

AN EXPOSURE-RESPONSE ANALYSIS OF CANCER MORTALITY AMONG A COHORT OF WORKERS EXPOSED TO ETHYLENE OXIDE

L. Stayner, K. Steenland, A. Greife, R. Hornung, R. Hayes,
S. Nowlin, J. Morawetz, V. Ringenburt, L. Elliot, W. Halperin

National Institute for Occupational Safety and Health (NIOSH),
4676 Columbia Parkway, C-15, Cincinnati, Ohio

Ethylene Oxide (EtO) is widely used in the production of chemicals, and in the sterilization of medical devices and pharmaceuticals. An excess in leukemia, lymphoma and other cancers has been observed in experimental studies of animals exposed to EtO. Excess leukemia mortality has also been reported in some studies of workers exposed to EtO. We previously reported the results from the largest cohort mortality study of EtO-exposed workers conducted to date. Here we extend our previous work by quantitatively examining the relationship between cancer mortality and EtO exposure estimated by an industrial hygiene based model. Historical exposures to EtO were estimated for all cohort members based on a regression model. Standard life-table analysis was used to examine the cancer mortality in three categories of cumulative exposure to EtO. The Cox proportional hazards model was also used to examine cumulative and other measures of EtO exposure as continuous predictors of cancer mortality. A weak positive trend in all lymphatic and hematopoietic cancer mortality with cumulative EtO exposure was observed in the life-table analysis. This trend was only evident for males with SMRs of 95 (95% CI=26-243) in the lowest exposure category (<1200 ppm-days), 143 (95% CI=62-283) in the middle exposure category (1200-8500 ppm-days) and 196 (95% CI=101-343) in the highest exposure category (>8500 ppm-days). A significant exposure - response relationship with cumulative EtO exposure ($\beta=1.1 \times 10^{-5}$, $\chi^2=4.96$, $p=0.03$) was observed for all lymphatic and hematopoietic neoplasms when exposures were lagged 10 years in the Cox model. The most pronounced relationship was observed for cumulative EtO exposure lagged 5 years with a model combining lymphocytic leukemia and non-Hodgkin's lymphoma ($\beta=1.2 \times 10^{-5}$, $\chi^2=8.44$, $p=0.004$). Duration, average, and maximum exposure were not found to significantly predict mortality from all lymphatic and

hematopoietic neoplasms in the Cox model. Mortality from all leukemias, stomach, pancreatic, kidney and brain cancers were not found to have a significant positive association with any of the exposure measures. We believe our findings provide some support for the hypothesis that exposure to EtO increases the risk of mortality from lymphatic and hematopoietic neoplasms.

Proceedings of the 9th International Symposium on Epidemiology in Occupational Health



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

**PROCEEDINGS OF THE 9TH INTERNATIONAL
SYMPOSIUM IN EPIDEMIOLOGY IN
OCCUPATIONAL HEALTH**

**International Commission on Occupational Health
(ICOH)**

**Book of Extended Abstracts from the
Proceedings of the 9th International Symposium on
Epidemiology in Occupational Health
held September 23-25, 1992, Cincinnati, Ohio**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health**

DISCLAIMER

Sponsorship of this conference and these Proceedings by NIOSH does not constitute endorsement of the views expressed or recommendation for the use of any commercial product, commodity or service mentioned. The opinions and conclusions expressed in the plenary papers and abstracts are those of the authors and not necessarily those of NIOSH.

The research recommendations are not to be considered as final statements of NIOSH policy or of any agency or individual who was involved. They are intended to be used in advancing the knowledge needed for worker protection.

This document is in the Public Domain and may be freely copied or reprinted. Copies of this and other NIOSH documents are available from:

**Publication Dissemination, DSDTT
National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, Ohio 45226
FAX (513) 533-8573**

The proceedings used as the basis for the 9th International Symposium on Epidemiology in Occupational Health is available from the National Technical Information Service.

**For information on other occupational safety and
health problems, call
1-800-35-NIOSH**

DHHS(NIOSH) Publication No. 94-112