Occupational Cutaneous Burn

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A 23-year-old research assistant in a biological laboratory presents to the occupational health clinic with a 30-min history of painful swollen left arm as a result of chemical burns to her left forearm while working with a disinfectant in the laboratory. She wore her usual personal protective equipment including her lab coat, gloves, and a face shield. Immediately after the accident she removed her lab coat and rinsed her arm with tap water copiously, but the pain became unbearable so that she stopped rinsing the lesion. In the occupational health clinic, she was noted to have blistering erythema on the flexor surface of the left forearm with streaks of non-peeling edematous skin that was tender to touch (Figures). There were no systemic symptoms or signs. She had no airway injury or respiratory difficulties.

What is the likely chemical involved and what is the initial management of this burn injury?

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Phenol Burn

The chemicals that may result in chemical burn by cutaneous exposure in a biological research laboratory include acids, aldehydes, chlorinated compounds, oxidants, and phenols. Our patient was working with a disinfectant that subsequently spilled onto her forearm skin resulting in a first-degree burn. Of all the listed chemicals, aldehydes (glutaraldehyde), alcohols (isopropanol), chlorinated compounds (bleach, chlorine), oxidants (hydrogen peroxide), phenols, and quaternary ammonium compounds (benzalkonium chloride) are the likely disinfectants in a biological laboratory. Among the listed disinfectants, cutaneous exposure to phenol and acids are the most likely to result in dermal burns. Boric acid is used as an antiseptic cutaneous exposure to which gives a characteristic boiled lobster appearance to the skin. Fortunately, the patient knew she was exposed to phenol, also known as carbolic acid. In contrast to an alkaline burn, which results in liquefactive necrosis, exposure to an acid results in coagulative necrosis leading to edema, erythema, ulceration, and necrosis of tissue and ultimately eschar formation that limits further penetration of the acid.[1] Phenol effectively penetrates the skin, leading to severe burns and systemic toxicity.

The first step in the management of cutaneous exposure to phenol in the laboratory is immediate decontamination such as removing the carbolic acid-soaked laboratory coat or removal from the source of exposure. Some studies have discouraged rinsing the lesion with water (as it was done in this case), as this may increase the dermal absorption of phenol and tissue injury.[2] Others have suggested that water and phenol form a bilayer making it difficult to remove the phenol.[3] Some animal studies in rat and pig models, respectively, suggest that low molecular weight polyethylene glycol (PEG 400) and 70% isopropanol are superior to water in decreasing dermal burn injury and equally effective.[2-4] However, in the absence of polyethylene glycol or isopropanol, high-flow water is also recommended as the initial treatment.[3]

For more information on phenol burn see http://www.theijoem.com/ijoem/index.php/ijoem/article/view/7

Conflict of Interest: None declared.

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