

## CASE REPORT

## Toxicology

# Contact chemical burn of the hand caused by xylene: A case report

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## Abstract

The use of household cleaners during non-commercial cleaning applications is a very common task, and the chemical makeup of the cleaning solutions vary as much as their applications do. Although most users of these products follow the written safety directions and are generally careful with their use, it is not uncommon for users to suffer toxicologic effects of these cleaners without proper protective equipment. In this case report, we describe an unusual chemical burn pattern to the hand of a young female patient after prolonged exposure to a xylene-containing product without proper chemical-resistant gloves. Fortunately, with prompt recognition, and urgent referral for burn treatment, the patient underwent a successful debridement of the burn and suffered minimal functional impairment.

## KEYWORDS

burns, chemical burns, emergency treatment, hand injuries, irritants, toxicity, xylenes

## 1 | BACKGROUND

Xylene is an aromatic hydrocarbon-based chemical mixture of isomers with many uses. It has been present in modern industry for many years as a solvent and is present in industrial synthesis reactions as well as in household cleaning products. The toxicity of xylene is well known, and occupational exposure limits are strict to prevent toxicity from occurring.<sup>1,2</sup> Toxicity of xylene is wide-ranging, because prolonged exposure to toxic levels can cause respiratory distress, alteration in consciousness, ototoxicity (from long-term exposure), and is a skin irritant through its ability to strip oils from the skin and defat the tissues. This is complicated by the fact that the same exposure defats the stratum corneum layer of the normal epidermis, which in turn leads to enhanced chemical absorption.<sup>3</sup> This can then lead to a spectrum of skin disruption with ongoing exposure from contact dermatitis ultimately through to necrosis.<sup>4-6</sup> Generally, xylene mixtures (that include

the isomers *m*-xylene, *o*-xylene, and *p*-xylene) are classified as a category 4 dermal toxin, indicating they are relatively less toxic than other dermal toxin substances, hence requiring prolonged exposure to cause damage and/or toxicity.<sup>7,8</sup>

## 2 | CASE REPORT

### 2.1 | Introduction

A previously healthy 22-year-old right-hand-dominant female presented to the emergency department (ED) complaining of right-hand pain and sensory disturbance. The patient reported having been assisting with cleaning throughout the day. She had been using a chemical cleaner that contained xylene on floors.<sup>9</sup> Exposure time was ~7–8 hours in length. She began to notice pain in her hand, difficulty

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**FIGURE 1** Volar aspect of affected hand. Note devitalized tissue and discoloration of distal phalanges

with flexion, and tingling/numbness to approximately the mid-palmer crease. She noted difficulty with flexion of the digits of that hand and blistering of the palmar surface of her hand and fingers. The patient was an otherwise healthy 22-year-old female without any significant past medical, surgical, or social history. She was not taking any medications at the time of the presentation to the ED, nor did she have any known allergies or known co-exposures. Before presentation, the patient decontaminated her hand multiple times with soap and water.

## 2.2 | Clinical findings

An otherwise healthy 22-year-old right-hand-dominant female in minimal distress with unremarkable vital signs and an isolated contact burn/irritation to primarily the volar aspect of digits 1–5. There was devitalization of the middle and distal aspect of all 5 fingers. No frank blistering noted, but the tissue was hard and woody at the distal phalanges, with the second and third digits being the most severe (Figure 1). There was no significant sensory function of the first through fourth distal phalanges concerning fine touch or pain. The distal phalanges were white in appearance without capillary refill. Capillary refill was present but diminished at the proximal phalange at the first interphalange crease. The dorsal aspect of the phalanges was also affected but not as significantly as can be seen in the clinical pictures (Figure 2). There was no significant sensory disturbance to the dorsal tissues.



**FIGURE 2** Dorsal aspect of hand with less severe color change to distal phalanges

## 2.3 | Case conclusion

The patient received oral pain and anti-nausea medication. She subsequently underwent transportation by ground to a regional burn center. She underwent operative debridement of the devitalized tissue of digits 1–4 digits. She was otherwise conservatively managed and retained the full functional ability of her right hand on follow-up at 1 month with minimal residual scarring or discomfort.

## 3 | DISCUSSION

As mentioned above, xylene exposure can occur both in industrial and civilian use. The toxic effects of xylene exposure depend on the route and length of exposure. In this case, we presented a young female with relatively prolonged cutaneous exposure to a xylene-containing compound without any protective equipment. She sustained the equivalent of a chemical contact burn to the right hand, predominately affecting the volar surface of the right hand. While initially presenting with discomfort and functional limitation in terms of reduced flexion of the digits and sensory disturbance, prompt recognition of the significance of the injury, referral to burn center, and debridement resulted in full functional recovery with minimal pain at 1-month follow-up. Although inhalational toxicity to aromatic hydrocarbons is a well-recognized

toxicologic and environmental emergency, prolonged exposure and significant damage to dermal tissue, in this case of the hands, is much less common. Previous occupational exposure reports indicate most exposures being self-limited and resulting in irritation only.<sup>6</sup> Recognition of the danger presented by prolonged cutaneous exposure to xylene-containing compounds is an important consideration when faced with this situation, as prompt recognition, referral, and treatment are essential in minimizing the potential long-term impact of this type of chemical exposure burn.

#### ACKNOWLEDGMENTS

The patient has given their express informed consent for this case to be published. This article conforms to the CARE case report guidelines.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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