Laboratory Evaluation and Field Testing Of A Collection Method For 1-Bromopropane In Exhaled Breath

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1-Bromopropane (1-BP) has been marketed as an alternative for ozone-depleting solvents and is in adhesives, cleaning solvents, and aerosol products. Toxicity of 1-BP is poorly understood, but it may be a neurologic, reproductive, and hematologic toxin. Sparse exposure information has prompted NIOSH to conduct a multi-industry study using air, exhaled breath, and urinary metabolite measurements. Exhaled breath analysis can be a powerful, non-invasive tool which is affected by inhalation and dermal exposures. Breath sampling methods must be accurate, sensitive, and unaffected by water vapor to measure trace levels consistently without contamination or deterioration. This study evaluated a practical breath collection method for 1-BP analysis conducted at an off-site laboratory with proper quality control.

Three-liter Tedlar7 breath bags with waste-air diverting valves were used for end-tidal breath collection. Bags were filled with nitrogen or breath and spiked in triplicate with nominal concentrations of 0.2, 0.5, 2, and 5 ppm. The bag mixtures were adsorbed on carbon molecular sieve tubes and analyzed by gas chromatography via NIOSH Method 1025. The limit of detection was 0.7 _g; therefore, 1-BP could be detected as low as 0.05 ppm in 3 liters. The mean recoveries of 1-BP were 72% and 73% for nitrogen and breath trials, respectively. The mean recovery after 3 hours was nearly the same (73.5%). Breath samples were provided by workers using 1-BP solvents and spray adhesives. Breath concentrations of 1-BP ranged from 1.7 to 20.8 ppm in post-shift samples, and from 0.44 to 2.9 ppm in 16-hour post-shift samples. This study demonstrates that respiratory elimination is an important excretion pathway useful to evaluate 1-BP exposures. Furthermore, this sampling strategy allows breath samples to be analyzed off-site, thereby eliminating analysis with portable instrumentation in field surveys.

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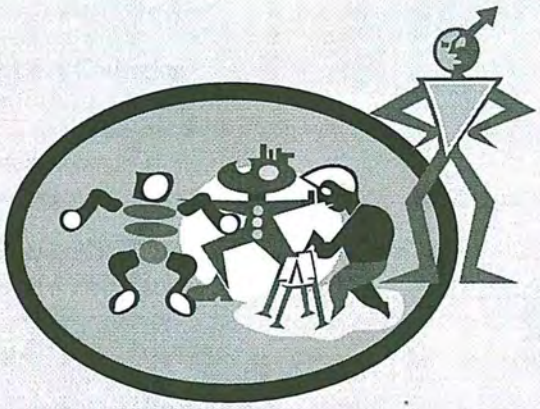

Abstract

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