

Commentary

High Background Levels of Urinary Benzene Metabolites Found in a Volunteer Study

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INTRODUCTION

Although benzene exposure is most often assessed via air monitoring, its metabolites can be measured in urine as well. The most commonly measured urinary metabolites for benzene are phenol, t,t-muconic acid (ttMA), and s-phenylmercapturic acid (sPMA). Biological monitoring for benzene can be done to assess both peak and chronic occupational exposures. The Occupational Safety and Health Administration (OSHA) benzene standard (29 CFR 1910.1028) requires that in an emergency benzene exposure incident, an employee's urine be collected at the end of the shift and analyzed for phenol adjusted for specific gravity. If the urinary phenol exceeds 75 mg/L, further medical evaluation and monitoring is required. In addition, the American Conference of Governmental Industrial Hygienists (ACGIH[®]) has established recommended biological exposure indices (BEIs) for benzene exposure of 500 μg ttMA/g creatinine and 25 μg sPMA/g creatinine measured at the end of a work shift.⁽¹⁾ The BEI for both metabolites is based on the current threshold limit value (TLV) of 0.5 ppm. Studies show that urinary phenol levels are not reliable indicators of airborne benzene exposures below approximately 5 ppm.^(1–6)

This commentary presents the urinary phenol and ttMA results of one volunteer (first author) exposed to low levels of airborne benzene while simulating historical occupational exposure to Liquid Wrench. These results were used to evaluate the reliability of a single person's urinary excretion levels of phenol and ttMA to accurately portray low level exposure to benzene.