

# Industrial Injuries Advisory Council - Information Note

## Lobar pneumonia in welders

November 2010

*This Information Note describes recent Council deliberations on the potential prescription of lobar pneumonia in welders (a topic raised by one of its members). In the event, the Council felt unable to recommend prescription – the background and the main considerations are summarised here.*

1. Successive analyses of occupational mortality for England and Wales over more than five decades – conducted on behalf of the Office for National Statistics and its predecessor, the Office for Population Censuses and Surveys – have demonstrated increased death rates from pneumonia in welders. For example, during 1949-53, 70 deaths were observed with 31 expected;<sup>1</sup> in 1959-63 101 deaths as compared with 54.9 expected;<sup>2</sup> and in 1970-72 66 deaths with 42.0 expected.<sup>3</sup>
2. A more recent analysis<sup>4</sup> covering a longer period (1979-90 with one missing year of data) confirmed the association and, with the larger available number of deaths, explored the pattern in greater detail. It revealed that the excess was attributable largely to deaths from pneumonias other than bronchopneumonia, principally lobar pneumonia.
3. Pneumonia is an infection of the lung substance. Lobar pneumonia is a subcategory of pneumonia, affecting a large and continuous area of the lobe of a lung. In contrast the more common bronchopneumonia develops around infected conducting airways (bronchioles), resulting in more scattered pockets of infection. The two types of pneumonia tend to have different known causes and different infecting organisms. Of note, lobar pneumonia often involves a specific organism, *Streptococcus pneumoniae*,

or pneumococcus, and is less clearly associated with smoking habits; it is the most common form of pneumonia in young adults; and often runs an acute course, which may occasionally prove fatal, but otherwise tends to result in complete recovery.

4. In the analysis referred to in paragraph 2, the excess of deaths in welders was limited to men below the normal retirement age of 65 years (55 deaths from lobar pneumonia observed vs. 21.6 expected), suggesting the possibility of a reversible (short-term) risk of occupation.
5. This risk was also evident for several other occupations entailing exposure to metal fume, such as moulders and coremakers and furnacemen in foundries – suggesting a hazard of metal fume, rather than other gaseous ingredients of welding fume.
6. A subsequent case-control study<sup>5</sup> established the occupational histories of working-aged men admitted to hospital with community-acquired pneumonia. This study was based in Birmingham and the West Midlands, areas with a high prevalence of metal-working jobs in the community, and was designed to test the hypothesis that inhaled metal fume is a reversible cause of pneumonia, and especially lobar or pneumococcal pneumonia. In all, 525 cases of community-acquired pneumonia were compared with 1,122 men of similar age admitted to the same hospitals under the same consultants with other medical disorders.
7. The study found that admission with pneumonia was associated with occupational exposure to metal fume in the previous 12 months but not in earlier periods, supporting the hypothesis of a hazard that is reversible following cessation of exposure and that it affects the occurrence of disease (and not just case fatality or severity).
8. Risks were increased by 1.6 to 1.8-fold overall, but were higher still for recent exposure to iron-containing metal fume and with lobar pneumonia as the outcome (increased 2.3

to 3.0-fold). Strong associations were also found with pneumococcal infection as confirmed by laboratory investigations (odds ratio 3.1).

9. A later analysis of mortality in England and Wales during 1991-2000 confirmed continuing excesses of mortality from pneumococcal and lobar pneumonia among working-aged men in metal fume-exposed occupations (54 deaths vs. 27.3 expected, a 1.99-fold increase in risk in statistically adjusted analyses), but no excess from these causes at older ages, or from bronchopneumonia at any age.<sup>6</sup>
10. These data add to a growing and consistent body of evidence indicating a specific, short-lived (but sometimes severe) risk of lobar pneumonia from occupational inhalation of metal fume – clearest for welders but also evident in moulders and core makers in foundries.
11. Further support for these conclusions comes from a study (reported only in abstract format<sup>7</sup>) of mortality in a Swedish cohort of 52,511 construction workers with exposure to welding fumes, gases or irritants, and 41,063 other unexposed construction workers: risks of death from/with pneumonia were elevated 1.7-fold overall, and by 5.7-fold when lobar pneumonia was analysed as a subgroup of interest.
12. The mechanism by which metal fume might increase risk of lobar pneumonia is unknown, although it has been suggested that the fine inhalable fume may cause oxidative damage to lung defences; or that iron in the fume may act as a growth nutrient for micro-organisms in the flora of lung linings (normally an iron-restricting environment).<sup>8</sup>

## **Considerations for prescription**

13. The Council notes that there are only a few research reports in this area, findings resting on several analyses of national mortality (large scale with deaths numbered in millions) and consistent observations in a large British case-control study.
14. Risks were not always as much as doubled in these reports (a benchmark that is normally applied in screening for potential additions to the list of Prescribed Diseases), although this threshold was crossed for lobar pneumonia, notably in welders.
15. However, the Council has concluded that, even if this level of evidence is accepted as sufficient, the scope for prescription is limited. For fatal cases, a key consideration is that compensation is only available if a claim is made before death; and benefits are only available for a period starting 90 days after the onset of the disease. Death from lobar pneumonia in working-aged adults occurs only rarely, and then rapidly – the onset and time course being so rapid that few, if any, fatal cases would benefit under current rules of the Scheme.
16. For non-fatal cases, recovery tends almost always to be complete, with no residual functional incapacity. Under these circumstances, cases would be assessed as having an insufficient degree of disablement to be awarded benefit.
17. The Council has considered the likelihood that some non-fatal cases may develop long-term complications, leading to illness extending beyond 90 days and causing a meaningful degree of disablement. One such complication is empyema (a condition in which pus collects in the space between the lungs and chest wall, with the potential to generate scar tissue and impaired lung function). However, a literature review has indicated that this is a very rare complication of pneumonia and that the degree and

duration of ensuing disability is uncertain. No direct evidence exists that welding or occupational exposure to metal fume double the risks of empyema.

18. In view of these various limitations, the Council has decided not to recommend prescription for lobar pneumonia in welders or other groups of workers with occupational exposure to metal fume. A watching brief will be maintained, however, in case further evidence suggests a way forwards.

## References

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