Occupational and Environmental Exposures of Skin to Chemicals - 2005

Abstract for Poster 78

Urinary (2-Methoxyethoxy)acetic Acid: A Comparison of Two Analytical Test Procedures for Quantification

C. B'Hymer, K.L. Cheever*
NIOSH, Cincinnati, Unites States

Two derivatization procedures were evaluated for the quantification of (2-methoxyethoxy)acetic acid (MEAA) in urine. MEAA is a metabolite and biomarker for exposure to 2-(2-methoxyethoxy)ethanol, a glycol ether which is of concern because of general toxicity. Glycol ethers have been frequently reported to damage the hemopoietic system, the male reproductive system and have demonstrated fetal/embryonic developmental toxicity. Specifically of interest to this laboratory is the use of 2-(2-methoxyethoxy)ethanol as an anti-icing additive to the military jet fuel JP-8. 2-(2-Methoxyethoxy)ethanol is readily absorbed through the skin and of concern for human dermal exposure. Two derivatization/GC test procedures to quantify the level of MEAA in human urine were developed and compared. Gas chromatography using a mass selective detector and a 50-m X 0.20-mm (id) dimethylpolysiloxane capillary column were used in each procedure studied. First, MEAA was extracted from fortified urine with ethyl acetate. Esterification of MEAA to the corresponding ethyl ester was one derivatization approach, and the derivatization of MEAA to the corresponding *tert*-butyldimethylsilane (TBDMS) derivative was the second approach for gas chromatographic anaylsis. Recovery studies using 2, 5, 10, and 20 µg/ml MEAA fortified human urine samples demonstrated good accuracy and precision for both procedures. Recoveries using the ethyl ester procedure varied between 95-105% with precision measured as percent relative standard deviation (%RSD) as high as 14.3%. Recoveries using the silylation reagent were between 94-99% with %RSD as high as 7.3%. The TBDMS derivative procedure was less labor intensive and demonstrated better precision. The diethyl ester derivative procedure had better chromatographic performance from the more extensive sample cleanup.

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This conference follows the success of the first International Conference on Occupational and Environmental Exposures of Skin to Chemicals: Science and Policy, which was held near Washinton, DC, in September, 2002.

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