OPINION

Pneumococcal vaccination for welders

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Over the past 20 years, evidence has accumulated that occupations entailing exposure to metal fume (principally welders) are at increased risk of developing and dying from pneumococcal and unspecified lobar pneumonia.[1–9] The hazard is apparent in people working with ferrous metal,[2 4] may extend to other metals[4] and is reversible following cessation of exposure.[1 4 5] There are indications that the ultrafine particles in welding fume promote adherence of pneumococci to bronchial epithelium,[10] but the underlying mechanisms are not yet well established. Nevertheless, in 2011, the independent Joint Committee on Vaccination at the English Department of Health (DH) judged that the evidence of increased risk was sufficient to recommend that employers offer welders vaccination against pneumococcus.[11] This was a new measure that had not previously been applied in other countries.

Subsequently, on the advice of the UK Health and Safety Executive (HSE), the DH weakened its recommendation, stating only that vaccination 'should be considered for those at risk of frequent or continuous occupational exposure to metal fume (e.g. welders), taking into account the exposure control measures in place'.[12] Then after some delay, HSE published guidance for employers in which they were advised to prioritise controls on exposure and to take the efficacy of such controls into account when deciding whether or not to offer vaccination.[13] The guidance emphasised that vaccination was not a regulatory requirement, provided that an adequate risk assessment could demonstrate that fume was effectively controlled.

A fundamental flaw of this approach is that, as the HSE's guidance acknowledges, 'there are no research studies which specify how much exposure to welding or metal fume (dose) will result in an increased susceptibility to pneumonia (response)'.[13] It follows that there is no evidential basis for determining whether exposures are sufficiently controlled to eliminate the risk. When challenged on the matter, HSE responded that despite the admitted absence of evidence, 'we do know what constitutes effective controls in relation to welding and those are intended to prevent all health-related end-points' (J Delic, personal communication). They also suggested that exposures should have reduced over time, although they had no supporting empirical evidence.

New data have now become available on mortality by occupation in England and Wales during 2001–2010, and we used them to explore whether the excess risk of pneumonia in welders had persisted into the new century.

The Office for National Statistics provided us with the numbers of deaths in England and Wales during 2001–2010 at ages 16–74 years, broken down by combinations of sex, age (in 5-year bands), occupation (in 143 categories), social class (eight categories) and underlying cause of death (229 categories). All of this information came originally from death certificates. The data were used to calculate proportional mortality ratios (PMRs) for pneumococcal and unspecified lobar pneumonia (categories J13 and J18.1 in the 10th revision of the International Classification of Diseases) in welders, standardised for age and social class. CIs for PMRs were based on the Poisson distribution. Results were compared with those derived previously by a similar method for the period 1991–2000 when pneumococcal and unspecified lobar pneumonia was classified to a single category (481) in the ninth revision of the International Classification of Diseases.[14]

During 2001–2010, there were 2863 male deaths from pneumococcal and unspecified pneumonia at ages 16–74 in all occupations combined compared with 3234 during 1991–2000. The corresponding numbers of deaths from all causes were 927 152 (including 8160 in welders) during 2001–2010 and 1 202 888 (10 455 in welders) during 1991–2000. As in 1991–2000, mortality from pneumococcal and unspecified lobar pneumonia during 2001–2010 was significantly elevated in welders of working age (table 1), with a particularly high PMR for pneumococcal pneumonia specifically (3.58, 95% CI 1.44 to 7.37). The estimated excess of deaths from pneumococcal and unspecified lobar during 2001–2010 was 10.9 compared with 18.8 during 1991–2000.

Our analysis indicates that welders continued to experience significant excess mortality from pneumococcal and unspecified lobar pneumonia during 2001–2010. As discussed in relation to earlier similar analyses, the excess is unlikely to be explained by bias or confounding.[1–3 5 8] The PMR during 2001–2010, although significantly elevated, was somewhat lower than in the preceding decade (1.64 vs 2.42), which may reflect reduced levels of exposure. Nevertheless, the hazard was responsible for approximately 11 excess deaths, and for every attributable fatality there are likely to have been many more non-fatal cases, including some associated with serious morbidity. An important proportion of such disease should be preventable by pneumococcal vaccination.

There is an urgent need for regulatory bodies internationally to consider the need for pneumococcal vaccination for welders and for the HSE to review its approach to the hazard. Similarly, clinicians advising welders should review their practice and the advice they give. Controls on exposure are important, but as currently applied in the UK, they

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Table 1 Mortality of welders from pneumococcal and unspecified lobar pneumonia, England and Wales, 1991–2010

Cause of death	Deaths at age 16–64 years				Deaths at age 65–74 years			
	Observed	Expected	PMR	(95% CI)	Observed	Expected	PMR	(95% CI)
1991–2000								
Pneumococcal and unspecified lobar pneumonia	32	13.2	2.42	(1.66 to 3.42)	21	15.0	1.40	(0.86 to 2.13)
2001–2010								
Pneumococcal and unspecified lobar pneumonia	28	17.1	1.64	(1.09 to 2.36)	18	13.6	1.32	(0.78 to 2.09)
Pneumococcal pneumonia	7	1.96	3.58	(1.44 to 7.37)	0	0.82	0.00	(0.00 to 4.51)
Unspecified lobar pneumonia	21	15.2	1.38	(0.86 to 2.12)	18	12.8	1.40	(0.83 to 2.22)

PMR, proportional mortality ratio.

appear not to provide adequate protection. It is likely that the same applies in many other countries. An analogy can be drawn with hepatitis B immunisation for healthcare workers at risk of sharps injuries. Good working practices are necessary to minimise the occurrence of such injuries, but because in practice they are not fully effective, it is necessary to promote and provide additional protection by vaccination.

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