

A Proposed Approach for Setting Occupational Exposure Limits for Sensory Irritants Based on Chemosensory Models

SHANNON H. GAFFNEY* and DENNIS J. PAUSTENBACH

ChemRisk, Inc., 25 Jessie Street, Suite 1800; San Francisco, CA 94105, USA

Received 23 October 2006; in final form 24 February 2007; published online 30 June 2007

Objectives: Setting occupational exposure limits (OELs) for odorous or irritating chemicals is a global occupational health challenge. However, often there is inadequate knowledge about the toxicology of these chemicals to set an OEL and their irritation potencies are usually not recognized until they are manufactured or used in large quantities.

Methods: In this paper, the importance of accounting for risk perception and communication; conditioned responses; and interindividual variability in tolerance, detection and susceptibility with respect to setting an OEL are discussed in relation to three chemosensory models. These parameters and models were then used to construct a flowchart-style methodology that can be used to set an OEL for a specific chemical.

Results: The OEL identified for a chemical odorant or irritant will depend on the type of chemosensory effect that the chemical is likely to exhibit. For example, experience has shown that chemicals with a low odor threshold often require low OELs even though many are not toxic or do not cause irritation at those air concentrations.

Conclusion: In order to establish the appropriate OEL, organizations need to agree upon the percentage of the workforce that they are attempting to protect and the types of toxicological end points that are sufficiently important to protect against (e.g. transient eye irritation, enzyme induction or other reversible effects). This is particularly true for sensory irritants. The method described in this paper could also be extended to setting limits for ambient air contaminants where risk perception plays a dominant role in whether the public views the exposure as being reasonable or safe.

Keywords: occupational exposure limits; odorants; sensory irritants