The carcinogenicity debate on formaldehyde: How to derive safe exposure limits?

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Matters of good epidemiological practice (Boffetta et al. 2008; Clapp and Kriebel 2009; McLaughlin et al. 2009; Coglianò and Straif 2010) and consequences of potential conflicts of interest (Boffetta et al. 2009; Hauptmann and Ronckers 2009) have been topics of recent editorials and correspondence in scientific journals publishing human toxicity studies, including Archives of Toxicology (Slama 2009; Slama et al. 2009; Morfeld 2009a, b, c). This discussion specifically affected evaluations of a number of industrially or environmentally important chemicals, such as acrylonitrile, TCDD (Boffetta et al. 2008) and formaldehyde (Boffetta et al. 2009; Hauptmann and Ronckers 2009; McLaughlin et al. 2009). In this context, also the current evaluation of formaldehyde by the International Agency for Research on Cancer (IARC (International Agency for Research on Cancer) 2006; Baan et al. 2009), indicating strong evidence related to human sino-nasal cancer and moderate evidence of human leukaemia, was questioned (McLaughlin et al. 2009).

Key topics of the toxicity and carcinogenicity of formaldehyde have been recently reviewed (Kupczewska-Dobacka 2007; Sul et al. 2007; Duhayon et al. 2008). The carcinogenicity of formaldehyde and the derivation of a safe occupational exposure limit have been matters of

documentations by a number of scientific expert panels, including DFG (Deutsche Forschungsgemeinschaft) (2000), DECOS (Health Council of the Netherlands: Dutch Expert Committee on Occupational Standards) (2003), Nordic Expert Group (2003) and SCOEL (Scientific Committee on Occupational Exposure Limits) (2008). Just recently, SCOEL (Scientific Committee on Occupational Exposure Limits) (2008) has considered formaldehyde to be a “genotoxic carcinogen, for which a practical threshold is supported” (category 3, according to Bolt and Huici-Montagud 2008) and has recommended a health-based Occupational Exposure Limit of 0.2 ppm.

By contrast to occupational exposure, scientifically based recommendations for a health-based limit of environmental formaldehyde exposure, especially for indoor air exposure, have been scarce. For many chemicals, recommendations of safe environmental exposure levels were traditionally based on dividing recommended occupational limits by a fixed factor, e.g. a factor of 100. For formaldehyde, the German *Umweltbundesamt* had issued a specific recommendation of an indoor air limit for formaldehyde of 0.1 ppm and confirmed this in 2006 (UBA (Umweltbundesamt) 2006). However, an updated extensive documentation has been lacking.

In this issue of Archives of Toxicology, Nielsen and Wolkoff (2010) provide a new documentation on cancer effects of formaldehyde, in order to propose an indoor guideline level. They conclude that the guideline value of WHO (World Health Organization) (2000) of 0.08 ppm formaldehyde is still preventive of carcinogenic effects, in compliance with recent epidemiological findings.

We hope that this publication will contribute to the present international discourse on how to amalgamate scientific toxicological findings with regulatory requirements.

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