

Society For Risk Analysis Annual Meeting 2010

Risk Analysis in Action

W4-E: Wednesday, December 8, 2010

All Routes of Exposure

W4-E.3 16:10 Estimating Occupational Dermal Exposures to Benzene. *Williams PRD*, Sahmel J, Knutsen J, Spencer J; E Risk Sciences, LLP, ChemRisk, Colorado School of Mines, Environmental Profiles, Inc.* pwilliams@erisksciences.com

Abstract: There is growing emphasis in the United States and Europe regarding quantification of dermal exposures of chemical mixtures and other substances. In this presentation, we evaluate the potential for dermal uptake of benzene from neat, aqueous, and organic liquid mixtures based on a comprehensive review and analysis of the published literature. Specifically, we summarize and/or calculate the permeability coefficient (Kp) and dermal flux of benzene for more than 50 experimental results (taken from more than dozen in vitro and in vivo studies), and assess how different factors (e.g., anatomical site, skin thickness, test species, vehicle, chemical activity) can affect the uptake of benzene through the skin. We find that the dermal flux for neat benzene was fairly consistent across in vivo studies, ranging from approximately 0.2-0.4 mg/cm²-hr (human data sets) and 0.5-0.7 mg/cm²-hr (animal data sets), except for a few outlier values. Greater variability in dermal uptake was observed for the neat benzene in vitro data sets. Observed outlier flux values for neat benzene were likely due to (1) the use of animal test species that have more permeable skin than humans, (2) study conditions that result in damage to the skin barrier, and/or (3) estimates of the evaporation rate of benzene for unoccluded skin conditions. Because few dermal absorption studies have been conducted on benzene-containing organic mixtures and aqueous solutions, and available test results are highly variable and uncertain, we recommend that estimated flux values for benzene for specific mixtures should not be used as surrogates for other mixtures. We also discuss the most appropriate applications for quantifying occupational dermal exposures to benzene and highlight important areas in need of further research.