

PO 128-2 Dermal Absorption of Benzene in Occupational Settings: Estimating Uptake and Applications for Risk Assessment. *P. Williams, E Risk Sciences, LLP, Boulder, CO; J. Sahmel, ChemRisk, Boulder, CO; J. Knutsen, Colorado School of Mines, Golden, CO; J. Spencer, Environmental Profiles, Inc., Columbia, MD.*

Objective: There is growing emphasis in the United States and Europe regarding the quantification of dermal exposures to chemical mixtures and other substances. In this presentation, we characterize the dermal flux of benzene in neat form, organic solvents, and aqueous solutions based on a critical review and analysis of the published literature, and discuss appropriate applications for using benzene dermal absorption data in occupational risk assessment.

Methods: We synthesize and analyze data for 77 experimental results taken from 16 studies of benzene skin absorption. We also assess the chemical activity of benzene in simple hydrocarbon solvent mixtures using a thermodynamic modeling software tool.

Results: Based on the collective human in vivo, human in vitro, and animal in vitro data sets, we find that the steady-state dermal flux for neat benzene (and benzenesaturated aqueous solutions) ranges from 0.2 to 0.4 mg/(cm² h). Observed outlier values for some of the animal in vivo data sets are possibly due to the use of test species that have more permeable skin than humans or study conditions that resulted in damage to the skin barrier. Because relatively few dermal absorption studies have been conducted on benzene-containing organic solvents, and available test results may be influenced by study design or vehicle effects, it is not possible to use these data to quantify the dermal flux of benzene for other types of solvent mixtures. However, we describe several potential approaches that can be used to derive a rough approximation of the steady-state benzene dermal flux for these mixtures.

Conclusions: Important study limitations include a lack of data on factors that affect the dermal uptake of benzene, meaningful metrics for evaluating the dermal uptake of benzene, the effect of skin damage on the dermal flux of benzene, and standardized test methods for estimating the dermal flux of benzene.