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DIVISION OF CHEMICAL HEALTH AND SAFETY

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L.J. Doemeny, Chairman
D.B. Walters, Secretary

MONDAY MORNING AND AFTERNOON - SYMPOSIUM ON THE LITERATURE OF LAB SAFETY AND HEALTH - M.E. GREEN, Presiding

1. HEALTH AND SAFETY LITERATURE — WHO REALLY CARES? Howard H. Fawcett, Fawcett Consultations, 12920 Matey Road, Wheaton, MD 20906

Health and safety literature will be reviewed with respect to three types of users:

1. the prophylatic user -- who wonders how accidents and health risks may be controlled or prevented before the fact;
2. the postmortem user -- who wants to know what happened after the fact;
3. the optimistic user -- who, in spite of numerous "horror stories" still believes chemical and other materials can be synthesized, handled, transported, reacted, and disposed of safely, for the benefit of mankind.

The above review will be seen in the context of "cost-effective" or "benefit-risk" analyses, dictated by the current economic considerations.

2. WHAT SHOULD A LAB SAFETY BOOK ACCOMPLISH? J. Bretherick, S P Research Center Sunbury on Thames Middlesex TW16 7LN England

Chemical safety books need three attributes to be of real use to chemists and their managers. First, they must persuade all levels of management and laboratory workers that sound safety practices are an essential and integral part of effective technical operations. Second, they must provide well presented information relevant to the wide range of chemicals and experimental techniques now encountered in the laboratory.

Third, they must provide references to further sources of more detailed information necessary to develop this general attitude into a higher level of understanding wherever possible.

User response to previous editions has played a part in shaping the new third edition of the Royal Society of Chemistry's HAZARDS IN THE CHEMICAL LABORATORY, and the author looks forward to suggestions for further improvements.

3. PRUDENT PRACTICES FOR HANDLING HAZARDOUS CHEMICALS IN LABORATORIES. Blaine C. McKusick. Haskell Laboratory for Toxicology and Industrial Medicine, Du Pont Co., Wilmington, DE 19898.

A National Research Council (NRC) Committee recently issued a report of the above title. The report was prepared in response to chemists' concern about long-term toxicities of many chemicals used in research laboratories. It provides guidelines for safe handling and disposal of hazardous chemicals in laboratories. It discusses the full range of chemical hazards, including risks from fire, explosion, acute toxicity, and chronic toxicity (e.g., carcinogenicity).

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- WEDNESDAY MORNING AND AFTERNOON - SYMPOSIUM ON CHEMICAL HEALTH AND SAFETY, ESPECIALLY IN THE ACADEMIC LABORATORY - ORGANIZED BY DIVISION OF CHEMICAL EDUCATION, INC., JOINT WITH DIVISION OF SMALL CHEMICAL BUSINESSES - ABSTRACTS IN SECTION CHED

- WEDNESDAY AFTERNOON - SYMPOSIUM ON EPIDEMIOLOGY: 2 - SPECIFIC STUDIES AND CONCLUSIONS - H.H. FAWCETT, Presiding

36. A Retrospective COHORT STUDY OF MORBIDITY AND MORTALITY AMONG CHEMISTS. Shelia K. Hoar. National Cancer Institute, Landow Building, Room 3C07, Bethesda, MD 20205.

This retrospective cohort study examines morbidity and mortality among 3686 men who were employed as chemists in 1959. During 1964-1977, the chemists experienced lower overall mortality than other salaried employees of the chemical company (198 observed, 241.0 expected, SMR=82). A large deficit is seen in lung cancer and arteriosclerotic heart disease deaths. The chemists appear to be at slightly higher risk for death from malignancies of the colon (12 observed, 6.7 expected, SMR=178) and cerebrovascular disease (15 observed, 10.8 expected, SMR=138). The low overall mortality resulted in a larger than expected proportion of deaths due to cancer. Fewer than expected cases were diagnosed of cancer of all sites combined (61 observed, 86.5 expected, SIR=71) and of the lung (8 observed, 20.0 expected, SIR=40). The incident of melanoma and cancer of the prostate is slightly higher than expected, relative to the Third National Cancer Survey and the nonchemists, respectively. All disabilities of eight days or more were also examined. Associations between cause of illness and department group are presented. Possible explanations for the lack of anticipated excess risks and for the observed deficits are discussed.

37. Accidental environmental contamination with 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Seveso, Italy. Epidemiologic strategy for evaluation of potential adverse effects in the human population. Ruth Lilis, M.D. and Irving J. Selikoff, M.D.. Environmental Sciences Laboratory, Mount Sinai Medical Center, New York, New York 10029

The manufacture of trichlorophenol (TCP) in a chemical plant in Seveso, Italy was based on the treatment of 1,2,4,5-tetrachlorobenzene with NA OH, and that of the resulting sodium trichlorophenate with HCL, yielding TCP. An accident (uncontrolled exothermic process) occurred in July 1976, and resulted in the dissemination of the contaminant 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in the environment. Adverse effects on vegetation and animal life were soon observed, followed by the development of chloracne predominantly in children and y oung adults. The multi-organ toxic effects of TCDD are known from previous such industrial accidents and from extensive experimental studies; the marked toxicity and the potential carcinogenic and teratogenic effects prompted special efforts for multifaceted clinical and laboratory investigations of the exposed population. Liver function, neurologic status, lipid metabolism, immunologic status, glucaric acid excretion (an indicator of mixed function oxidase system enzymes induction) have received special attention. Monitoring for congenital malformations, spontaneous abortions, mortality patterns (including Cancer Registry) was also undertaken and is in progress.

38. A CASE/CONTROL EPIDEMIOLOGIC STUDY ON THE RELATIONSHIP BETWEEN THE HERBICIDE 2,4-D and SPONTANEOUS ABORTION. D. Carmelli, SRI International, 333 Ravenswood Ave.,Menlo Park, CA 94025, and R.W.Morgan, Environmental Health Associates, Inc., 2150 Shattuck Ave.,Berkeley, CA 94703.

The possible association of the herbicide 2,4-D with human spontaneous abortion was examined by means of a two-stage case-control study. In the first stage a base population in which approximately half of the males are exposed to 2,4-D in the course of their work was identified via a brief postal questionnaire sent out to members of agricultural associations and employees of various industries. From this population,a subsample of 134 cases defined as women reporting a miscarriage since 1/1/78 and 311 controls (most recent live birth) were selected for fur-

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ther investigations through an extensive telephone interview addressed to both husband and wife. Exposure to the herbicide, at work and at home around conception date and over the whole study period were each tested for a possible increased risk of spontaneous abortions during the study time period. In the course of the investigations we controlled: age and education of husband and wife, conception month and source list (type of occupational exposure). The association to cigarette smoking and the use of legal and illegal drugs were considered. No association between spontaneous abortions and husband or wife exposure categories for the total sample was found, but increased risk was noted in the forest group.

39. LONG TERM STATUS OF WORKERS PREVIOUSLY EXPOSED TO 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN THE MANUFACTURE OF 2,4,5-T. Marion Moses, Ruth Lilis and Irving J. Selikoff. Environmental Sciences Laboratory, Mount Sinai Medical Center, New York, New York 10029

In 1949 workers at a Monsanto Chemical Company plant had chloracne and/or serious systemic illness related to exposure to 2,3,7,8-TCDD from a reactor accident where trichlorophenol was being made for 2,4,5-T production. Chloracne continued to be a problem at this plant as long as the herbicide was manufactured there, from 1948 to 1969. In 1979 a health survey of active and retired workers at this plant was conducted. Residual chloracne was found at the time of examination in 71 (31%) of the workers surveyed. An additional 45 (20%) had a history of chloracne in the past. In approximately 50% of the workers with current or past chloracne, the condition had persisted for more than 20 years. A relationship was found between chloracne and elevated triglycerides, as well as abnormalities in some liver function tests. Heavy exposure to 2,4,5-T was found to be associated with liver function abnormalities. Additional findings from the continuing analysis will also be presented.

THURSDAY MORNING - SYMPOSIUM ON EPIDEMIOLOGY: 3 - METHODOLOGY - S. KAPLAN, Presiding

40. EPIDEMIOLOGY: BASIC CONCEPTS. Ralph R. Cook, M.D., Dow Chemical U.S.A., Director of Epidemiology, 1803 Building, Midland, Michigan 48640

Epidemiology is etiologic research. In the course of obtaining meaningful associations between chemicals and human disease, the epidemiologist must grapple with five basic concepts: selection, misclassification, confounding, chance, and causation. The validity of any particular study depends on how well the investigator has managed these issues. Improper selection of study subjects or controls, inconsistent classification of disease state or exposure, failure to adjust for other causes of disease, inappropriate or excessive reliance on statistical techniques, and ignorance of the epidemiologic rules of causation can have profound effects on risk estimates and the resultant interpretations. In the past, the errors inherent to this observational science were thought to produce underestimates of risk. This fallacy has even been incorporated into government policy. It is now known that overestimates also can commonly be generated. The five concepts and their influence on relative risks are discussed through a series of simple numerical examples. Emphasis is placed on nondifferential and differential misclassification.

41. EPIDEMIOLOGIC METHODS IN INDUSTRY: A COMPARISON. Robert W. Morgan, M.D., 2150 Shattuck Ave., Suite 414, Berkeley, CA 94704

The measurement of health, and health effects due to employment or environmental exposure offers considerable challenge to industry, which frequently turns to the epidemiologist for a solution. The presentation will summarize the research methods available, with the strengths and weaknesses of each, especially applied to occupational situations, and indications and countraindications for common types of studies. Examples will illustrate the major pitfalls to avoid. These will be a brief discussion of statistical power and its relationship to negative epidemiologic studies, especially as they concern regulatory agencies.

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42. OCCUPATIONAL EPIDEMIOLOGY. C. P. Wen and S. P. Tsai, Gulf Science and Technology, P.O.Box 2100, Houston, TX 77001

Epidemiology is the study of the distribution and the determinants of disease or physiological condition in human population. The epidemiologist is interested in the occurrence of disease by time, place, and persons.

Occupational epidemiology is a discipline of quantitative health risk assessment of workers by integrating and statistically treating medical, personnel, safety, industrial hygiene, toxicology, process engineering and community information.

Five major types of epidemiological programs will be described as an example of an occupational epidemiology. They are: 1) prospective epidemiology; 2) retrospective epidemiology; 3) clinical epidemiology; 4) reproductive epidemiology; and 5) applied epidemiology.

Retrospective epidemiology on mortality will be described in more detail and statistics such as Standardized Mortality Ratio (SMR), Proportional Mortality Ratio (PMR), relative and attributable risk will be discussed.

43. STUDY METHODOLOGY IN OCCUPATIONAL EPIDEMIOLOGY. William R. Gaffey, Monsanto, 800 N. Lindbergh Blvd., G2WE, St. Louis, MO 63166

Although the acute effects of occupational exposure should not be ignored, chronic effects following long latent periods tend to be more serious, and more difficult to measure. Chronic effects can manifest themselves at any point on the health spectrum from asymptomatic anomalies to death. For reasons of expediency, epidemiologic studies of chronic disease in employed populations tend at the present time to study mortality. The most common type of mortality study is the cohort follow-up study, in which a living population exposed several decades ago is identified and followed to the present time. The numbers of deaths by cause which occur are compared to the numbers which would be expected in a comparable unexposed population. A second common methodology is the proportional mortality study, which looks only at the deaths in an exposed population. The percentages of deaths due to various causes are compared with the percentages to be expected in a similar sample of deaths in the general population. Both study designs present problems of interpretation. Examples of each will be discussed to illustrate these problems, which include the healthy worker effect, the survivor effect, and others.

● THURSDAY MORNING AND AFTERNOON - JOINT SYMPOSIUM ON TRANSPORTATION OF RADIOACTIVE MATERIALS - ORGANIZED BY DIVISION OF NUCLEAR CHEMICAL AND TECHNOLOGY - ABSTRACTS IN SECTION NUCL

● THURSDAY AFTERNOON - SYMPOSIUM ON EPIDEMIOLOGY: 4 - PROSPECT AND OUTLOOK - H.H. FAWCETT, Presiding

44. OCCUPATIONAL DISEASE AWARENESS = THE TEACHING OF OCCUPATIONAL MEDICINE IN BRITISH AND IRISH MEDICAL SCHOOLS. Ralph W. Fawcett, M.D.PhD, The National University of Ireland, Galway (U.S. Address, 12920 Matey Road, Wheaton, MD 20906)

Since 1775, when the relation between occupational cancer was correlated with exposures of chimney sweeps, physicians in the British Isles have been actively concerned with the effect of occupational environments on health. Currently, the interests encompass a wide spectrum from the blast furnaces and chemical plants to agriculture with corresponding variations in patterns of disease. Both industrial and agricultural occupational diseases are taught in all medical school courses, commonly titled "Social and Preventive Medicine", with some emphasis on locally prevelent diseases and treatment. A brief survey of such courses will be given. A discussion of the requirements for specialization in occupational medicine will follow. The role of the occupational physicians and the relation to epidemiology will be briefly discussed.

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45. EPIDEMIOLOGY OF REFINERY WORKERS WITH BENZENE EXPOSURES. C.P.Wen and S.P. Tsai, M.D.s, Gulf Science and Technology Company, P.O.Box 2100, Houston, TX 77001.

Health effects of workers with chronic benzene exposures in a refinery are described. A retrospective cohort study examines the mortality experience of benzene workers (N=443) in the period 1952 to 1976 to determine if they experienced unusual death rates for specific causes indicative of exposure to benzene in the work environment. Standardized mortality ratios (SMR's) for all causes of death using the comparable US male populations as a reference population showed that benzene workers in this refinery experienced more favorable mortality than the comparable US population. Any SMR's below 100 indicate more favorable mortality. The SMR's for all causes of death were 43 for white males and 38 for non-white males. No deaths from leukemia were observed nor were deaths from any specific cancer site in statistical excess. A medical surveillance system on these benzene workers is also described with emphasis on the evaluation of 21 years of collection of hematology and blood chemistry data. There were no specific effects observed from chronic exposure to benzene. The relevance of proposed regulatory criteria to monitor blood results is discussed.

46. THE CONFUSED EPIDEMIOLOGY OF PCBs. William R. Gaffey. Monsanto. 800 N. Lindbergh Blvd., G2WE, St. Louis, MO 63166.

Polychlorinated biphenyls are a class of substances once widely used in applications requiring thermal stability, low vapor pressure and insulating properties. In 1968, about 1000 people in Japan became acutely ill from eating rice oil heavily contaminated with PCBs. Subsequently it was found that PCBs were ubiquitous in the environment. Production of PCBs in the United States ceased in the 1970's, but concern for the long term effects of PCBs continues, as does their presence in the environment. Because rat feeding studies in 1975 suggested that PCBs might cause liver cancer, several epidemiologic studies of exposed populations were carried out. Those which examined morbidity in living populations generally found no effects other than (in some studies) some cases of mild liver dysfunction. Three cohort studies of long term mortality in occupationally exposed populations were carried out. Although each of them found some excess mortality from some causes, they have in common the fact that (a) they do not agree with each other and (b) they do not confirm the rat feeding studies. The interpretation of these mortality studies will be discussed in the light of the criteria established by the International Agency for Research on Cancer for establishing occupational carcinogenesis.

47. HEALTH STATUS OF CAPICITOR AND TRANSFORMER MANUFACTURING WORKERS WITH LONG TERM EXPOSURE TO PCBs. Alf Fischbein, Mary S. Wolff, John Thornton, Ruth Lilis and Irving J. Selikoff, Environmental Sciences Laboratory, Mount Sinai Medical Center, New York, New York 10029

In order to evaluate the health effects from occupational exposure to PCBs, a clinical survey was conducted of 326 workers employed in a capitor and transformer manufacturing facility where PCBs had been used since the 1940s. Aroclor 1016 and, to a minor degree Aroclor 1221 had replaced the higher chlorinated PCBs for two years prior to this study. Forty percent of the workers, half of whom were females, had been employed for 20 years or longer. Mean plasma concentrations of higher (Aroclor 1254) and lower (Aroclor 1242) congeners of PCBs were 124 ppb and 48 ppb respectively. Despite high plasma concentrations of PCBs, which correlated well with intensity of exposure, there was a paucity of clinical and laboratory abnormalities. However, there was a high prevalence of abnormal dermatological findings, including chloracne (6%) and conjunctival and palpebral abnormalities (16%). Association was found between dermatological abnormalities and plasma levels of higher congeners of PCBs. A similar relationship was demonstrated between higher congeners of PCBs and serum triglyceride levels. No evidence of porphyria or peripheral nerve dysfunction was found in a subgroup of this population. The absence of significant clinical disease is of interest when compared to the clinical syndrome of human PCB poisoning described as Yusho. Our findings give credence to the hypothesis that clinical effects ascribed to PCBs, may in part reflect a higher disease inducing potential of contaminants such as dibenzofurans.

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