

Irritants and Corrosives



Richard Tovar, MD^{a,*}, Jerrold B. Leikin, MD^b

KEYWORDS

- Corrosives • Irritants • Hazardous materials • Triage systems
- Communication of hazards • Contact dermatitis • Coagulative necrosis
- Liquefactive necrosis

KEY POINTS

- Irritant gas exposures predominantly affect the airways, causing tracheitis, bronchitis, and bronchiolitis.
- Complications of acute exposure may include adult respiratory distress syndrome, bacterial infections, and bronchiolitis obliterans (sometimes leading to pulmonary fibrosis).
- Diagnosis of acute exposure is usually obvious by history, but pulse oximetry and chest radiograph should be obtained. Follow-up evaluation should include spirometry and lung volume assessment.
- Treat acute irritant exposures supportively, and observe symptomatic patients and those at risk of delayed pulmonary injury for 24 hours.
- Corrosive compounds can cause significant immediate tissue destruction via direct contact.
- Skin decontamination involves a copious amount of water irrigation.
- Management of gastrointestinal exposure is mostly supportive, and includes endoscopy for significant ingestions.

INTRODUCTION

The US Occupational Safety and Health Administration (OSHA) defines an irritant toxic chemical as one whereby the skin or other organ system experiences reversible damage following the application of a test substance for up to 4 hours. OSHA defines a corrosive agent as one that produces irreversible damage to the skin or other organ systems; namely, visible necrosis into the organ system integumentary layers, following the application of a test substance for up to 4 hours. Corrosive reactions can cause coagulation or liquefaction necrosis. The damaged areas are typified by ulcers, bleeding, bloody scabs, and, by the end of observation at 14 days, discoloration caused by blanching of the skin, complete areas of alopecia, and scars.

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^a Medical Toxicology, Clinical Forensic Medicine, TacticalTox, 3215 Golf Road #130, Delafield, WI 53018, USA; ^b Medical Toxicology, NorthShore University HealthSystems-OMEGA, University of Chicago Pritzker School of Medicine, 2150 Pfingsten Road, Suite 3000, Glenview, IL 60026, USA

* Corresponding author.

E-mail addresses: rttox@me.com; rttox@yahoo.com

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Histopathology should be considered to evaluate questionable lesions. An example of the serious degree that chemical irritants and toxins can cause severe population toxicity is the release of chlorine gas from a train derailment on January 6, 2006, in Graniteville, South Carolina (Fig. 1). One rail tank car was estimated to have released approximately 60 tons of chlorine gas. The release resulted in at least 1 death and 250 exposures to residents of the surrounding area. More than 5000 residents were required to evacuate the scene, and the estimated cost of the cleanup, according to the National Transportation Safety Board, was more than \$30 million.

IRRITANTS

Irritants are materials that can cause inflammation of the body surface with which they come into contact. The inflammation results from concentrations far below those needed to cause corrosion.¹ Corrosives are discussed in a separate section. Hazardous material irritants can be divided into those that cause irritation along with contact dermatitis and those that cause upper respiratory symptoms. Examples of irritant gas placards are shown in Fig. 2.

Dermatitis is a localized inflammation of the skin. Signs of skin inflammation include some or all of the following: redness, heat, swelling, and pain. More significant signs can include blisters, scales, or eschars. Skin becomes inflamed with exposure to hazardous materials, resulting in a nonallergic, irritant dermatitis. Other contributory factors to the extent of an irritant contact dermatitis are as follows.

- Substance chemical properties (eg, acid, alkali)
- Concentration of substance
- Duration and frequency of exposure
- Body surface area of the skin that is affected
- Preexisting skin condition (eg, abrasions, perspiration)



Fig. 1. Aerial picture of Graniteville crash site. (From United States Environmental Protection Agency. On-scene coordinator: Norfolk Southern Graniteville Derailment. Available at: http://www.epaos.org/site/image_list.aspx?site_id=A4GY.)

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