

Industrial Injuries Advisory Council - Information Note

Lung Cancer in Haematite Miners

March 2012

This Information Note records recent Council deliberations on whether there are grounds to recommend adding lung cancer in haematite miners to the list of prescribed diseases. This topic was considered by way of updating an earlier Council report on occupational causes of lung cancer (Occupational Lung cancer Cm. 37, April 1986) and complements other updates in the area. In the event, the Council has decided that the evidence remains insufficient to support such a recommendation, in line with earlier conclusions. The background and the main considerations are summarised here.

Each year about 40,000 new cases of lung cancer are diagnosed in the UK. The disease is strongly associated with smoking and establishing a link to a particular employment and disease occurrence is challenging. The legal framework makes it clear that compensation through the Industrial Injuries Disablement Benefit (IIDB) scheme should be paid only where such a link can be established or presumed with reasonable certainty in the individual claimant. Usually, as explained in our published reports, the Council requires high quality, consistent research evidence that the risks of the disease in question are more than doubled by occupational circumstances that can be defined within the Scheme (corresponding to the standard of attribution on the balance of probabilities – more likely than not – under the circumstances of the claim).

In 1986, when the matter was last considered, sufficient scientific evidence was found to add work in a tin mine to the list of occupational circumstances in PD D10 that give rise to lung cancer; but the case for adding work as a haematite miner was deemed insufficiently compelling.

Boyd *et al* had reported that the risk of lung cancer was elevated in haematite miners from Cumberland, but was less than doubled (raised about 1.7-fold) [Boyd *et al*, 1970]. Kinlan and Willows (1988) also looked at iron ore miners in Cumbria and found slightly lower levels of risk over the same period (1948 to 1967) using a slightly different comparison population, and found no appreciable excess after 1967.

No further British data on risks of lung cancer in haematite miners were available then, and none was found in this updating review.

Internationally, however, higher risks of lung cancer have often been reported in iron ore miners. For example, in one study of French iron ore miners, the relative risk for lung cancer was raised 2.25-fold, and higher still (raised 3.7-fold) at later follow-up in 1992 [Mur *et al*, 1987; Pham *et al*, 1992]; in Sweden, the relative risk of lung cancer in iron ore miners was between 11 and 16, and 7 at follow-up in 1984 [Edling, 1982; Edling, 1983; Jorgensen *et al*, 1973; Jorgensen *et al*, 1984]; a report on haematite miners from Slovakia found risks of lung cancer to be elevated 2.8- to 4-fold in the two mines investigated [Icsó *et al*, 1994]; and in a Chinese study the relative risk of lung cancer was 3.7 in iron ore miners [Chen *et al*, 1990].

This increased cancer risk in iron ore miners is assumed – as in the case of tin miners – to arise from contamination of the work environment by the radioactive gas radon, although a role for other substances that might be present, such as silica, cannot be ruled out. Like most radioactive substances, radon naturally decays as a result of the emission of radioactivity and forms so-called “radon daughters”. The major source of radioactivity emitted during this process is alpha particles, which when inhaled may be deposited in the lung epithelium causing lung cancer. The dose of radioactivity miners receive is likely to vary considerably according to geography and according to the degree of ventilation in mines. One possible explanation for the higher risks identified in non-UK studies is that radon levels have been higher in overseas mines than in the Cumbrian ones. (A measurable excess of lung cancer may also arise also from residential exposures to radon.)

PD D10 (occupational lung cancer)

Because risks were not as much as doubled in British haematite miners in the studies reported by Boyd *et al* and Kinlan and Willows, and no new data on this association have come to light, prescription by adding haematite mining to the list of qualifying occupational circumstances in PD D10 remains inappropriate.

This does not preclude the possibility that, in some mines over some time periods, doses of radiation may have been considerably higher, high enough perhaps to double risks of lung cancer, and in this respect Duggan *et al* reported potentially high exposures to radon and its decay products in one particular mine.

PDA1 (diseases due to ionising radiation)

Several cancers that arise from exposure to external ionising radiation are covered by the provisions of PD A1, such that benefit is recognised if it can be established that the received occupational dose of ionising radiation is enough to double their risk of occurrence. Lung cancer is not on the list at present.

However, authoritative international risk models (e.g. BEIR VI committee: Health Risks from Exposure to Low Levels of Ionizing Radiation, 2006; Kreuzeret *al*, 2010) have recently been developed, which in principle might allow estimation of the required dose to double risks. The Council, therefore, explored the potential for adding lung cancer to the diseases covered by PD A1, to cover haematite miners who could prove exceptionally high levels of internal exposure to alpha radiation over long periods.

In practice, several obstacles were found to this course of action:

1. We were informed by the Health Protection Agency that extrapolations from the new risk models would be uncertain, requiring that the dose models developed in unusually highly exposed uranium miners could be extrapolated to the differing circumstances of iron ore workers.
2. The limited Duggan data did not provide a sufficient basis for estimating a miner's exposure history over a working lifetime and therefore a miner's cumulative exposure.
3. In contrast to classified radiation workers, exposed to external radiation such as gamma radiation, underground miners will not have routinely worn personal air samplers, meaning that an individual miner's exposure history cannot be reconstructed with any reasonable degree of accuracy.
4. Little evidence exists on the distribution of exposure levels in UK haematite mines, and none on how often and for how long exposures were as high as in the worst mine investigated by Duggan. The Council sought data of this kind from various sources (the Health and Safety Executive's Central Index of Dose Information (National Radiological Protection Board, HSE), experts at the University of Oxford (Professor Sarah Darby) and the Health Protection Agency (D Dixon)). A report of the National Radiological Protection Board was identified, confirming the impact of improved ventilation in iron ore mines during the 1970s (Hunter and Leonardi, 2012), but none of the parties approached held data from earlier times with which to pursue investigation.

Based on the lack of research evidence to indicate a greater than doubled risk of lung cancer in haematite miners in the UK, and the absence of adequate

exposure information to define a subgroup at particular risk through higher than average levels of exposure, IIAC has concluded that no case can be made for recommending that haematite miners be added to the list of prescribed occupations for which PD A1 or PD D10 is payable.

The Council is happy to receive further evidence on the matter, should it be, or become, available.

References

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