

against the thermophilic actinomyces in all patients, but positive against *Aspergillus glaucus* in six. Nine patients had allergic alveolitis on biopsy.

Because crops are dry in Manitoba (annual rainfall 535 mm) and stored cold (average January temperature -18°C), it is probable that thermophilic actinomyces do not grow often in the hay. Instead, *Aspergillus* species grow, and the daily exposure of a dairy farmer to them in an enclosed space (the barns are closed for warmth) produces this variant of farmer's lung in Manitoba.

Inhibition of Erythrocyte Acetylcholinesterase by Isocyanates — M. Dewair, Ph.D., X. Baur, M.D., Pulmonary Section, Medical Clinic I, Klinikum Grosshadern, University of Munich, Munich, Fed. Rep. of Germany.

Isocyanates are highly reactive chemical substances now widely used in industry. One hundred forty-one isocyanate workers suffering from asthma or bronchitis in connection with exposure to isocyanate vapors were investigated at our clinic. In only 22 of these patients, could the diseases be explained on immunological bases since isocyanate specific IgE antibodies could be detected in their sera. Therefore, other mechanisms must be involved in the pathological effects of isocyanates. To explore the possible pharmacological bases of isocyanate-induced asthma, the effect of aromatic and aliphatic isocyanates on human acetylcholinesterase activity was investigated in vitro. All isocyanates tested were found to be potent inhibitors of this enzyme. As much as 90% inhibition was caused by submicromolar concentrations of these compounds, with inhibition seemingly irreversible. The inhibited enzyme undergoes slow, limited, spontaneous reactivation. It is concluded that small, seemingly sub-toxic doses of isocyanates can build up causing pharmacologically-mediated hypersensitivity reactions.

Diagnosis of Occupational Asthma — Frederick E. Hargreave, M.D., Associate Professor of Medicine, Firestone Regional Chest & Allergy Unit, St. Joseph's Hospital, McMaster University, Hamilton, Ont., Canada. — No Abstract Received.

April 30

Friday — 8:30 to 12:00 Noon
CONCURRENT SESSION No. 13 — Essex

Medical Care at Sea

The Seafarer As a Patient — Christfried J. Urner, M.D., Medical Director, Lykes Bros. Steamship Co., Inc., New Orleans, La.

Seafarers are subject to the same illnesses as land based personnel. Their working and living environment is confined, unstable, and in areas of rapid changes in time, weather and climate. The response to problems by patients and medical providers varies in many respects from those seen with similar illness ashore. Aspects of this will be examined.

Treatment of Acute Medical Emergencies — William R. Anderson, M.D., Anderson-Benell-Croft Medical Group, Inc., San Pedro, Calif.

A discussion of the most frequent emergencies occurring aboard ship at sea. Discussion will also focus on present and proposed methods of communication for medical emergencies at sea, inherent dangers involved in air-sea rescue, ship diversion as a means to expedite medical care, renewed efforts to train ship's officers in paramedic type training, upgrading and standardization of ship board medical supplies and equipment, and the importance of prevention of emergencies by better selection of seamen for offshore employment.

The Delivery Patterns of Medical Care to Seafarers — Bernard

R. Blais, M.D., Fleet Surgeon, Department of the Navy, Washington, D.C. — No Abstract Received.

Friday — 8:30 to 12:00 Noon
CONCURRENT SESSION No. 14 — Cinema I

Occupational Carcinogens

Chrysotile Exposure, Smoking and Mortality — F. Douglas K. Liddell, Ph.D., Professor, Department of Epidemiology and Health, McGill University, Montreal, Que., Canada.

Since 1966, a cohort of more than 11,000 past and present employees of the Quebec Chrysotile production industry has been studied with the objective of defining relationships between exposure and response in terms of mortality. The most revealing analysis has used a case-referent approach, using a small, fixed number of referents for each death from causes of specific interest, i.e., pneumoconiosis, respiratory malignancies and abdominal malignancies. Exposures, as reported in most publications to-date, have been in terms of dust particle measurements. Main mortality findings in relation to fibre concentration will be presented. The difficulties of the investigation and how they have been overcome will be emphasized, as well as the basic findings.

Lung Cancer in Foundries — Edward S. Gibson, M.D., Director, Occupational and Environmental Health, DOFASCO, Inc., Hamilton, Ont., Canada.

Certain foundry trades, have been associated with an excess risk for lung cancer for many years. Only in the past few years have epidemiological studies been used to attempt to clarify the situation. Four studies tend to support this finding; one study, part of a much larger study, does not.

Casual agents have not been identified, but polycyclic aromatic hydrocarbons emitted in moulding are generally blamed.

The epidemiological evidence for the association of lung cancer with foundry work will be reviewed.

Results of work done at DOFASCO using the Ames test to identify mutagenic activity in the foundry atmosphere will be described. Levels of mutagenic activity correlate with the differences in risk between the foundry trade groups will be studied.

Ongoing work in testing for chromosomal aberrations, urine mutagenicity, chemical identification of carcinogens, and the examination of the role of particulate matter as a carrier of carcinogenic material will be described.

What Proportion of Cancer is Occupational in Origin? — Alan C. Chovil, M.B., Associate Professor, Department of Preventive Medicine & Community Health, School of Medicine, University of South Carolina, Columbia, S.C.

Occupational cancer is defined as "any cancer that would not have developed in the absence of some defined occupational exposure." The background of the present state of knowledge of identified cancer is reviewed, and the development of the controversy over what proportion of all cancer this represents is discussed. It is suggested that most occupational cancers come from relatively small identified sources. Data from the Workmen's Compensation Board of Ontario is presented to suggest that occupational causes only contribute to about 1% of cancer deaths.

Review of Nickel Toxicology — A.G. Cecutti, Medical Director, Falconbridge Nickel Mines Limited, Canadian Nickel Division — Sudbury Operations, Falconbridge, Ont., Canada.

Nickel carbonyl poisoning and nickel dermatitis have long been known. The main emphasis of this paper will be on the recent interest in nickel carcinogenesis. NIOSH has estimated that 250,000 workers in the United States are exposed to inorganic nickel.

Numerous animal studies have clearly identified the carcinogenic activity of nickel. More recently, epidemiological and in vitro studies indicate that the so-called insoluble nickel compounds are much more active biologically. Nickel analysis in biological tissue has been refined so that small differences in the environment are demonstrated in blood and urine.

Aside from nickel carbonyl poisoning, there is no dose response relationship between biological levels of nickel and specific clinical manifestations of disease. Confounding the issue is the relationship between total body burden of nickel and serum levels, and further, no firm correlation exists at the moment between environmental monitoring and biological monitoring of insoluble nickel compounds.

Mortality in Ontario Nickel Workers — Robin S. Roberts, M. Tech., Associate Professor, McMaster University, Department of Epidemiology and Biostatistics, Hamilton, Ont., Canada.

This presentation will describe the design and major findings of a large mortality study of Ontario nickel workers. The research design is a conventional historical prospective approach with mortality over a 27 year period ascertained through linkage with the Canadian National Mortality Data Base of death certificates. An analysis of cause-specific standardized mortality ratios will be presented by major occupational subgroups within the work force (miners, millers, furnace workers, etc.) and concentrate on various respiratory cancers and kidney cancer. Finally, the presentation will investigate the occurrence of unusual patterns of cancer mortality in other sites in what might be described as a "controlled scientific fishing expedition."

Carcinogenicity of Roofing Asphalt Fumes — Richard W. Nemeier, Ph.D., Chief, Acute and Subchronic Toxicology Section, Division of Biomedical and Behavioral Science, National Institute for Occupational Safety and Health, CDC, Cincinnati, Ohio.

The tumorigenicity to mouse skin of condensed volatile components of roofing asphalts was investigated in an 18-month experiment. The factorial design included 16 groups of 50 mice each and the experimental variables were: two strains of male mice (CD-1 and C3H/HeJ); two initial roofing asphalts; two temperatures of generation of volatile fume materials (232° and 316°C); and exposure to simulated sunlight vs. the absence thereof. Dermal application of the condensed volatiles and light was performed twice weekly. Benzo(a)pyrene, solvent and sunlight were used as controls.

The following observations were made: all condensed asphalt fume samples were tumorigenic; higher temperature of preparation increased tumorigenicity; C3H/HeJ strain was much more sensitive than the CD-1 strain; sunlight slowed the appearance rate of tumors; conversion ratios of tumor types, i.e., from benign to malignant, were high for the C3H/HeJ groups (~60%) and much lower for the CD-1 groups (~8%).

Friday — 8:30 to 12:00 Noon
CONCURRENT SESSION No. 15 — Cinema II

Occupational and Environmental Toxicology

The Fertility of Workers Exposed to Dinitrotoluene and Toluene Diamine — Richard J. Levine, M.D., Chief of Epidemiology, Chemical Industry Institute of Toxicology (CIIT), Research Triangle Park, N.C.

From studies of laboratory animals little has been learned of the potential for toluene diamine to affect reproduction. On the other hand, animal studies have shown that dinitrotoluene has the capacity to impair spermatogenesis and cause testicular atrophy in rodents and dogs. To determine whether these chemicals may affect human reproduction under usual conditions of exposure, question-

naire-based epidemiologic studies were conducted at five chemical plants.

Polychlorinated Biphenyls (PCBs) — Update 1982 — Kenneth H. Chase, M.D., Washington Occupational Health Associates, Inc., Washington, D.C.

Diverse worker groups, as well as private citizens, have risked exposure to polychlorinated biphenyls (PCBs) in a variety of settings over recent decades. The circumstances under which opportunity for such exposure has occurred will be discussed, along with the results of recent clinical and epidemiologic studies addressing the consequences of such exposure. Emphasis will be placed on those investigations attempting to demonstrate the presence of chronic toxicity, including carcinogenic and reproductive effects, resulting from exposure to PCBs as well as dioxins and dibenzofurans which are found both as trace contaminants as well as in the pyrolysis products of PCBs.

The likelihood of future exposure incidents will be discussed along with the feasibility of several newly developed methods for disposal of PCBs.

Nutritional Modulation of Environmental Toxins — Ibrahim Farid, M.D., Assistant Professor, Department of Preventive Medicine and Community Health, University of Illinois, Chicago, Ill.

Population groups with high levels of exposure to toxic chemicals (such as industrial workers) may be candidates for nutritional assessment and modification as a protective measure in the work environment. Although frequently the mechanism of action has not been well elucidated, there are instances in which available evidence suggests certain nutrients can afford protection against toxicity. Examples of these include: reduced absorption of lead by calcium and zinc; inhibition of methanol toxicity by folate and reduction of hazards caused by ingestion of nitrite-containing food by ascorbate. Many hepatotoxins at chronic low exposure levels may not cause early detectable alteration (by routine screening methods) of hepatic function while affecting absorption, storage and metabolism of micronutrients such as folate, and other B vitamins, zinc and vitamin A as suggested by available evidence. There are dietary factors present in the edible cruciferous plants that were shown to inhibit carcinogenesis by polycyclic hydrocarbons in experimental animals.

This paper reviews proposed mechanisms of action of some dietary factors as modulators of toxic chemicals and the potential value of their use in preventing work hazards.

Subjective and Objective Measures of the Health of Lead Smelter Workers Compared with Their Serial Blood Lead Levels and with a Control Group — Gordon J. Stopps, M.B., Acting Director & Associate Professor, Occupational & Environmental Health Unit, University of Toronto, Toronto, Ont., Canada — No Abstract Received.

Industrial Aspects of Ophthalmic Toxicology — Bryan Ballantyne, M.D., Corporate Director of Applied Toxicology, Union Carbide Corporation, South Charleston, W.V.

Industrial chemicals may produce structural and functional injury of the eye by direct contamination of hematogenous dissemination of material or its reactive metabolite(s). Many materials of comparatively high toxicity can be absorbed across conjunctival blood vessels producing systemic effects. This presentation will discuss the nature of chemically-induced, adverse effects on the eye, methods for determining the potential for eye injury, and the relevance of ophthalmic toxicology to assessment of workplace hazards.

Reproductive Toxicity of the Glycol Ethers — Bryan D. Hardin,