



Utilizing Biomarkers to Detect Epoxy Resin Exposures Among Construction Workers

Urinary biomonitoring of occupational exposures to Bisphenol A Diglycidyl Ether (BADGE) – based epoxy resins among construction painters in metal structure coating

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Overview

Epoxy resin systems are used widely in construction as part of protective coatings for steel structures such as bridges, storage tanks and wind turbines. Occupational exposures to epoxy resins have been associated with allergic and irritant dermatitis, occupational asthma, hypersensitivity pneumonitis (epoxy-resin lung) and acute decline in lung function. Seventy-five to 95% of these coatings contain bisphenol A diglycidyl ether (BADGE), and this research team has documented high inhalation and skin exposures to BADGE among workers using these products. As part of their continued examination of exposure to epoxy resins, the researchers collected urine samples from 44 painters applying mid- and top-coats to steel structures. This study's goal was to determine urinary concentrations of BADGE biomarkers among construction painters, examine their cross-shift changes in urine, and compare urinary biomarkers' concentrations among mid-coat and top-coat painters. This is the first biomonitoring study of exposures to epoxies in occupational settings, including construction.

Key Findings

- Among the four biomarkers measured, BADGE-2H2O provided high sensitivity (quantified in 100% of urine samples) and specificity (able to discriminate between various exposure scenarios and across shifts), making it a potentially robust urinary biomarker for biomonitoring of exposure to BADGE-based epoxy coatings among workers using them in occupational settings.
- A statistically significant 2.9X increase pre- to post-shift in the BADGE-2H2O biomarker was observed among mid-coat applicators, who directly used epoxies-based paints at the day of urine sampling.
- The authors propose an initial urinary concentration of 0.5 ng/mL for BADGE-2H2O as a threshold for good hygiene practices for epoxy exposures in occupational settings.
- Field observations, in combination with urinary biomonitoring, indicate that better exposure controls are needed for construction workers who paint steel structures and other surfaces with commonly used epoxy resin systems.

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Read the abstract:

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