Prevent Cough Syrup Poisonings With Color-Changing Polymer Films

Diab, Lamis (School: Gwinnett School of Mathematics, Science, and Technology)

Diethylene glycol DEG contamination in medicinal syrups represents a persistent global health crisis, having caused over 300 child fatalities since 2022 alone, and occurring recently as of October, 2025. These toxic industrial solvents, often undetectable due to their similarity to pharmaceutical glycerin, require laboratory-based analysis for identification, which is a resource-intensive process unavailable in low-income regions where poisonings predominantly occur. This study evaluates a novel, low-cost colorimetric detection system utilizing molecularly imprinted polymers (MIPs) integrated with leuco crystal violet dye for rapid, consumer-accessible DEG identification. It was hypothesized that DEG concentration would directly affect leaching time from polymer films, with higher concentrations yielding faster, more pronounced color changes. Methacrylic acid was used as the monomer and ethylene glycol dimethacrylate cross-linker, with DEG as a template molecule. Control non-imprinted polymers (NIPs) were synthesized in parallel. Films were tested against DEG concentrations of (0.01%, 0.1%, 0.5%, 1%, 10%, 40%, and 60%) , with triplicate runs across multiple days (n=84 trials). Results demonstrated MIP specificity, with significant color development within seconds exclusively in DEG presence, while NIPs and common syrup excipients (glycerol, sucrose) showed negligible response. The system achieved detection at concentrations relevant to toxic thresholds with. This research establishes a modular detection platform that could prevent fatalities by enabling pre-consumption contaminant screening in resource-limited settings, addressing a critical gap between laboratory diagnostics and consumer protection.

Awards Won: