

Risk of lung cancer and mesothelioma after cessation of asbestos exposure

To the Editor:

SANDÉN *et al.* found no increased risk of lung cancer in a prospective study of 3893 shipyard workers 7–15 yrs after exposure to asbestos had ceased [1]. However, there was an increased risk for pleural mesothelioma. Expected numbers were calculated from the male Gothenburg population, an area where shipyards are one of the major industries. The authors conclude that shipyard workers mainly exposed to chrysotile have no increased risk of lung cancer some years after exposure has ceased.

This could be misleading because the effect measure may be biased [2]. The choice of this reference population may have underestimated the SMR for lung cancer. Several studies from coastal regions indicated increased lung cancer mortality in shipyard areas [3–5]. Asbestos insulators were not included in the cohort but they may well have contributed to the expected number of lung cancer cases, since insulators are known to be under high risk for asbestos-related malignancy [6].

The proportion of workers recruited in 1976 having left the shipyards before 1976 is unknown. The cohort consists of selected invited participants and the number of workers previously exposed to asbestos is unknown. There is no information on the response rate of workers employed in the shipyards in 1976. Selection bias would occur leading to an underestimation of the effect parameter if subjects are lost due to non-response, unknown place of living, and loss is related to exposure [2].

Studies have shown that volunteers joining a cohort may have a lower overall mortality than those who do not participate [7]. Self-referral of subjects is ordinarily considered a threat to validity since the reasons for self-referral may be associated with the outcome under study [8].

It is well established that carcinogenic effect of an exposure to asbestos is to multiply a pre-existing risk at a given site by a factor relating to dose and to continue to multiply the risk in the absence of exposure for several decades [9].

In a prospective cohort study of formerly asbestos-exposed workers in the Federal Republic of Germany a significant increase of lung cancer mortality was observed in a subcohort until at least two decades after cessation of asbestos exposure [10, 11].

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From the authors:

We are grateful for the opportunity to reply to the letter from Giersiepen, Rösler and Woitowitz and like to thank them for their interesting comments on our paper [1].

The choice of a reference population is always important. If we had used Swedish men as the

reference group the expected number of lung cancer and pleural mesotheliomas would have been 20.6 and 0.7 respectively. Twenty two observed cases of lung cancer *versus* 20.6 expected give 95% confidence intervals for rate ratio of 0.67–1.6. Eleven observed cases of pleural mesotheliomas *versus* 0.7 expected give 95% confidence interval for rate ratio of 7.9–28.1. Thus, the same pattern results, *i.e.* no excess of the risk of lung cancer but a high excess of the risk of pleural mesotheliomas.

However, our opinion is that men in the same city are a more adequate reference population. It takes into account environmental and socio-economic factors such as smoking habits. Gothenburg has a higher incidence rate for lung cancer than the country but the largest city in Sweden, Stockholm, has only a very small shipyard but still a higher incidence of lung cancer than Gothenburg.

Insulators are a risk group for asbestos-associated cancer but a rather small occupational group. In another study we observed, over a 10 year period, all 272 men who were active members of the union of insulation workers in Gothenburg [2]. During that period there were 5 cases of lung cancer and 4 cases of peritoneal cancer but no pleural mesotheliomas. Thus even if the incidence was high in insulators it has a negligible impact on the incidence of the total population of the city.

The possibility of a selection bias resulting in selection of only low or non-exposed subjects [3] is highly improbable since there was a high incidence of mesothelioma, and a high prevalence of pleural plaques and asbestosis or suspected asbestosis [4].

Forty six men with earlier known cancer participated in the health check-up. Thus, also men with known diseases participated. However, if men with serious diseases had been excluded, this could had been a diagnostic bias [3]. As we studied the morbidity in lung cancer and not mortality, such a bias is highly unlikely [5]. Only lung cancer cases diagnosed after the health examination were included in the analysis.

A threat to validity would be men who referred themselves to the health check-up because of the outcome after the study had started [3]. These men were no included in the study.

We do not know the exact participation rate since we do not know how many of the employed workers were previously exposed to asbestos. The rate is estimated by us, the unions and company to be more than 90%. However, even a lower rate would not invalidate the findings, unless workers with a high probability of developing lung cancer in the following years were less prone to participate, which is highly improbable.

Some studies have included workers who have discontinued employment in asbestos industries [6–9]. Walker [10] analysed the results of these studies and considered that the data may be interpreted to support the view that the risk of lung cancer decreased when asbestos exposure stopped.

Our study included subjects mainly exposed to chrysotile and the findings may not be valid for persons exposed to amphiboles [11, 12].

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