Organic dusts and respiratory cancer: a complex issue

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Commentary on the paper by Laakkonen *et al* (see page 726)

Organic dusts are complex mixtures derived from vegetable and animal sources, often contaminated with endotoxins. Exposures to these dusts have been shown to affect development of respiratory diseases such as asthma, allergic alveolitis, byssinosis, chronic bronchitis, and emphysema.¹ Organic dusts occur in a range of occupations including agricultural work; the textile industry, especially cotton processing; flour milling and bakeries; and the wood industry, particularly sawmills, carpentry, and wood processing. Many of these occupations, particularly agricultural work, also have the potential for concurrent exposure to other substances that affect respiratory health, for example metals, gases, fibres, and chemicals.²

In contrast to non-malignant disease, the relationship between organic dusts and cancer appears to be more complex. In a Finnish record linkage study, Laakkonen *et al*³ identify elevated risks for nasal and lung cancer associated with wood dust and for laryngeal cancer associated with grain milling. They use the Finnish national job-exposure matrix (FINJEM) and occupations obtained from the 1970 census to assess exposures to organic dust. Although FINJEM has been established as fairly robust for establishing broad occupational cancer risks, this type of study is still subject to lack of precision and accuracy in the assessment of individual exposure, and has limitations for identifying specific sub-categories within an overall industry with potential for high exposures and increased risk.

For example, although the study confirms the established association between nasal cancer and wood dust, the elevated risk is statistically non-significant, in men only, and there is only one subject in the high exposure category. Specific studies in the wood industry have shown that the level and pattern of disease varies with the type of wood dust, the climatic conditions, the processes, and exposure to other potential hazards, such as formaldehyde.⁴ Laakkonen *et al* suggest that their results

may be due to the fact that most of the wood dust exposure in Finland is softwood (pine and spruce). The increased risk associated with hardwood dust has been found in several studies, including a Scandinavian study that found an odds ratio (OR) of 7.55 (95% confidence interval (CI) 1.7 to 33.6) associated with hardwood compared to an OR of 3.44 (95% CI 1.1 to 10.8) for softwood exposure.⁵ The risk has also been shown to vary considerably by specific wood-working industry. For example, a Dutch study found an OR of 11.9 for wood and paper industry workers, 16.3 for factory joinery and carpentry work, and 139.8 for furniture and cabinet making.⁶ In the UK, levels of wood dust have been declining over the years across all wood industry sectors.⁷ However, a UK survey of wood dust exposure in small businesses carried out in 2000 found that 30% of the businesses had levels in excess of the current 5 mg/m³ maximum exposure limit.⁸

A key issue in investigating the effect of organic dusts is the difficult problem of disentangling the separate effects of concurrent and multiple exposures. In the paper by Laakkonen *et al*, elevated risks of lung cancer were found for wood dust (but only in the lowest exposure) and generally reduced risks associated with many of the other organic exposures, including plant and animal dusts. Many mortality studies of farmers and agricultural workers have found reduced lung cancer, which has been attributed to a healthy worker survival effect, reduced smoking, and exposure to carcinogens. However, the potential protective effect of exposure to endotoxins in dust has also been hypothesised with risk decreased particularly in livestock farmers.⁹ Using a nested case-control design of lung cancer cases from follow up of subjects included in a historical archive of self-employed small farmers in Italy, a clear reduction in the risk of lung cancer was shown in relation to increased size of dairy herd in workers for whom less than 15 years had elapsed since ceasing dairy farming to end of follow up.¹⁰

However, this reduction was not shown for those farmers for whom more than 15 years had elapsed from the end of work to end of follow up. This suggests that removal of exposure to dusts that include endotoxins diminishes the protective effect.

This presents a dilemma to those involved in prevention of occupational ill-health. On the one hand there is clear evidence of the adverse effect of dusts, including those containing endotoxins on non-malignant respiratory disease. Studies such as that by Laakkonen *et al* and others indicate that there may be also be adverse effects for some cancers although this is less equivocal. On the other hand there may be protective effects of exposure to the same dusts for some diseases. The design of studies that can disentangle these effects and estimate the risks of concomitant exposure, together with elucidation of the mechanisms is required in order to develop appropriate interventions. It also remains essential to assess the effectiveness of any proposed interventions.

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