

Silica and lung cancer

1. In June 1992, the Industrial Injuries Advisory Council published a report (CM2043) on lung cancer and silica. In keeping with reports of that era, the detail of the evidence examined is not displayed but the Council recommended:
 - a. that the balance of evidence suggested a more than two fold 'real' increase in the risk of lung cancer among persons with silicosis
 - b. but that the evidence in relation to silica exposure in the absence of silicosis was insufficient to justify the prescription of lung cancer.
2. Consequently, the term of prescription was limited to patients with silicosis who had been employed in any one of a list of ten industries ¹
3. In 1997 the International Agency for Cancer Research (IARC 1997) published a monograph evaluating the relationship between lung cancer and silica exposure. On the basis of animal and human data the Agency determined that crystalline silica, in the form of quartz or cristobalite inhaled at work, was a pulmonary carcinogenic (Group 1).
4. In that analysis, the evidence for carcinogenicity was strongest for patients with pre-existing silicosis; no formal meta-analysis was carried out but 84% of published risks in this group were significantly increased.
5. The Agency's conclusions were, however, not unanimous and in the monograph were preceded by a statement to the effect that carcinogenicity was not demonstrated in all industrial circumstances.
6. Further uncertainties, also expressed elsewhere, arose from the potential for selection and diagnostic biases in patients with silicosis, the difficulties of excluding the effects of carcinogenic co-exposures at work, and likely confounding by cigarette smoking in some exposed populations.
7. More than 50 informative studies have been published since 1997. Those published up to 2005 have been usefully summarised by Pelucchi et al. (Pelucchi 2006). In 35 cohort or case-control studies of silica-exposed workforces with undefined or absent silicosis status, the risk of lung cancer was reported to be increased in most, but in only one (a case-control study of Chinese tin miners) by more than two-fold.
8. The summary risk estimate for 11 cohorts of patients with silicosis was 1.69 (95% confidence interval 1.32-2.16). The risk estimates were increased in each individual cohort but were more than doubled in only three.
9. Two of these cohorts were of patients hospitalised with silicosis in Sweden or Denmark. No information on occupation was available, and the measured risks of lung cancer were not adjusted for smoking or exposure to other carcinogens (particularly radon) encountered at work. The third cohort was of Australian men compensated for silicosis. Although the unadjusted estimate of the increase in risk of lung cancer was more than doubled (2.15), adjustment for the greater than average rate of smoking in the cohort reduced this estimate to 1.90. Unadjusted estimates by various industries were increased but without information on statistical significance.

1. ¹ glass manufacture, sandstone tunnelling and quarrying, the pottery industry, metal ore mining, slate quarrying and production, clay mining, use of siliceous materials as abrasives, foundry work, granite tunnelling and quarrying, stone cutting and masonry.

10. From 2006, a further four studies directly of the relationship between silica exposure and lung cancer were identified. Two were of patients with silicosis; one (Yu 2007) of patients in Hong Kong failed, after an approximate adjustment for smoking, to find any significant increase in the risk of lung cancer. The other (Marinaccio 2006), of Italian patients, suggested only a small, unadjusted increase in risk (SMR 1.10, 95% confidence interval 1.03-1.18).
11. A cohort study of 17,644 German porcelain workers (Birk 2009) followed for about 20 years reported that in both sexes, the unadjusted risk of lung cancer was reduced, significantly so in men.
12. A case-control study of patients with lung cancer from seven European countries (Cassidy 2007) reported that after adjustment for smoking and some other occupational carcinogens, the odds of accumulated exposure to silica of at least 100mg/m³.hours were significantly more than doubled in all patients, in those with silica exposure from concrete and in those who had worked in manufacturing or construction. No separate analysis of patients with silicosis was reported.
13. On the basis of the above evidence the Council concludes that there is no requirement to change the current terms of prescription.

References

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