■ CENTER FOR INDOOR AIR RESEARCH

SUPPORTED STUDIES
JUNE, 1990

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CENTER FOR INDOOR AIR RESEARCH

The Center for Indoor Air Research (CIAR) is a non-profit corporation formed in March, 1988. The Center's mission is to create a focal point organization of the highest scientific caliber, to sponsor and foster quality, objective research in indoor air issues including environmental tobacco smoke, and to effectively communicate research findings to the broad scientific community.

The Center has established a Science Advisory Board (SAB) which develops the research agenda for approval by the Board of Directors. The SAB recommends proposals for funding after they have been reviewed by the Center's pool of peer reviewers. This structure ensures that only high quality research which will contribute to the knowledge bank on indoor air is recommended for funding.

The Center supports original research through contracts written for those proposals which are recommended by the SAB and approved by the Board of Directors. The Center also provides funding for a limited number of applied studies.

RESEARCH AND REVIEW PROCESS

The research agenda of the Center for Indoor Air Research is formulated by the Science Advisory Board (SAB), a multi-disciplinary group of individuals with reputations for expertise and scientific leadership in the disciplines relevant to indoor air research. The SAB seeks the best judgments of active research scientists as to what scientific information is missing in the various disciplines before independently ascertaining the research priorities of the Center.

After the SAB establishes the research agenda, the Center announces to the scientific community at large that research applications in response to the agenda are being accepted. The review of proposals and their selection for funding is accomplished in a scientifically rigorous and objective manner. Proposals are reviewed first for scientific quality by the applicant's peers. The SAB, in turn, reviews the applications and peer evaluations, and develops recommendations on the selection of proposals.

A staff scientist is assigned to each funded project to continually monitor the investigator's progress and to provide assistance to the investigators toward the successful completion of the project and submission of a final report.

CIAR APPROVED RESEARCH PROJECTS - JULY 1990

ETS: Nasal Response and Aerosol Deposition Effect
PI: Rebecca Bascom, M.D.
University of Maryland
Department of Medicine

The researchers will use acoustic rhinometry to assess upper respiratory effects of sidestream smoke, predict alterations in deposition of secondary pollutants, and characterize the efficacy of a portable room air cleaner in ameliorating the effects of ETS.

Metabolic Epidemiology of Nicotine in Nonsmokers
PI: Nancy J. Haley, Ph.D.
American Health Foundation
Department of Clinical Biochemistry

The researchers will develop and validate immunochemical methods for the determination of nicotine metabolites including nicotine, cotinine, and trans 3'-hydroxycotinine to enable the conduct of large scale and relevant epidemiological studies in ETS exposure and uptake.

Susceptibility to Ozone-Induced Airway Inflammation
PI: Steven R. Kleeberger, Ph.D.
The Johns Hopkins University
School of Hygiene and Public Health

A unique genetic model of lung inflammation will be used to study the molecular mechanisms involved in the development of lung inflammation which may ultimately determine susceptibility to ozone-induced pulmonary inflammation.

Toxicological Interactions between the Indoor Air Pollutant NO_2 & O_3
PI: Jerold A. Last, Ph.D.
University of California, Davis
Department of Internal Medicine

The investigators will examine whether NO_2 is more damaging to the rat lung when inhaled as a mixture with ozone than when inhaled alone, and will critically evaluate the relationship between total dose delivered and the rate of delivery of NO_2 and/or ozone as lung toxicants.

Injury in Gas Exchange Units Due to Low Level Nitrogen Dioxide
PI: Robert R. Mercer, Ph.D.
Duke University Medical Center
Department of Medicine

The researchers will study phenomena involved in the progression of chronic low level exposures to airborne pollutants and will provide techniques for the isolation of specific sites within the lung which are most likely to demonstrate changes at low levels of exposure.

Pulmonary Reactive Uptake of Inhaled Toxic Contaminants
PI: Edward M. Postlethwait, Ph.D.
University of Texas Medical Branch
Pulmonary Division

The proposed project is designed to characterize and compare across species (including man) the kinetics of interaction and the predominant substrates involved during the pulmonary airspace absorption of NO_2 and O_3 with the goal of establishing a model for evaluating relative dosimetry. The researchers will delineate the absorption determinants of NO_2 and O_3 within the intact, isolated lung, followed by the determination of the extent to which uptake is localized to within the epithelial lining fluid (ELF).

The Regional Deposition of ETS and its Influence on Radon Dosimetry
PI: J. N. Pritchard, Ph.D.
Harwell Laboratory
Oxfordshire, England

In these studies, the deposition of ETS particles in different regions of the respiratory tract, and the effects of ETS on airborne radioactivity levels and degree of attachment will be measured. Results will be combined in a dose assessment of the effects of ETS on radon dosimetry.

Inflammatory Responses after Indoor Exposure to Airborne Glucan and Endotoxin
PI: Ragnar Rylander, M.D.
University of Gothenburg
Sweden

The investigators will perform an epidemiological study on populations in sick buildings in which the extent of "sick building" symptoms will be evaluated and related to the amount of airborne endotoxin and glucan. Results may explain the origin of symptoms reported and open up a means to control the quality of indoor air.

Genotoxicity of Epoxide-Induced 3-Hydroxyalkyl Uracil
PI: Jerome J. Solomon, Ph.D.
New York University Medical Center
Department of Environmental Medicine

The investigators will test the hypothesis that 3-hydroxyalkyl uracil is the critical premutagenic lesion produced by aliphatic epoxides *in vivo*. The results will address the mechanisms of mutagenesis and cancer induction by alkenes and will permit an evaluation of the suitability of 3-hydroxyalkyl uracil adducts in DNA as markers of exposure to, and genotoxic risk from, alkenes.

New Bioaerosol Sampling Techniques for Indoor Air Environments
PI: Klaus Willeke, Ph.D.
University of Cincinnati Medical Center
Department of Environmental Health

Portable personal and stationary area samplers with the same inlet and aerosol impaction stage will be developed, laboratory-evaluated, and field-tested to permit intercomparison of data on microorganism species identification and quantification of colony forming units.

Neuroendocrine Lung Cancer: Mechanistic Studies
PI: Hanspeter R. Witschi, M.D.
University of California, Davis
Department of Veterinary Medicine

The investigators will analyze oncogene expression in lung cancers induced in hamsters during tumor development and in formed tumors. The understanding of early patterns of gene expression will allow for accurate prediction of ultimate tumor type.

CIAR APPROVED RESEARCH PROJECTS - JANUARY 1990

Indoor Fate and Transformations of Selected Nitrogenous Organic Compounds
PI: Janet Arey, Ph.D.
University of California, Riverside
Statewide Pollution Research Center

The researchers will study the physical chemistry of important nitrogen- containing compounds found in indoor air, including the effect of normal indoor lighting conditions. They will begin to develop a database for indoor air constituents.

Effect of ETS and NO_2 on Respiratory Infection: Murine Model Development

PI: Jerry K. Davis, Ph.D.
University of Alabama, Birmingham
Department of Comparative Medicine

This work will explore how the potential effects of ETS and/or NO_2 alter susceptibility to viral infection. This study will determine the effects of these indoor air constituents on the severity rather than on the incidence of infection.

Mutagenicity of Gas and Particulate Phase Compounds in ETS: Development of an SFE/SFC - Bioassay Analytical Technique

PI: Delbert J. Eatough, Ph.D.
Brigham Young University
Department of Chemistry

The researchers will develop chemical analytical procedures using supercritical fluid extraction and chromatography techniques to separate and identify ETS components with genotoxic properties.

Effects of O_3 and NO_2 on Pulmonary Function & Eicosanoid Metabolism

PI: Albert Gunnison, Ph.D.
New York University Medical Center
Department of Environmental Medicine

The researchers will characterize the effects of ozone and other indoor air pollutants on pulmonary function and lung eicosanoid metabolism. Their new approach may help identify sensitive populations of individuals who are susceptible to low levels of ozone in indoor air environments.

Development of Fast Atom Bombardment Mass Spectral Techniques for the Identification of Unknown Carcinogen-Nucleoside Adducts

PI: Jackson O. Lay, Jr., Ph.D.
University of Arkansas, Little Rock
Department of Chemistry

An analytical strategy using FAB/MS will be developed to determine molecular weights and major fragment ions of unknown carcinogen-nucleoside adducts in human samples. These methods will likely permit DNA adducts to be used as biological dosimeters of exposure to carcinogens in indoor air.

Indoor Aldehydes and Bronchial Hyperreactivity
PI: George D. Leikauf, Ph.D.
University of Cincinnati Medical Center
Department of Environmental Health

The researchers will determine if formaldehyde depresses or inactivates mechanisms by which it induces airway hyperreactivity. The airways are at risk from indoor formaldehyde exposure due to the high aqueous solubility and irritant properties of this compound.

Indoor Biological Agents: Exposures and Responses in Allergy and Asthma
PI: Mary Kay O'Rourke, Ph.D.
University of Arizona College of Medicine
Division of Respiratory Sciences

Building on an established population of 800 individuals representing 300 families which have been defined for purposes of studies of indoor air pollution supported by EPA, this study will take indoor air samples for pollens and other allergens and antigens to be identified by immunologic tests and compare them with respiratory symptomatology determined by questionnaire, illness, and respiratory dysfunction.

Does ETS Promote Arteriosclerosis or Act as a Co-Atherogen?
PI: Arthur Penn, Ph.D.
New York University Medical Center
Department of Environmental Medicine

The objective of the proposed study is to determine whether chronic inhalation of ETS leads to accelerated arteriosclerotic plaque development. The researchers will determine if exposure of cockerels to ETS components results in activation of dominant transforming genes.

Effects of ETS on Prenatal and Perinatal Lung Development
PI: Kent E. Pinkerton, Ph.D.
University of California, Davis
Department of Veterinary Anatomy

The investigators will determine whether or not exposure to ETS adversely effects lung development in rats. The three major phases of lung development through embryogenesis to the attainment of a mature lung by three or four months of age will be assessed.

The Fate of Nicotine During "Aging" of Environmental Tobacco Smoke
PI: J. N. Pritchard, Ph.D.
Harwell Laboratory, Atomic Energy Authority
Oxford, England

The proposed study will investigate the mechanisms by which nicotine is removed from the indoor environment. The work will distinguish between chemical reaction and physical adsorption as removal mechanisms.

CURRENT ONGOING RESEARCH PROJECTS

Cabin Air Quality in Commercial Flights
PI: Delbert J. Eatough, Ph.D.
Brigham Young University

The object of this work is to determine cabin air quality during commercial passenger flights. The study is designed to determine the extent to which environmental tobacco smoke penetrates into the non-smoking section of the aircraft, the changes in concentration of ETS and other cabin constituents as a function of time and ventilation conditions, and other environmental constituents and conditions which may be related to passenger comfort during the flight.

Building Ventilation and Smoking Policy Effects on Indoor Air Quality and Employee Comfort and Health
PI: Alan Hedge, Ph.D.
Cornell University
Department of Design & Environmental Analysis

The objectives of this work are to determine the extent to which ETS is related to the perception of comfort and health of office workers in office buildings, the extent to which different smoking policies and ventilation conditions impact on indoor air quality in office buildings, and the extent to which differences in perceived comfort and health of office workers are related to smoking policies and ventilation conditions in office buildings.

The Pulmonary Effects of ETS Exposure on Asthmatic Subjects
PI: Samuel B. Lehrer, Ph.D.
Tulane University Medical Center

The researchers will characterize pulmonary reactions to ETS and analyze the underlying mechanisms of this response. "Smoke-sensitive" and "smoke-tolerant" asthmatics as well as normal individuals will be studied to assess the specificity of ETS induced lung function changes.

Role of Foliage Plants in Indoor Pollution Control
PI: Gray Robertson, Ph.D., HBI, Inc.
B. C. Wolverton, Ph.D., NASA

The researchers will complete a number of indoor air quality studies specifically focusing on the capability of diverse foliage plants to absorb specified indoor pollutants (CO, CO_2, RSP, nicotine, microbes, and VOCs) from their environment.

APPLIED STUDIES

Indoor Air Quality in Public Schools
Allen C. Abend, Chief
School Facilities Office
Maryland State Department of Education

Scope of Work: To develop technical information now needed to define design standards and maintenance procedures in school systems in the form of technical bulletins for use by school systems in Maryland and nationwide. Topics would include the design of ventilation systems for designated tobacco smoking areas in schools, and the design and maintenance of local exhaust systems for elementary and secondary schools.

Development of Enhanced Indoor Air Quality Models
Gerald E. Anderson
Systems Applications Inc.

Scope of Work: To develop a comprehensive plan for achieving attainable indoor air modeling performance goals. This work represents a first step in the provision of improved tools for computational studies of health risks from polluted indoor environments.

Monograph on the Chemistry of Environmental Tobacco Smoke
Michael R. Guerin, Ph.D.
Oak Ridge National Laboratory

Scope of Work: To prepare a publishable monograph describing what is currently known about the physical and chemical properties of ETS. The relationship between various constituents of ETS and between constituents from tobacco smoking and other sources are a central theme of the monograph.

Comparison of a Personal and Area Monitor for the Measurement of Ambient Nicotine
Roger A. Jenkins, Ph.D.
Oak Ridge National Laboratory

Scope of Work: To determine the reliability of area sampling as a predictor of personal exposure to ETS. ETS exposure is unique because the sources of exposure are multiple, intermittent, and mobile. A specific purpose of the work is to compare the results obtained using a portable area sampling system with those using a personal sampler.

Efficient Laboratory Experiments for Testing the Mutagenicity of Components of Indoor Ambient Air
Marvin A. Kastenbaum, Ph.D.
Statistical Consultant
K. O. Bowman, Ph.D.
Oak Ridge National Laboratory

Scope of Work: To develop statistical tables which allow investigators measuring the mutagenicity of indoor air components to optimize the number of repeats of experiments for wide degrees of significance.

Perception of ETS: A Visual or Sensory Response?
D. J. Moschandreas, Ph.D.
S. M. Relwani, M.S.
IIT Research Institute

Scope of Work: To determine whether reaction to environmental tobacco smoke is initiated by visual contact with or by perception of odors from cigarette smoke, or by synergistic action of the two factors.

Indoor Air Quality in General Office Areas
Gray Robertson, Ph.D.
HBI, Inc.

Scope of Work: To complete a number of indoor air quality studies focusing on the ETS present in typical office environments. An evaluation of the data will be provided in addition to the quarterly reports on ETS constituent concentrations measured.

Air Quality in Passenger Cabins of DC-9 and MD-80 Aircraft
Torbjorn Malmfors, M.D., Ph.D.
Karolinska Institute
Stockholm, Sweden
J.F. van der Wal
TNO Division of Technology for Society
Department of Indoor Environment
The Netherlands

Scope of Work: To study the air quality in aircraft passenger cabins of DC-9 and MD-80 aircraft on 48 Scandinavian Airline System flights. Measurement of temperature, relative humidity, and concentrations of respirable suspended particles, nicotine, carbon monoxide, and carbon dioxide were performed with the use of portable air sampling briefcases.

Investigation of Factors Influencing Air Quality on Aircraft: Modeling and Data Analysis
P. Barry Ryan, Ph.D.
Harvard School of Public Health

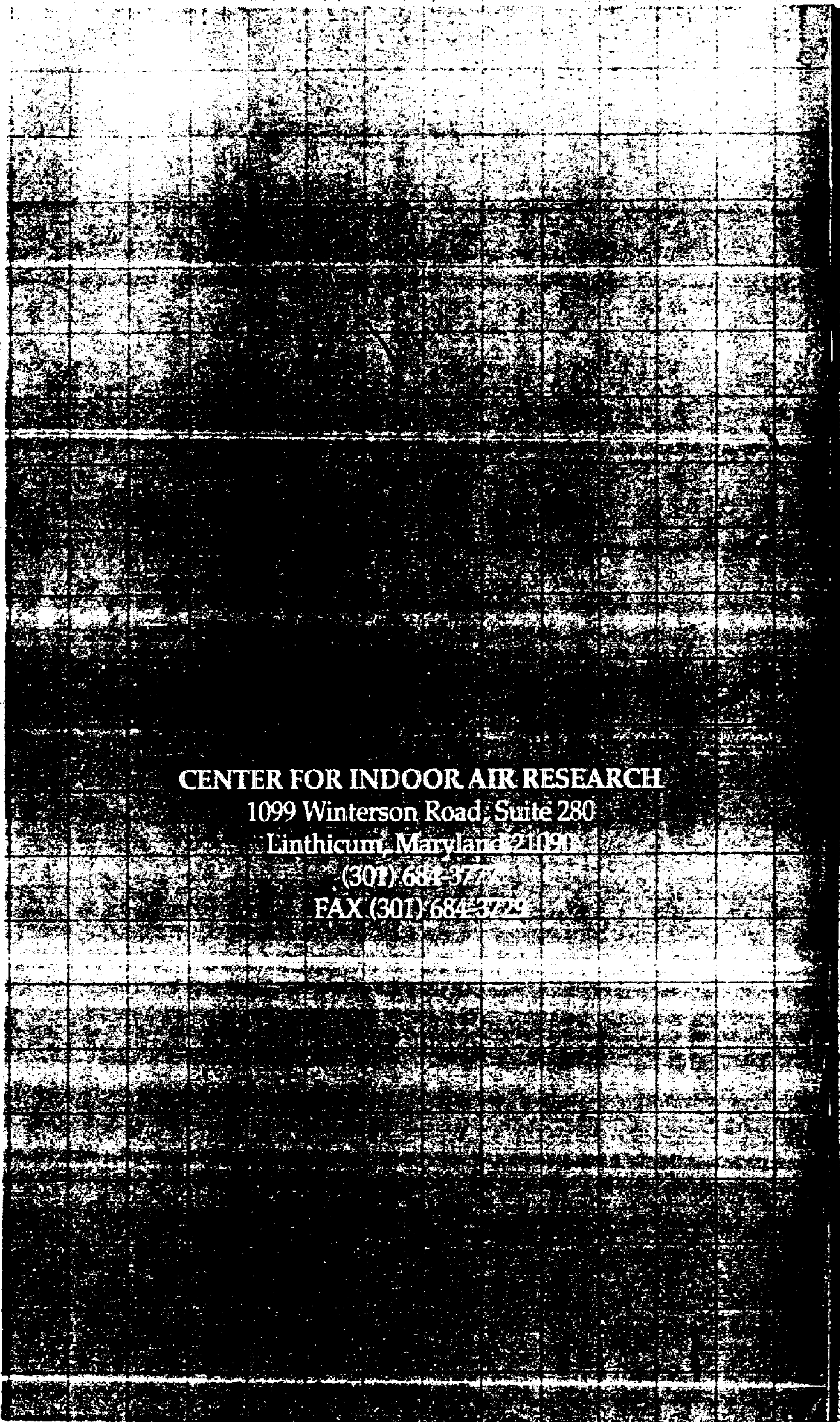
Scope of Work: To analyze data collected on approximately 48 commercial air flights (Scandinavian Airline System) and to modify an existing model of cabin air quality to afford a more "user-friendly" presentation. Model modification will allow the use of the data collected to validate the system.

Investigations of Ozone Reactive Chemistry in Indoor Environments
P. Barry Ryan, Ph.D.
Harvard School of Public Health

Scope of Work: To develop modeling systems for ozone in indoor environments. The investigators will establish the importance of the contribution of chemical reactivity to human exposures in indoor environments through the use of data on ozone deposition velocities with indoor materials in chamber studies, and evaluation of pollutant concentrations in residences.

Evaluation of Effectiveness of Portable Indoor Air Cleaning Systems
Richard L. Shaughnessy, Ph.D.
University of Tulsa

Scope of Work: To evaluate the effectiveness of selected console-type portable air cleaners by measuring the clean air delivery rate (CADR) in removal of the following parameters: dust particulate matter, tobacco smoke, pollen, viable and total fungal spores, and gaseous contaminants (specifically carbon monoxide, nitrogen dioxide, nicotine and formaldehyde). Chamber studies will be conducted in accordance with a modified version of the Association of Home Appliance Manufacturers (AHAM) test procedures and will be followed by sensory perception studies.



CENTER FOR INDOOR AIR RESEARCH
1099 Winterson Road, Suite 280
Linthicum, Maryland 21090
(301) 684-3777
FAX (301) 684-3729