known inducers of liver microsomal enzyme activity such as phenobarbital, DDT, and tolbutamide are used in low concentration: 1) to study the effect of acute toxicity of these solvents, and 2) to study the chronic effect of simultaneous intake of low concentrations of the inducers and chronic exposures to these solvents over periods of time of from one week to three or more months.

The hepatotoxic reaction to carbon tetrachloride and chloroform is determined by serum enzyme activity (serum glutamic oxaloacetic acid-SGOT) and by histopathology. Blood and bone marrow are studied for benzene toxicity. Microsomal enzyme activity is measured by means of *in vitro* studies of liver homogenates and microsomal fractions.

Publications: none

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 5 R01 OH-00349-02

Principal Investigator:

Leslie M. Klevay, M.D.
Kettering Laboratory
Eden & Bethesda Avenues
Cincinnati, Ohio 45219

Title:

Vanadium Toxicity: A Study of Mechanisms

Objectives:

This project seeks primarily to test the hypothesis that toxic amounts of vanadium, an emerging potential industrial hazard, produce ill effects by interfering with normal biological utilization of chromium. Secondary objectives are the elucidation of underlying mechanisms of vanadium toxicity resulting from occupational exposure and the understanding of environmental influences on the etiology of atherosclerotic heart disease.

Description:

In closely controlled feeding studies, rats on chromium - deficient diets are provided with vanadium.

Biochemical factors measured include: growth rate, serum cholesterol, serum phospholipids, mineral balance, and glucose tolerance. Radioiodine uptake tests are performed to test thyroid function and rat tissues are examined microscopically after killing the animals.

Publication:

Klevay, L.M., H.G. Petering, and K.L. Stemmer: A Controlled Environment for Trace Metal Experiments on Animals. Environ. Sci. & Tech. p. 1196-1199 (December 1971).

STANFORD UNIVERSITY
Palo Alto, California

Grant Number: 2 R01 OH-00352

Principal Investigator:

Eugene D. Robin, M.D.
Department of Medicine
Stanford University, Sch. of Med.
Palto Alto, California 94305

Title:

Lung Cell Function in Health and Disease

Objectives:

This is a biochemical and physiological project which seeks development of methods to study aspects of biological transport and biochemistry of lung cells and to apply the methods to an investigation of alveolar macrophages under normal and abnormal conditions.

Description:

The approach and methodology in this project include: measurement of key substrates in the glycolytic and oxidative phosphorylation pathways, measurement of enzyme activity of key enzymes (cytochrome oxidase, pyruvate kinase, and lactate dehydrogenase), measurements of sodium and potassium flux and transmembrane potential, measurements of intracellular pH and intramitochondrial pH, and measurements of macromolecular influx and efflux.

Publications:

1. Mintz, S. and E.D. Robin: Redox State of Free Nicotinamide-Adenine Nucleotides in the Cytoplasm and Mitochondria of Alveolar Macrophages. J. Clin. Inves. 50: 1181-1186 (June 1971).

2. Robin, E.D., J.D. Smith, A.R. Tanser, J.S. Adamson, J.E. Millen, and B. Packer: Ion and Macromolecular Transport in the Alveolar Macrophage. Biochem. Biophys. Acta. 241: 117-128 (1971).

3. Simon, L.M., S. Axline, B.R. Horn and E.D. Robin: Macrophage Bioenergetic Adaptations. ABST.

4. Simon, L.M., J. Theodore, and E.D. Robin: Enzymatic Difference in Macrophage Energy Metabolism. ABST.

STANFORD UNIVERSITY

5. Theodore, J., J. Acevedor and E.D. Robin: Enzyme Implantation: Acquisition of "de novo" Uricase Activity by Alveolar Macrophages (AM). Draft

6. Simon, J.R., S. Mintz, G. Freeman, J. Theodore, and E.D. Robin: Effects of NO_2 on Redox State of Alveolar Macrophages. ABST.

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

Grant Number: 1 R01 OH-00359

Principal Investigator:

Stanley B. Gross, Ph.D.
University of Cincinnati
Dept. of Environmental Health
Kettering Laboratory
Cincinnati, Ohio 45219

Title:

Variables Affecting Estimation of Human Body Burden

Objectives:

This study seeks to develop "standard" rational sampling methods to determine the human body burden for a variety of "toxic" metals such as lead and mercury, mainly, and subsidiarily, zinc, chromium, copper, and cadmium. The ultimate aim is the establishment of a valid relationship between environmental exposure and the content of heavy metals in human tissues.

Description:

By means of analytic examinations of about 30 tissues from about 20 cadavers supplied through the Coroner's Office, measures of metal body burdens are made and calculated. The bodies are divided into categories of three age groups, the two sexes, and three "body conditions," normal, ischemic, and congested. Variations of metal content in the different tissues are correlated with the cause of death, body condition at autopsy, and any observed abnormalities in terms of age, sex, race, and organ pathology.

Publications: none

FACTORY MUTUAL RESEARCH CORPORATION
Norwood, Massachusetts

Grant Number: 5 R01 OH-00405-03

Principal Investigator:

Archibald Tewarson, Ph.D.
Factory Mutual Research Corporation
1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062

Title:

Development of Lethal Environments in Building Fires

Objectives:

The principal aim is to develop data which can be used to predict lethal environments in building fires. A subsidiary aim is to be able to use the results of this investigation in recommendations for safety from fires in building designs and materials.

Description:

Lethal environment is defined as one which will not support life due to the presence of a combination of products of pyrolysis and combustion. Residual oxygen may remain in the products. Temperature of products and heat flux are also factors. The approach in this research is valuable in that it simulates conditions that prevail in actual conflagrations.

The nature of the combustion and pyrolysis products are determined for a building fire. Time-temperature and time-concentration curves are constructed in large-scale fires. Convective movement of hot gases is also investigated. This research is useful to aid in establishing evacuation routes and criteria for construction of dwellings and work buildings in terms of materials and design.

Publication:

Heskestad, G.: Modeling of Enclosure Fires. Presented at the 14th International Symposium on Combustion (August 1971).

DEMONSTRATIONS

BROOKDALE HOSPITAL CENTER
Brooklyn, New York

Grant Number: 3 R01 OH-00319

Principal Investigator:

A. Walter Hoover, M.D.
The Brookdale Hospital Center
Linden Blvd. at Brookdale Plaza
Brooklyn, New York 11212

Title:

Occupational Health Services in Small Industries

Objectives:

This is essentially a demonstration project which seeks a workable approach to bridging a gap in provision of comprehensive health care, with particular emphasis on occupational health services. The project is directed toward defining the need, scope, and nature of occupational health services required for small industries, (i.e. those too small to have in-house programs) and to determine whether or not these services can be provided through a plan based on an existing hospital. The estimation of anticipated benefits in relationship to costs is an important aim.

Description:

The program has two overlapping phases. The first phase which includes defining the need, also involves surveying the problems, attitudes, interest, and knowledge of employers with respect to occupational health. The second phase is essentially the provision, by means of an experimental facility, of services encompassed by a complete occupational health program.

Publications: none

RESEARCH GRANTS IN FISCAL YEAR 1972

GRANT NUMBER	INSTITUTION & PROGRAM DIRECTOR	PROJECT PERIOD	FY 1972 AWARD
R01 OH 00300	Villanova Univ. Quam, G.N.	06/01/70-05/31/72	$ ---
R01 OH 00301	Snell Memorial Fdn., Inc. Snively, G.C.	02/01/70-04/30/73	26,825
R01 OH 00302	Duke University Kilburn, K.H.	02/01/71-01/31/74	111,928
R01 OH 00303	Univ. of Pennsylvania Samitz, M.H.	12/01/69-11/30/72	20,568
R01 OH 00304	John B. Pierce Fdn. Bouhuys, A.	09/01/69-10/31/72	73,892
R01 OH 00305	Mt. Sinai Sch. of Med. Selikoff, I.J.	12/01/71-11/30/73	75,277
R01 OH 00306	Marshfield Clinic Fdn. Emanuel, D.A.	12/01/71-11/30/74	29,584
R01 OH 00308	Univ. of Pittsburgh Belding, H.S.	09/01/67-10/31/72	40,428
R01 OH 00309	Mass. Dept. of Labor and Industries Elkins, H.	09/01/71/08/31/74	27,300
R01 OH 00310	Harvard University Ferris, B.G.	10/01/68-09/30/73	51,567
R01 OH 00312	Univ. of Okla. Med. Ctr. Nau, C.A.	01/01/68-08/31/72	---
R01 OH 00313	Pan Am. Health Orgn. Torloni, H.	11/01/70-10/31/74	81,069
R01 OH 00315	Harvard University Murphy, S.D.	01/01/72-12/31/75	57,674
R01 OH 00316	Univ. of Florida Leibman, K.C.	01/01/71-12/31/75	36,439
R01 OH 00317	N.Y. Univ. Palmes, E.D.	10/01/66-04/30/72	---

RESEARCH GRANTS IN FISCAL YEAR 1972

GRANT NUMBER	INSTITUTION & PROGRAM DIRECTOR	PROJECT PERIOD	FY 1972 AWARD
R01 OH 00318	N.Y. Univ. Med. Ctr. Albert, R.E.	05/01/69-04/30/72	$ ---
R01 OH 00319	Brookdale Hospital Ctr. Hoover, A.W.	05/01/66-04/30/73	---
R01 OH 00320	Mt. Sinai Sch. of Med. Selikoff, I.J.	05/01/71-04/30/74	42,088
R01 OH 00321	Univ. of Washington Milner, J.E.	05/01/71-04/31/74	52,697
R01 OH 00322	Harvard University Peters, J.M.	09/01/71-08/31/76	29,366
R01 OH 00323	Wayne State University Reeves, A.L.	08/01/71-07/31/73	78,600
R01 OH 00324	Wofford College Stephens, B.G.	03/01/68-02/28/73	22,356
R01 OH 00325	Univ. of Pittsburgh Minard, D.	04/01/71-03/31/73	10,974
R01 OH 00326	Indus. Hyg. Fdn. Gross, P.	06/01/68-05/31/72	---
R01 OH 00327	Stanford University Beard, R.R.	06/01/71-05/31/74	117,347
R01 OH 00328	Univ. of California Globus, G.G.	05/01/69-10/31/71	---
R01 OH 00329	Ga. Inst. of Tech. Orr, C.	03/01/69-02/29/72	---
R01 OH 00330	Univ. of Okla. Coleman, R.L.	06/01/69-05/31/73	---
R01 OH 00331	Montefiore Hospital and Medical Center Weitzman, E.D.	06/01/70-05/31/74	57,700

RESEARCH GRANTS IN FISCAL YEAR 1972

GRANT NUMBER	INSTITUTION & PROGRAM DIRECTOR	PROJECT PERIOD	FY 1972 AWARD
R01 OH 00332	Univ. of Nevada Smith, R.W.	09/01/69-04/28/73	$ 67,597
R01 OH 00333	Indus. Hyg. Fdn. Gross, P.	11/01/70-10/31/71	---
R01 OH 00334	Univ. of Rochester Ferin, J.	09/01/69-08/31/72	73,500
R01 OH 00335	Univ. of Cincinnati Mattheis, E.B.	09/01/69-08/31/72	31,518
R01 OH 00336	Univ. of Michigan Boettner, E.A.	06/01/70-02/29/72	---
R01 OH 00337	Univ. of Cincinnati Petering, H.G.	09/01/69-08/31/72	52,085
R01 OH 00338	Marquette Sch. of Med. Boren, H.G.	02/01/70-05/12/72	11,816
R01 OH 00339	Universita Degli Studi Di Milano Vigliani, E.C.	06/01/70-05/31/72	---
R01 OH 00340	Univ. of Washington Frank, N.R.	10/01/70-09/30/73	65,193
R01 OH 00341	Pennsylvania State Univ. Michael, P.L.	06/01/70-03/31/73	41,536
R01 OH 00342	Univ. of Notre Dame Pollard, M.	06/01/71-05/31/74	22,525
R01 OH 00343	Stanford Research Inst. Bycroft, G.N.	12/01/71-06/30/73	37,675
R01 OH 00344	Univ. of Arizona Hoenig, S.A.	04/01/70-03/31/72	---
R01 OH 00345	Louisiana State Univ. Guilbault, G.G.	04/01/70-03/31/73	28,905
R01 OH 00346	Univ. of Miami Wiener, E.L.	02/01/71-01/31/74	52,944

RESEARCH GRANTS IN FISCAL YEAR 1972

GRANT NUMBER	INSTITUTION & PROGRAM DIRECTOR	PROJECT PERIOD	FY 1972 AWARD
R01 OH 00347	Univ. of Cincinnati Kaplan, P.D.	04/01/71-03/31/74	$ 32,990
R01 OH 00348	Univ. of Michigan Cornish, H.H.	04/01/71-03/31/73	40,124
R01 OH 00349	Univ. of Cincinnati Klevay, L.M.	04/01/71-03/31/73	27,700
R01 OH 00350	Univ. of Minesota Ward, W.D.	04/01/71-03/31/74	38,252
R09 OH 00351	SOH Study Section Briggs, G.E.	06/15/70-06/30/72	22,000
R01 OH 00352	Stanford University Robin, E.D.	05/01/71-04/30/74	44,968
R01 OH 00353	Univ. of Minnesota Stebbings, J.	06/01/70-09/30/72	---
R01 OH 00354	Indus. Hlth. Fdn. Gross, P.	05/01/71-04/30/72	---
R01 OH 00355	Univ. of Cincinnati Petering, H.G.	06/01/71-05/31/74	54,993
R01 OH 00356	Univ. of Cincinnati Christian, R.	06/01/72-05/31/75	19,957
R01 OH 00357	Univ. of Cincinnati Mattheis, E.B.	06/01/71-05/31/73	46,646
R01 OH 00358	Ohio State Univ. Davis, G.W.	06/01/71-05/31/73	97,998
R01 OH 00359	Univ. of Cincinnati Gross, S.B.	06/01/71-05/31/73	66,188
R01 OH 00360	West Virginia Univ. Burrell, R.	06/01/71-05/31/74	27,926
R01 OH 00361	New York Acad. of Sciences Selikoff, I.J.	06/01/71-05/31/72	---

RESEARCH GRANTS IN FISCAL YEAR 1972

GRANT NUMBER	INSTITUTION & PROGRAM DIRECTOR	PROJECT PERIOD	FY 1972 AWARD
R01 OH 00362	Centro Malattie Cardiovascolari Puddu, V.	08/01/71-07/31/76	$ 2,300
R01 OH 00364	State of N.Y. Upstate Medical Center Henderson, D.	05/01/72-04/30/74	49,835
R01 OH 00365	Univ. of South Dakota Heimstra, N.W.	10/01/71-09/30/73	20,243
R01 OH 00366	Univ. of Mo.-Rolla Warner, H.D.	11/01/71/10/31/73	8,922
R01 OH 00367	Univ. of Pittsburgh Alarie, Y.C.	10/01/71-09/30/74	18,159
R01 OH 00368	Univ. of California Milby, T.H.	02/01/72-01/31/75	111,877
R13 OH 00382	Indus. Hlth. Fdn. deTreville, R.	01/01/72-12/31/72	17,328
R01 OH 00387	Tulane Univ. Sch. of Med. Ziskind, M.	06/01/71-05/31/74	71,646
R01 OH 00404	Univ. of California Nahum, A.M.	01/01/72-12/31/73	32,381
R01 OH 00405	Factory Mutual Research Corporation Tewarson, A.	08/01/69-04/30/72	21,793
R13 OH 00430	Univ. of Rochester Laties, V.G.	05/01/72-04/30/73	6,184
R01 OH 00435	Univ. of So. Fla. Boren, H.	06/01/72-01/31/73	18,200
R09 OH 00445	Wayne St. Univ. Birmingham	06/30/72-06/30/73	8,000

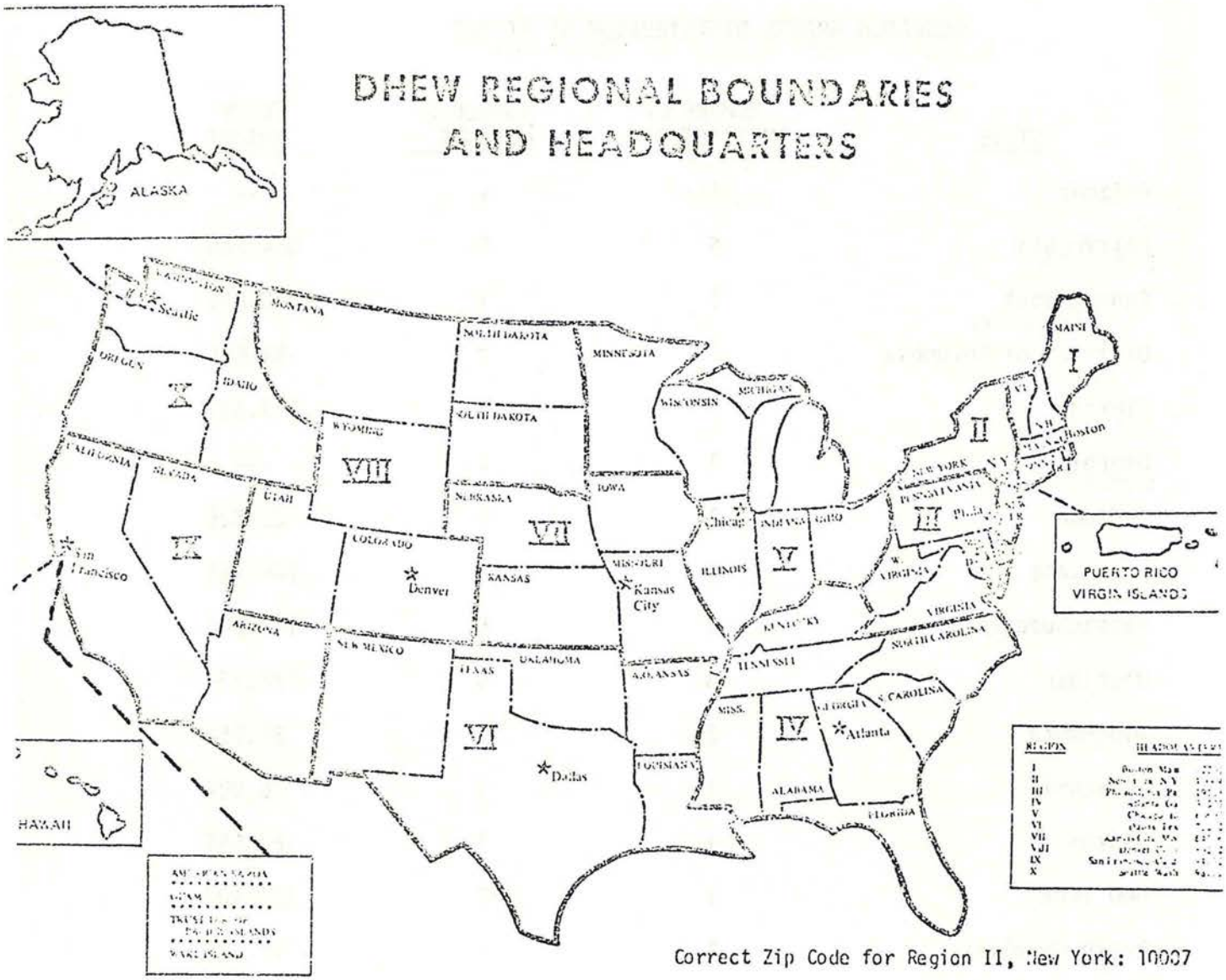
RESEARCH GRANTS SUMMARY BY PROGRAM AREA

	Active Grants	FY'72 Support	
		No.	Amount
BEHAVIORAL AND MOTIVATIONAL FACTORS	5	5	205,640
BIO-ENVIRONMENTAL SAMPLING AND ANALYSIS	1	1	111,877
DERMATOLOGY	2	2	73,265
EPIDEMIOLOGY	4	3	129,144
ERGONOMICS	2	1	57,700
HEAD AND BODY PROTECTION	4	3	96,881
INSTRUMENTATION	2	1	28,905
OCCUPATIONAL RESPIRATORY DISEASE			
Byssinosis	2	2	185,820
Coal Worker's Pneumoconiosis	5	4	195,473
Farmer's Lung	1	1	29,584
Respiratory Tract Carcinoma	4	2	120,688
Silicosis	2	1	71,646
Unspecified	4	4	89,460
PHYSICAL AGENTS			
Noise	3	3	129,623
PHYSICAL AND CHEMICAL ANALYSIS	4	3	117,253

RESEARCH GRANTS SUMMARY BY PROGRAM AREA

	Active Grants	FY'72 Support	
		No.	Amount
PHYSIOLOGY			
Respiratory	4	2	120,146
Heat Stress	4	4	86,889
TOXICOLOGY AND PATHOLOGY	16	12	555,589
DEMONSTRATIONS	1	0	0

RESEARCH GRANTS DISTRIBUTION BY REGION



Region	Number of Grants	Total Amount
I	6	$261,592
II	11	331,409
III	12	257,988
IV	6	241,867
V	19	680,976
VI	4	100,551
VII	1	8,922
VIII	1	20,243
IX	8	411,845
X	2	117,890

RESEARCH GRANTS DISTRIBUTION BY STATES

STATE	NUMBER OF INSTITUTIONS	NUMBER OF GRANTS	FY'72 AMOUNT
Arizona	1	1	---
California	6	6	344,248
Connecticut	1	1	73,892
District of Columbia	1	1	81,069
Florida	3	3	107,583
Georgia	1	1	---
Indiana	1	1	22,525
Louisiana	2	2	100,551
Massachusetts	3	5	187,700
Michigan	3	4	126,724
Minnesota	2	2	38,252
Missouri	1	1	8,922
Nevada	1	1	67,597
New York	7	11	331,409
North Carolina	1	1	111,928
Ohio	2	10	452,075
Pennsylvania	6	10	148,993
South Carolina	1	1	22,356
South Dakota	1	1	20,243
Washington	1	2	117,890
West Virginia	1	1	27,926
Wisconsin	2	2	41,400
Oklahoma	1	2	---
Foreign (Italy)	2	2	2,300

INDEX OF PRINCIPAL INVESTIGATORS

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