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Methods for estimating importance of chemicals in occupational health

A new study examines different methods for assessing the health impacts of chemicals that people are exposed to at work. Combining two different approaches may help reduce the effect of the shortcomings of each approach and provide greater assurance that the most damaging chemicals are prioritised for regulatory action.

In assessing the health impacts of chemicals, two different types of approach may be used. The first is the approach of the occupational risk assessment community. Employers have a duty to look after the safety and wellbeing of their staff and under EU law[1] are required to carry out risk assessments to identify and analyse any risks that their employees may be exposed to at work and judge whether they are acceptable. Risk assessment approaches have a longer history of application in EU policymaking, for example, in the regulation of chemical and radiological hazards – compared to the second type of approach: life cycle assessment (LCA)[2]. LCA assesses the environmental and health impacts of products (including chemicals) at each stage of their production, application and disposal.

The study combined knowledge from both approaches in order to assess the health impacts of chemicals in the workplace. It compared the results of a risk assessment methodology with those of an LCA methodology to prioritise a list of 38 chemicals that employees may be exposed to occupationally. For each method, they used a different equation to calculate chemicals' ranks.

Both methods incorporate information about the concentration of exposure, severity of health effects and total exposed population but in slightly different ways. The LCA method estimates the damage caused by chemicals using an 'effect factor' and values for severity of cancer and non-cancer effects, whereas the risk assessment method uses a more compact approximation based on the occupational exposure limit (OEL). The OEL is used in occupational risk assessment to limit concentrations of hazardous chemicals in the workplace.

The outcome was that the ranking results from each method were different, although five out of the top 10 ranked chemicals, in order of importance for future studies, were the same. These five chemicals were dichloromethane, ethanol, formaldehyde, methanol and toluene. The highest ranked chemical was dichloromethane for each method. Perhaps unexpectedly, ethanol featured among the top five chemicals in both cases, despite not being particularly toxic. The researchers say this illustrates the need to be cautious in interpreting the results of such studies. Closer monitoring of exposure to ethanol in the workplace would be preferable to replacing it as substituted chemicals might be more toxic.

According to the researchers, the two approaches are complementary and using both provides greater assurance in assessing health impacts of occupational chemicals. They also stress that assessment approaches need to be adaptable to emerging risks caused by new applications, materials and processes.

1. Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. Online: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0391:en:HTML
2. Cowell, S.J. *et al*. (2002). Use of Risk Assessment and Life Cycle Assessment in Decision Making: A Common Policy Research Agenda. *Risk Analysis*, 22(5).879-894.

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