CANCER MORTALITY IN WORKERS OF THE HAMBURG-MOORFLEET PLANT OF THE BOEHRINGER INGELHEIM COMPANY. A RETROSPECTIVE COHORT STUDY. METHODOLOGY AND PRELIMINARY RESULTS

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The Hamburg plant of the Boehringer Company produced trichlorophenol, 2,4,5-trichloro-phenoxyacetic acid, lindane and some other herbicides and insecticides since the early 1950's. In 1984 it closed because of problems in disposal of production waste, contaminated with dioxins, especially 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD).

In 1987, the Hamburg Department of Health started an investigation of possible health effects for the workers of this plant.

The first step was a mortality cohort study, the preliminary results being described in this paper.

Questions

- Does the cohort show a higher cancer mortality, compared to a control group of industrial workers?
- Is there evidence that elevated cancer mortality in this cohort can be attributed to exposure to 2,3,7,8-TCDD, benzene, dimethylsulfate or other human carcinogens?

Methods

A cohort was set up of all persons, who had a contract with the company in 1952 or later for at least 3 months. 1525 persons (1146 men, 379 women) were included. The follow-up covers the years 1952 - 1989.

3 subcohorts were built with respect to the amount of possible exposure to 2,3,7,8-TCDD and other, higher chlorinated dioxins, based on analyses of production processes and TCDD-adipose-tissue measurements in 48 persons[1]. In addition, the cohort was divided with respect to time of entry (<=1954, >1954), because in 1954 there were changes in 2,4,5-T-production, which reduced TCDD contamination. Finally, the cohort was divided into 4 categories according to different length of employment.

Vital status was assessed for the cohort. In 18 cases follow-up was not successfull.

357 deaths were identified. Causes of death were derived from different sources of information. All causes of death could be assessed. There were 115 deaths with cancer verified by medical records. After a review of these cases by two pathologists in 111

[1] Data from Prof. Konietzko, Institute for Occupational Medicine, University of Mainz

cases (91 men, 20 women) cancer was determined to be the underlying cause of death. Death certificates are available only for a small part of the cohort. Work on collecting the remainder is in progress.

For the males in the Boehringer cohort, a cohort of gas workers was used as comparison group. This cohort was studied by the same investigator with the same methods. The control group comprises 3417 men. The follow-up covers the years 1952-1985. There were 1517 deaths in the control group, including 377 cancer deaths, identified in the same way as for the Boehringer cohort. Work to extend follow-up up to 1989 is in progress. The control group differs from the Boehringer cohort in that it includes employees with a length of employment of at least 10 years.

In addition, a comparison with the FRG mortality data was performed. Due to different sources of information this comparison has to be interpreted with caution.

Statistical analysis was done by the person-year-method. Likelihood-ratio-tests were performed.

Preliminary results

Total mortality is elevated for the males in the Boehringer cohort in relation to the control group. The SMR for those, who entered the plant in 1954 or earlier is 1.26 (1.02,1.53; 95%-confindence bounds). For those who entered after 1954 SMR is 1.38 (1.17,1.63). In relation to FRG mortality data the SMR does not statistically differ from 1.

Mortality for total cancer is elevated relative to the control group. The SMR's in the same order as above are 1.98 (1.43,2.66) and 1.04 (0.70,1.48) (FRG data: 1.65 respectively 0.93). In the group with suspected highest TCDD exposure SMR is 1.79 (1.20,2.58), whereas for the two other groups combined it is 1.28 (0.93,1.71) (FRG data: 1.38 vs. 1.16). The SMR for the group with longest duration of employment of 20 years and more is highest with 1.92 (1.02,3.27) (FRG data: 1.85).

According to the "Kieler classification" 5 Non-Hodgkin Lymphomas were observed: 2 Reticulosarcomas, 1 Lymphosarcoma, 2 Chronic Lymphatic Leukemias.

Females showed no elevation in total cancer, but the SMR for breast cancer is 2.23 (1.02,4.24;FRG data), based on 9 observed cases.

21 suicides were observed, which yields a SMR of 3.62 (2.18,5.66) (FRG data: 2.2).

Preliminary findings cannot be explained by possible confounders like smoking, life style factors or others. They support the hypotheses, that elevation in total cancer may be attributed to working place related exposure to carcinogens, especially 2,3,7,8-TCDD, though impact of benzene and dimethylsulfate could not be totally excluded. Findings of elevated breast cancer mortality and suicides must be further evaluated.