

CANCER MORTALITY AMONG MEN AND WOMEN WORKERS OF COPPER-ORE ENRICHMENT FACTORY

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We conducted a retrospective cohort mortality study of a copper-ore enrichment factory workers, with follow-up for >30 years, among copper production workers. The largest relative excesses for men of the copper-ore concentration factory were found for respiratory cancer (4.3), including cavity of nose and throat (11.9), and lung and trachea cancer (4.0). The largest relative excesses for women of this factory were found for digestive apparatus cancer (3.8), including intestine (8.2), and stomach cancer (2.8). The working conditions of the copper-ore enrichment factory are characterized with the influence of dust contains crystalline silicon dioxide, nickel and arsenic.

Keywords: malignant tumor, copper-ore enrichment, retrospective cohort mortality study.

The first stage of pyrometallurgical copper production is enrichment of polymetal copper-contained ores, where copper (0.9-1.5%) and sulphur (12-35%) are in significant number, and also there are other admixture compounds, such as iron, quartz, and others. The process of ore-enrichment (crushing, grating, reduction, flotation, thickening, filtration and drying) is characterized by a numerous sources of dust formation, especially in the centers of overloading raw materials, that causes significant air pollution in working area with complex of chemical structure consisting of dust, containing dangerous carcinogenic substances (arsenic, quartz, nickel).

Previous epidemiological and experimental studies have shown that melting, converting, the fire and electrolytic refining of copper have a carcinogenic potential [1, 2]. However, the presence of cancer risk associating with copper-ore concentration is uncertain.

The aim of this research was to study the mortality from malignant tumors in workers (males and females) in a copper-ore enrichment factory.

We conducted a retrospective cohort study of mortality in copper-ore factory workers for more than 30 years, among copper production workers in a melting plant, located in Sverdlovsk region. The cohorts included 2021 men and 1779 women. Observed and “expected” cancer mortality was compared in residents of the community who are not engaged at the copper-ore factory. An enlargement factor of observing mortality indexes from malignant tumors compared to “expected” one defined as additional risk degree, connected with this industry.

The mortality intensive data among male-workers who are engaged in the factory is 494.27, but among other men – 119.80 per 100 000 people. Thereby, the mortality among workers exceeds the mortality among other men of general population by 4.12 times (95% confidence interval). Especially this difference is obvious among malignant tumors of respiratory system, first of all among lung cancer – here the difference is 202.74 and 46.40. Also this regularity is shown at the cancer structure of digestion system, where the mortality intensive data among workers is 190.11, and among other men from population – 49.90, including a stomach cancer – 126.74 and 27.70 consequently.

The analysis of intensive mortality data from malignant tumors among female-workers, who are engaged in the main industry and women population of a control town, has demonstrated the same regularity as in men. In particular, the mortality among female-workers exceeds the women mortality of general population by 2.96 times ($p < 0,05$), and the difference between intensive mortality index from malignant tumors among female-workers and general women population are observed in majority of tumor localizations.

The mortality index of male workers in the copper-ore factory was greater than “expected” by 4.1. The highest incidence of mortality is from respiratory system cancer (4.3). The incidence of mortality from nasal cavity and a larynx cancer (11.9), and lung and trachea cancer (4.0); digestive system cancer (3.8), including pancreatic (10.1), stomach (4.6), and liver cancer (3.2) was high.

The mortality index in female workers in the copper-ore factory was by 2.4 times more than the expected rate. The highest incidence of mortality in the

electrolytic copper refining was observed for digestive system cancer (3.8), including intestine (8.2), and stomach cancer (2.8).

Thus, the investigation results have shown that carcinogenic danger of copper-ore process technology exists. The dust containing crystalline silicon dioxide, nickel and arsenic compounds, is the most real cause of the mortality in workers.

References

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