

Cement Burn

Khanh V.Q. Luong, MD, and Lan T.H. Nguyen, MD
Westminster, California

People working with cement should be aware of the potential for cement burn. The alkalinity of cement is due to the exothermic reaction of calcium oxide with water, which forms calcium hydroxide. Prolonged ex-

posure of the skin to wet cement may result in a caustic burn.

Key words. Caustics; burns, chemical; skin; calcium hydroxide. (*J Fam Pract* 1995; 41:601-602)

Cement is one of the most widely used substances throughout the world. The alkalinity of cement is due to calcium oxide. In reported cases of cement burn,¹⁻³ most patients were unaware of the hazards of prolonged contact with cement. We report two cases of cement burn.

nous antibiotics and daily soaks in povidone-iodine. The wound healed a few weeks later.

Case Reports

Case 1

A 35-year-old male construction worker developed minor irritation on his lower legs after wet cement spilled between his boots and legs. Seven days later, his lower legs developed many areas of deep secondary burns, requiring hospitalization for debridement of the necrotic tissue but no skin grafts.

Case 2

A 56-year-old man was admitted to the hospital for a severe leg ulcer. The patient was working in a cement powder plant. Cement leaked through his right boot and came in contact with and irritated his foot. Blisters developed, and his skin lesion began to have serous drainage over the next several days. Wound cultures grew *Pseudomonas aeruginosa*, for which he was treated with intrave-

Discussion

Portland cements are made by mixing and combining calcereous and argillaceous materials in the proper ratio. Five types of Portland cements are recognized in the United States. They contain varying amounts of the clinker compounds: calcium oxide, 60.20% to 63.85%; silicon dioxide, 19.90% to 21.08%; and alkali oxides, 1.4%.⁴ Calcium oxide (65% of the total weight) reacts with water exothermically to form calcium hydroxide [Ca(OH)₂], which may produce caustic burns to the skin. It is a strong alkali that can cause "liquefaction necrosis" of the tissue. It abstracts the water from the tissue and precipitates the protein. This process is distinct from "coagulation necrosis," which is caused by exposure to mineral acids. The time during which tissue is destroyed by alkali is more prolonged than with acids.

Roberts⁵ measured the total alkalinity of a mixture of Portland cement and water. Two minutes after mixing, alkalinity was approximately 0.05N (approximate pH conversion equaled 12.7), which is in the range of a strong alkali. Over the first 30 minutes, there was a rapid increase in total alkalinity to about 0.07N, which then remained relatively constant for between 8 and 24 hours. This increase in total alkalinity represents only one or two tenths of a pH unit, but such changes in pH may be physiologically significant.

In a study of the dermal chemical response to alkali injury in 60 men, Houck et al⁶ noticed a decrease in

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From Westminster, California. Requests for reprints should be addressed to Khanh V.Q. Luong, MD, 9188 Bolsa Ave, Westminster, CA 92683.

hydroxyproline in the lesions and an increase in hexosamine. The collagen content of the lesion also decreased profoundly within 3 days following injury. Some people seem to have skin that is particularly sensitive to caustics, whereas others have more tolerance.⁷ Allergic dermatitis can result from the presence of hexavalent chromates in cement in patients who have become sensitized to metallic salt,⁸ but this does not seem to be an important factor contributing to the burn.⁹

Rowe¹⁰ reported that prolonged exposure, usually more than 2 hours, of skin to wet cement can produce third-degree burns. The sand that is added to wet cement to make concrete can potentiate the burn by abrading the skin, particularly by means of the pressure and friction resulting from kneeling or movement within a boot.⁹ Hydration of cement is exothermic, but the rise in temperature is slow (about 10°C in 5 hours)¹⁰ and, thus, is not responsible for the burns.

People working with cement should be aware of this hazard. The risk of developing skin problems is highest when contact with wet cement is prolonged with pressure or occlusion. In case of contact, the skin should be washed with copious amounts of water. Appropriate antibiotics may be needed for secondary infection.

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Joseph B. Stanford, MD, MSPH
 Chairperson, AANFP Science and Research Committee
 University of Utah
 Department of Family and Preventive Medicine
 50 North Medical Drive
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 voice (801) 581-7234 ext 342
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