**Abstract/Outline/Brief Narrative:**

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Title: **Effect of Cycles of Contamination and Decontamination on Chemical Glove Performance**

Chemicals that saturate protective gloves cause matrix contamination to the glove materials. Following exposure, the contamination may then diffuse from the matrix to both sides of the gloves. As a result, subsequent wearing of the gloves without decontamination may expose the wearers' skin to the diffused chemicals. An adverse skin reaction may result, such as allergic contact dermatitis, which requires only a very minute concentration to trigger an allergic response.

In this study a method was developed for matrix decontamination based upon the permeation theory and glove resistance. The ASTM F739 method of permeation was used to measure the breakthrough (BT) and steady state permeation rate (SSPR) of toluene, which was used as the contaminant of three glove materials: nitrile, neoprene, and butyl. A closed-loop system, consisting of an Infrared analyzer (IR), an AMK 1-inch permeation cell, and a metal bellows pump, was used to obtain the data. The success of the decontamination was measured by the degree of resistance to permeation as determined by BT and SSPR. Following the exposure, the toluene contaminant was extracted from the matrix of the glove materials using consecutive washes of ethyl alcohol in three concentrations: 100%, 75%, and 50%, followed by a distilled water wash. The exposed sample of glove material and each wash solution was placed in a container which was in turn, incubated in an ultrasonic bath at 60 °C for 30 minutes.

Chemical resistance (BT and SSPR) of the three materials was measured for eight consecutive cycles of exposure and subsequent decontamination. The results indicate that the resistance of the neoprene glove material was not compromised in any of the eight cycles. Chemical resistance for the nitrile material was compromised after two cycles, (BT decline:33.6%, $p \leq 0.01$) while the butyl was compromised after the initial exposure (BT decline = 6%, $p \leq 0.01$). There was also an increase in SSPR values following the first exposure cycle.

In a separate study, the authors found that decontamination by heat extraction yielded good results with both neoprene and nitrile but was ineffective for the butyl. Thus, the authors concluded that no single method of decontamination is equally effective for all glove materials or all chemicals. Therefore, further studies are needed to determine the most effective decontamination methods for different material-chemical combinations.

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# Effect of Cycles of Contamination and Decontamination on Chemic Glove Performance

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