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Analysis of Exposure to Benzene from a Mineral Spirit Solvent Used During Parts Washing and Degreasing Operations

Sheehan, P; Hicks, J; Goswami, E; Richter, R; Fedoruk, M J; Lau, E



Author Information

*Exponent, Oakland, CA, USA; †Exponent, Irvine, CA, USA; and ‡Exponent, Menlo Park, CA, USA.

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Background:

Historically, the primary focus of benzene exposure assessment was on workers in industries that produced or used substantial quantities of benzene; however, questions have been raised regarding workers exposed to products generally containing low levels of benzene. Mineral spirit solvents are one type of benzene-containing product that has drawn attention because of widespread use in cleaning and degreasing applications, such as parts washing, but few exposure data exist.

Methods:

This study summarizes previously unpublished benzene data for parts-washing activities and provides an evaluation of potential daily and lifetime cumulative exposures of workers, typically mechanics, to benzene associated with the use of historical and current formulations of a recycled mineral spirit solvent in manual parts washers. The distributions of the potential total doses from inhalation and dermal uptake of benzene from the use of parts washers were calculated using probabilistic methods.

Results:

The 50th and 95th percentiles of the potential daily inhalation doses for workers performing parts washing are 0.42 and 2.9 mg (0.013 and 0.091 ppmv equivalents) for the historical solvent and 0.11 and 0.99 mg (0.0033 and 0.031 ppmv equivalents) for the current solvent formulation, respectively. The estimated 50th and 95th percentiles of total internal daily dose from both inhalation and dermal exposure are 0.32 and 2.1 mg and 0.076 and 0.70 mg benzene for historical and current solvent formulations, respectively. The results which take into account both inhalation and daily dermal contact with the solvent, indicate that inhalation constitutes approximately 93 and 99% of the total 50th percentile benzene dose for workers using historical and current solvent formulations, respectively. The 8-hour ppmv-equivalent value for the 95th percentile daily mechanic exposures from parts washing using the historical solvent, 0.091 ppmv, is well below the current Occupational Safety and Health Administration permissible exposure limit of 1.0 ppmv for benzene. Additionally, the estimated 50th and 95th percentiles of the distribution of occupational lifetime cumulative dose via inhalation for mechanics working in facilities with parts-washing units using the historical solvent are 0.029 and 0.53 ppmv-years, respectively.

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