

## PHARMACOLOGY/TOXICOLOGY CASE STUDY #2

History: A 40-year-old male presents to your emergency department after falling into a vat of chromic acid. The patient arrives via EMS with a dry cough and is actively vomiting. He is complaining of chest pain and shortness of breath.

PMH: Asthma.  
Medications: Albuterol inhaler as needed.

### Physical Examination:

T: 98.6°F    HR: 115 bpm    RR: 29 breaths per minute    BP: 176/94 mm Hg

General: He is awake and alert.

HEENT: Normal.

Pulmonary: Diffuse wheezing, poor air exchange.

CV: Tachycardic, regular rhythm without murmur, normal perfusion.

Extremities: Diffuse skin ulcers in exposed areas.

## QUESTIONS CASE STUDY #2

1. What would be your initial approach to this patient?
2. What complications may be associated with this type of exposure?
3. What therapy is indicated?

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1. Decontamination should accompany stabilization of the airway, breathing and circulation. The patient should have all clothing removed and copious aqueous irrigation performed.
2. Chromic acid is a strong acid that contains the hexavalent ( $\text{CrVI}^3$ ), or most hazardous, form of chromium. Acute skin exposure may cause burns and chronic exposure may result in skin and nasal ulcer formation. These skin ulcers are round or oval growths with reddish edges and necrotic centers and are often referred to as “chrome holes” or “chrome sores”. Chromic acid inhalation may be associated with upper respiratory irritation and bronchospasm, manifested by cough, chest pain and dyspnea. Pulmonary congestion visible on radiographs, interstitial pneumonia and delayed, non-cardiogenic edema have been reported. Systemic effects include renal failure secondary to acute renal tubular acidosis, hemolysis and liver damage.
3. Initially, the focus should be decontamination, including removal of contaminated clothing and a deluge, or heavy downpour safety shower. Fluid and electrolyte balance should be maintained, especially in the case of large skin and mucosal lesions which can lead to significant fluid losses. The efficacy of activated charcoal has not been demonstrated. Ascorbic acid (vitamin C) has been recommended for cases of ingestion and skin exposure to reduce absorption of chromium by oxidizing it from the hexavalent to trivalent form, which does not cross cell membranes as rapidly. This intervention must be performed within two hours of exposure. Beta agonist therapy is indicated for bronchospasm. Patients should be observed for the development of renal failure, non-cardiogenic pulmonary edema and liver failure. Hemodialysis, exchange transfusion and chelation therapy are ineffective.

The Poison Control Center should be called for advice on antidotes and for assistance with management of poisoning/exposure to unfamiliar chemicals.

Prevention of exposure to chromium, particularly respiratory exposure, is critical as chromium has a demonstrated carcinogenic potential