

Cancer morbidity among polishers

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ABSTRACT The mortality pattern among 86 men was determined to investigate the possible hazards of polishing steel. The men had polished steel with polishing paste for at least five years. The polishing pastes had contained tallow, beeswax, carnauba wax, alundum, carborundum, ferric oxide, and chalk. A total of 18 men had died compared with 13.3 expected. Four had died of stomach cancer compared with 0.44 expected ($p < 0.005$). The mortality for other causes of death was not increased. The study does not permit any definite conclusion but indicates a possible cancer hazard among polishers.

Metal polishing can be heavy, dirty work, the occupational hazards of which have not been studied extensively. Recently, however, two studies have been published concerning the risk of cancer among polishers. Blair¹ could not show any increased mortality from cancer in workers in the polishing and plating industry, but Sparks and Wegman² found an increased incidence of stomach cancer among jewellery workers mainly occupied with polishing. The present study was started before the publication of these two studies, and was undertaken as a screening programme to detect any possible occupational risk among polishers in the mechanical engineering industry.

Subjects and methods

The factory to which the study group of polishers belonged was founded in 1907, and its main product is bearing rings. Today some 3000 workers are employed. The study was designed as a cohort study, all men were selected from the personnel register, had been employed any time between 1950 and 1966, and had worked at least five years as a polisher.

The personnel register contained every person who had ever been employed by the company. Altogether 86 were selected as fulfilling the criteria for inclusion. Follow-up continued until 31 December 1976 or until death or emigration (five people) before that date. There was no other loss to follow-up.

The cancer morbidity of the cohort during the years 1958-76 was determined by scrutiny of the

Swedish Cancer Register. For those who were dead, a copy of the death certificate was obtained and the underlying cause of death was noted. The expected values were calculated by multiplying the person-years under observation, with stratification for five-year age-classes (20-84 years), calendar years, latent period, and exposure time, by the cause-, age- and calendar-year-specific incidence and mortality rates and summarising the fractional contribution over all the cohort. The cancer morbidity rates and mortality rates used for Swedish men were as provided by the official registers of Sweden.^{3,4} For those calendar years with no data available, rates were taken from the nearest available calendar year. A latent period for disease to develop was considered in the study and was defined as the time elapsing between first exposure and the calendar year of first observation at risk. The number of person-years was calculated until the year of emigration for the five emigrants.

Exposure

Metal is polished to smooth the surfaces and the polishers, as here defined, performed only this operation. Until 1960 "band polishing" was the only method used for polishing rings. Since 1960 there has been a gradual change to other methods. Balls were polished by so-called "drum-polishing." The different procedures are briefly described below. Since band polishing seems to be of the greatest interest, it is described most thoroughly. The rings and balls that were produced and polished consist of steel containing small amounts of chromium (~1.5%).

Band polishing probably started before 1930. A

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band of linen was covered with a paste containing tallow, beeswax, petroleum jelly, carnauba wax, alundum (Al_2O_3) or carborundum (SiC), ferric oxide, and chalk. Since 1972 a prefabricated paste has been used. Before the 1960s the polisher pressed the band against the ring. This procedure was very dirty, and the workers removed thick layers of used paste from their aprons. According to obtainable information, the process does not seem to have been very dusty. Today the process is mechanised and the polishers' contact with the paste is minimal.

Current measurements of dust from band polishing showed a total content of 0.5 mg/m^3 and small amounts of metals ($Cr < 0.2 \text{ } \mu\text{g/m}^3$, $Ni < 0.2 \text{ } \mu\text{g/m}^3$).

In drum polishing the ball is tumbled in a drum containing Vienna lime, alundum, and a solution of soda and sodium nitrate for rust-proofing.

Other methods of polishing have been adopted and have been used more commonly since the mid-sixties. Light mineral oils with additives of sulphur and vegetable oils are used.

Results and discussion

Of the 86 men, 18 had died during 1958-76 (table) and seven had developed cancer. In the cancer register the same seven individuals with cancer were found but no others. Both with regard to mortality and morbidity, there was an increased number of cancers of the stomach by comparison with expected. Other cancers or causes of death were not significantly increased.

Mortality in 86 men who had worked for at least five years as polishers. Expected numbers calculated from death rates of Swedish male population

| | Observed | Expected | 95% confidence interval for rate ratio ^b |
|---|----------|----------|---|
| All causes (1-030 person-years) | 18 | 13.3 | 0.8-2.1 |
| Cancer (140-209) ^{†‡} | 7 | 3.0 | 0.9-4.8 |
| Stomach cancer (151) | 4* | 0.44 | 2.5-23 |
| Circulatory diseases (390-438) | 7 | 6.1 | 0.5-2.4 |
| <i>Latent period ≥ 10 years</i> | | | |
| All causes | 18 | 11.2 | 1.0-2.5 |
| Cancer | 7 | 2.75 | 1.0-5.2 |
| Stomach cancer | 4* | 0.41 | 2.7-25 |
| Circulatory diseases | 7 | 5.8 | 0.5-2.5 |

* $p < 0.005$, two-tailed Poisson test.

[†] *International Classification of Diseases, 8th revision.*

[‡] In addition to stomach cancer there were tumours of lung, colon, and pancreas.

The four men with cancer of the stomach were aged 57, 59, 73, and 74 at the time of diagnosis. Three had worked mainly as band polishers and one as a drum polisher. Out of 45 men born before 1920, 32 had worked mainly as band polishers.

The exposure of the polishers in this mechanical engineering plant is complex. The ingredients in polishing paste are all rather inert, and some of them, such as beeswax and carnauba wax,⁶ are used as food additives, but many of them are poorly defined chemically. Iron oxide has been suspected to be a carcinogen, but its carcinogenic properties in man are uncertain, as shown by a recent study,⁷ although co-carcinogenic properties have been suggested in the context of lung tumours in animals.⁸ The suspicion that the increased incidence of stomach cancer was caused by the polishing paste is supported by a recent study of jewellery workers,² since there were five cases of stomach cancer against 1.3 expected among polishers using pastes containing chromium oxide, silica, diatomaceous earths, and silicon carbide.

The results of the present study do not permit any definite conclusions, but nevertheless indicate a possible cancer hazard among polishers in this specific factory and suggest that other groups of polishers should be studied. The earlier specific working operations for this cohort no longer exist, but similar working conditions might occur elsewhere, and many of the substances are still used in large quantities in industry.

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