

COKE PRODUCTION (Group 1)

A. Evidence for carcinogenicity to humans (*sufficient*)

In the first half of the century, case reports of tumours of the skin (including the scrotum), bladder and respiratory tract, in association with employment in industries involving the destructive distillation of coal, suggested a link between that industry and human cancer. Despite their methodological shortcomings, descriptive epidemiological studies based on death certificates corroborated these early suggestions¹.

Later studies carried out in Japan, Sweden, the UK and the USA identified the lung as the site at which the excess cancer rates occurred most commonly among workers in coke production. All but two of the pertinent analytical epidemiological cohort studies provided evidence that work in coke production carries a significantly elevated risk of lung cancer. The two studies showing no lung cancer excess suffered from serious methodological limitations. The risk was evident in comparison with both the general population and non-coke production workers, and the extent of the increased relative risk estimates varied from three to seven fold. In those studies in which the relevant information was available, differences in smoking habits were shown not to have severely confounded the risk estimates¹.

Excess risk of kidney cancer has been repeatedly associated with work in coke plants. In one study in the USA, a seven-fold increase in risk was seen for workers employed for five years or more at coke ovens. In single studies, excess risks were reported for cancers of the large intestine and pancreas¹.

The largest study was conducted on a cohort of some 59 000 steel workers in the Pittsburgh area (USA)¹. The study has recently been extended up to 1975 and the dose-response analysis of exposure to coal-tar pitch volatiles and lung cancer reviewed. Coke-oven workers (both white and nonwhite) exhibited a large, statistically significant increase in lung cancer mortality that was strongly associated with duration of exposure to coke-oven fumes and intensity of exposure, as documented by comparing topside- with side-oven experience. Significantly elevated mortality from prostatic and kidney cancer was also noted, but without clear evidence of an exposure-response relationship. Non-oven workers had no excess of lung cancer but a significantly increased mortality from cancer of the large intestine and pancreas. Cumulative exposure indices of exposure to coal-tar pitch volatiles were calculated and increasing lung cancer risk with increasing estimated exposure was found^{2,3}. A possible causative agent is coal-tar fumes.

B. Other relevant data

An increase in the incidence of sister chromatid exchanges was observed in cultured peripheral blood lymphocytes from 12 nonsmoking coke-oven workers in a steel plant, when they were compared to a group of age-matched controls. Urine samples from nonsmoking coke-plant workers were mutagenic to *Salmonella typhimurium* in the presence of an exogenous metabolic system. In a second study of coke-plant workers, the mutagenic activity in *S. typhimurium* of extracts of urine samples collected after work was not statistically different from that of samples taken before work. Antigenicity against benzo[a]pyrene diol epoxide-DNA adducts has been demonstrated in peripheral blood lymphocytes of coke-oven workers⁴.

References

- ¹IARC Monographs, 34, 101-131, 1984
- ²Redmond, C.K. (1983) Cancer mortality among coke oven workers. *Environ. Health Perspect.*, 52, 67-73
- ³Rockette, H.E. & Redmond, C.K. (1985) Selection, follow-up, and analysis in the coke oven study. *Natl Cancer Inst. Monogr.*, 67, 89-94
- ⁴IARC Monographs, Suppl. 6, 187, 1987