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WATCH COMMITTEE

PORTLAND CEMENT

Issue

1. Updated assessment of the respiratory and carcinogenic hazards of Portland cement.

Timing Considerations

2. Routine

Recommendation

3. WATCH is invited to respond to the issues in paragraph 18.

Background

4. WATCH first considered Portland cement in 1991 (WATCH/05/91) and the review considered by WATCH was published as an HSE criteria document in 1994. The WATCH review described reports of rhinitis, chronic productive cough, impaired lung function and slight chest radiographic abnormalities in cement dust-exposed workers. There were no reliable exposure data associated with the reports of these health effects, but it was suggested that they were associated with relatively high exposures. Excesses of stomach cancer were noted in three separate cohort mortality studies in cement dust-exposed workers, but only in one of these studies was the excess statistically significant. On the basis of the available evidence WATCH recommended OESs of 5 and 10 mg.m⁻³ (8-hour TWA) for the respirable and total inhalable fractions respectively. In 1997 the OES for the respirable fraction was reduced to 4 mg.m⁻³ in line with the ISO/CEN sampling convention. This merely reflected a change in sampling methodology and not a change in control requirements.

5. HSE has now produced an updated assessment of the health effects information presented in the earlier HSE (1994) review, focusing on the evidence for respiratory and carcinogenic effects. One reason for undertaking this assessment was in the context of the developing plans for the Occupational Respiratory Disease (ORD) sub-programme of the Disease Reduction Programme. A particular issue was to see if the evidence published since 1991 is now better able to characterise exposure-response relationships for the respiratory effects of cement dust. This is because the evidence-base collated for HSE's ORD sub-programme indicates that occupational exposure to dusts in general lead to an increased risk of chronic obstructive pulmonary disease (COPD). Cement dust is an alkaline and irritant material, suggesting it

might pose a greater risk of COPD than many other workplace dusts (often referred to as “low toxicity dusts”). Hence, we wanted to update the earlier HSE review to determine what degree of concern should be accorded to cement dust within the ORD sub-programme.

6. Furthermore, within the context of the ORD sub-programme, HSE intends to commission a review of the exposure-response relationships for the effects of coalmine dust on FEV₁ with a comparison against other dusts for which appropriate data are available. There is a detailed dataset on coalmine dust covering 7000 workers with 20 years of follow-up. The intention is to explore the possibility of using the data on coalmine dust as a benchmark for characterising the risks of “low toxicity dusts”. This in turn will help to determine the adequacy of the generic COSHH position relating to the values of 4 and 10 mg.m⁻³ (8-hour TWA) for respirable and total inhalable dust fractions respectively. The hope is that the updated assessment of cement dust can be compared, even if just qualitatively, against the data on coalmine dust, to help determine where cement dust stands in relation to other workplace dusts.

7. A further reason for undertaking this assessment is that it has been drawn to the attention of HSE that in recent years a number of case-control studies have been published suggesting that cement dust may be a cause of laryngeal and pharyngeal cancer. Given that the HSE (1994) review noted that the evidence on carcinogenicity was not reassuringly negative for cement dust, and given the widespread exposure to cement dust, it was felt worthwhile to examine the new data on carcinogenicity. Such evidence is relevant to the developing Cancer sub-programme of the Disease Reduction Programme.

8. The documentation provided with this Cover Paper consists of the draft updated health assessment, attached to which (as Annex 1) is a copy of the earlier HSE (1994) criteria document on Portland cement.

Argument

Respiratory effects

9. As can be seen from attached documentation, a considerable number of studies have been published since 1991 on the respiratory effects of cement dust. These studies are all based on workers engaged in the manufacture of Portland cement, but no studies have been conducted in the UK. The studies present a consistent picture of an excess of respiratory symptoms (chiefly chronic productive cough) and deficits in FEV₁ in exposed workers compared to control groups, but with one exception, all the studies are cross-sectional in design, and do not inform on dose-response relationships.

10. In the one retrospective cohort study available, carried out in Norwegian cement-manufacturing workers, the results suggest that long-term exposures to an average of about 1 mg.m⁻³ (respirable dust) did not lead to deficits in lung function or to an excess of COPD compared with a control group. A couple of studies described in the earlier HSE (1994) review provide support for this finding.

11. Exposure information provided in other studies suggests relatively high exposures to respirable and total inhalable dust in many cement-manufacturing workplaces. A cross-sectional study in Taiwan cement factories found that with current average respirable dust levels of just under 4 mg.m⁻³ there were marginal but statistically significant deficits in FEV₁ and FVC in the exposed workers compared to controls. The results of a recent cross-sectional study in a Tanzanian cement factory were analysed leading to the conclusion that 30 years exposure to average total inhalable dust levels of 10 mg.m⁻³ would lead to marked deficits in FEV₁ and FVC. Presumably much of the total inhalable dust would have been in the respirable size range.

12. Overall, the pattern of evidence indicates that cement dust has the potential to cause chronic productive cough and impairment of pulmonary function, and hence qualitatively, this strengthens the picture presented in the earlier HSE (1994) review. However, there are no prospective cohort studies available that would allow reliable conclusions on dose-response relationships to be drawn. At most, it would seem reasonable to conclude from the data available that respiratory deficits would start to develop with long-term average exposures to respirable cement dust above 1 but below 4 mg.m⁻³.

Carcinogenicity

13. A number of studies on cancer mortality and morbidity of relevance to cement dust have been published since 1991. However, the overall situation appears little changed compared to that reached by WATCH in 1991. The key finding in 1991 related to an excess of stomach tumours in cement-manufacturing workers. Excesses had been observed in three separate cohort mortality studies with SMRs ranging from 119-175. There was little evidence to confirm these findings in the updated assessment, other than slight evidence of a dose-related trend towards an increase in stomach cancer in a study in cement-manufacturing workers from Lithuania. However, in the two further additional cohort mortality studies in Sweden and Denmark, there was no evidence of any excess of stomach cancer (although the former study did reveal a clear excess of cancer of the right-sided colon). Overall, as far as a causal relationship with stomach cancer goes, the picture presented in 1991 was one of uncertainty, and this updated assessment does not appear to change this situation.

14. The other key finding of note is that recent case-control studies from Germany suggest an increased risk of laryngeal and pharyngeal cancer associated with past occupational exposure to cement. Although these studies were generally well conducted and took adequate account of other risk factors for these types of head/neck cancers such as tobacco and alcohol consumption, the cancer cases reporting past exposures to cement in these studies largely comprised workers from the construction industry. HSE feels that there is considerable uncertainty surrounding the role of other exposures aside from cement dust in the construction sector and that no reliable conclusions concerning cement dust should be drawn.

Link to HSC Strategy

15. As explained in the Background section above, this assessment contributes to the ORD and Cancer sub-programmes of the Disease Reduction Programme.

Consultation

16. A copy of the updated assessment has been sent to a representative from the European cement manufacturing industry. Beyond this, no wider consultation beyond HSE has been undertaken.

European Context

17. None

Action

18. WATCH is invited to consider the attached documentation and comment on the hazard assessment with respect to: -

- Respiratory (non-cancer) effects and what can be concluded in relation to dose-response.
- Cancer issues. In particular, the opinion of WATCH is sought on the interpretation of the evidence from the case-control studies on laryngeal and pharyngeal cancer.

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References / Attachments

- Annex 1 Portland Cement : Hazard Assessment
Annex 2 Portland cement dust, Criteria document for an occupational exposure limit (1994)