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# Isocyanates in the construction industry - Dermal exposure





## The Problem

Isocyanates are respiratory and skin sensitisers. They have been identified by HSE as a major cause of asthma in the motor vehicle industry and, under the COSHH regulations, there is a responsibility on dutyholders to reduce exposure to such substances as far as is reasonably practicable. Some hardeners and resins that are based on isocyanate polymers have low volatility and therefore a low risk of inhalation exposure. HSE investigated the potential for dermal exposure during the laying of polyurethane floors.



## The work

A company laying a polyurethane floor were using a resin mixture containing a methylene diphenyl diisocyanate (MDI) based hardener. The process involved one worker mixing the resin, another carrying the resin to the application area and two workers spreading the resin with trowels and smoothing with rollers. The two floor spreaders were observed by occupational hygienists from HSL to be wearing short-sleeve tops and general-purpose gloves whereas the other two other workers wore long-sleeve overalls.

## What we did

Personal air samples were taken for all workers and analysed by scientists at HSL. Inhalation exposure (8hr Time Weighted Averages) was low (all results well below the Workplace Exposure Limit) and results agreed with static samples indicating no significant aerosol exposure. MDI was detectable on glove samples from the worker mixing the resin and one of the floor spreaders.

Pre and post-shift urine samples were collected over 4 days from all workers and analysed by the biological monitoring team at HSL for methylene dianiline (MDA), a biomarker for MDI exposure. All samples had detectable MDA levels which were higher pre-shift than post-shift indicating a delayed absorption route which can be explained by dermal absorption. The levels of MDA measured in urine were higher than those values expected from inhalation exposure alone at the air concentrations measured. Statistical analysis also showed a significant correlation between MDI levels measured on gloves and next day pre-shift urinary MDA levels.

Biological monitoring showed that dermal absorption of isocyanates is possible and results can exceed the UK biological monitoring guidance value of 1  $\mu\text{mol/mol}$  creatinine.

## Outcomes/ recommendations

Evidence for significant dermal absorption of isocyanates has been demonstrated and appropriate precautions when handling resins containing isocyanates should be taken.