

Chemical Burns Education Tips for the Rural Setting

CASE

- Carmen Blandin Tarleton, a Vermont nurse, was purposely doused with lye in an intimate partner violence attack in 2007
- TBSA 80% and blinded
- 2 face transplants in 2013 and 2020
- Chemical burns can be occupational accidents, methamphetamine production related and purposeful violent events
- Lye and Lime are different chemicals; lye can cause irreversible blindness within 3-5 minutes

REFERRAL CRITERIA PER THE AMERICAN BURN ASSOCIATION:

- Partial thickness burns >10% TBSA
- Burns on face, hands, feet, genitalia, perineum, major joints
- Full thickness burns in any age group including pediatrics
- Electrical, chemical and inhalation burns
- **IRRIGATE EYES IF EXPOSURE PRIOR TO TRANSFER & REMOVE CONTACT LENSES**
- Lower acuity burns initially assessed at non-burn center did not yield negative outcomes

CHEMICAL BURN DEFINITION / ACID VS ALKALI

- Definition: Burns caused by a caustic or corrosive chemical that comes in contact with skin, eyes or mouth
- Alkali burns are typically worse than acid burns
- Acid Burns is to coagulative necrosis as Alkali Burns are to liquefactive necrosis
- Acid – coagulative necrosis denatures tissue proteins and coagulates to wall off the acidic substance, which limits tissue damage.
- Alkali – liquefactive necrosis causes saponification resulting in further penetration of caustic material deeper into tissues. And causes epithelial cell death

CAUTIONS !!!

- **BRUSH off the chemical powder FIRST before using water irrigation**
- NEVER use hydrogen peroxide or alcohol on a chemical burn
- **DO NOT GIVE EMETIC AGENTS FOR ASPIRATION AS RETCHING CAN DAMAGE THE AIRWAY**



CHEMICAL BURN SUSPECTS

- farmers, roofers, road workers, home cleaners, industrial workers, military, landscapers, gas station workers, oil drillers, coalminers, car detailers, exterminators, methamphetamine producers and domestic violence abusers

CHEMICAL BURN PREVENTION

- Do job with protective clothing and safety glasses
- Handle chemicals in well-vented areas
- Carefully read chemical labels and instructions carefully
- Store chemicals per manufacturer guidelines
- Keep chemicals out of children's reach
- Ensure workers get proper health, safety and OSHA training
- **POISON CONTROL #: 1-800-222-1222 or local poison control number**
- **Other resources: Emergency Response Guidebook, PubChem, NIOSH**

ASSESSMENT/ABCS/LABS

- Ask patient, paramedic, or family the name of the chemical agent, duration of contact, if there was an explosion, what decontamination has taken place
- ABC care
- Fluids, tetanus prophylaxis, analgesia
- Labs for potential systemic toxicity: CBC, CMP, Coagulation studies, urine

EYE CARE

- Remove contact lenses
- Measure pH at the fornix (normal 6.5 – 7.5) using litmus paper
- Irrigation for 15-30 minutes with water or isotonic saline using a Morgan lens
- **DO NOT USE A MORGAN LENS WITH GLOBE RUPTURE OR PENETRATING INJURY**
- Manual eye irrigation for cement and wet plaster
- Consider ocular anesthetic such as proparacaine
- Once ocular pH in neutral range, consider antibiotic ointment

DECONTAMINATION

- Protect first responders and emergency personnel from chemical exposure during rescue using PPE per agency policy
- Move the patient from the exposure scene
- Remove patient's clothing and jewelry
- Facial decontamination prevents inhalation/ingestion of toxins
- **BRUSH OFF DRY CHEMICALS FIRST**
- Copious water irrigation; avoid high pressure irrigation
- In cold weather, warmer water is needed to prevent hypothermia
- Decontamination fluids should not drain into a drainage system
- Tissue damage continues as long as chemical substance remains on skin
- Alkali burns require irrigation sometimes more than 2 hours

CHEMICAL EXAMPLES AND THINGS TO KNOW:

ACIDS

- Hydrofluoric acid: QTc prolongation, ventricular dysrhythmia, avoid succinylcholine for RSI, which can increase potassium
- Phenols: agitation, hypotension, dysrhythmia
- White Phosphorus: cover wounds with saline-soaked gauze to prevent drying
- Hydrocarbons: multi-system injuries
- **Buffalo Wild Wings Manager Dies, 13 Hospitalized After Exposure to Toxic Cleaning Product Fumes:**
<https://time.com/5722129/buffalo-wild-wings-employee-dies-fumes>

ALKALI

- Anhydrous ammonia: eye and lung injuries, laryngospasm and glottis edema
- Cement: lower leg and knee injuries
- Hydrocarbons: prolonged exposure can cause full-thickness burns
- Tar & Asphalt: tar attached to skin to be removed, use petrolatum, baby oil

ACID OR ALKALI

- Elemental fragments remove with dry forceps, cover with mineral oil

REFERENCES:

Bodily, N. E., Bruenderman, E. H., Bhutiani, N., The, S., Schucht, J. E., & Bozeman, M. C. (2021). The effect of transfer on outcomes in burns. *Journal of Burn Care & Research*, 841-846.

Chemical burns. (2023, October 2). Burn and Reconstructive Centers of America.
<https://burncenters.com/burns/burn-services/chemical-burns>

Cox, R. D. (2021). Chemical burns. Medscape. <https://emedicine.medscape.com/article/769336-print>

Emergency Nurses Association, V. (2020). *Sheehy's Emergency Nursing Principles and Practice* (7th ed.). Elsevier.

Tarleton, C. B. (2013). *Overcome: Burned, blinded, and blessed*.

UpToDate. (2023). Topical chemical burns: Initial evaluation and management.
<https://www.uptodate.com/contents/topical-chemical-burns-initial-evaluation-and-management>

VanHoy, T. B., Metheny, H., & Patel, B. C. (2023). Chemical burns. StatPearls Publishing, 1-6.
<https://www.ncbi.nlm.nih.gov/books/NBK499888/>