Children are the silent and small victims of skyrocketing number of home meth labs

Highly dangerous 'shake and bake' method of making meth causes untold misery to children of junkies.

BY DEBORAH HASTINGS / NEW YORK DAILY NEWS / Monday, December 2, 2013, 10:38 AM
A 3-year-old boy in Florida, after brushing his teeth earlier this year, drank from a sippy cup that was sitting on the bathroom sink. He suffered severe burns. The cup contained drain opener.

A 1-year-old in Alabama suffered critical skin burns from drain cleaner after a March meth accident in his home spewed caustic chemicals.

A 15-month-old in Ohio was seriously injured from simply toddling around her home and picking up things contaminated with meth residue. In April, she sustained second- and third-degree burns on her back and mouth. Her genitals were also burned by poisonous dust that got inside her diaper.

A 20-month-old boy died in Kentucky’s Wayne County in 2009 after drinking from a cup left on a bedroom table that was filled with Liquid Fire.
Burns

- Estimated that burns make up 5-22% of physical abuse
- Inflicted burns account for up to 25% of all pediatric burns
- Types include
  - Scald
  - Contact
  - Electrical/chemical
## Burns

<table>
<thead>
<tr>
<th>Old System</th>
<th>New System</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>First degree</td>
<td>Not classified</td>
<td>Fiery red, very painful, but not blistered</td>
</tr>
<tr>
<td>Second degree</td>
<td>Partial-thickness</td>
<td>Extend through the epidermis and may penetrate into the dermis. Healing by regeneration; full function and appearance should be recovered.</td>
</tr>
<tr>
<td>Third degree</td>
<td>Full-thickness</td>
<td>Penetrate the dermis and may involve subcutaneous tissue. Hair follicles, sebaceous glands, and sweat glands are destroyed. Healing occurs through scar formation and re-epithelialization</td>
</tr>
<tr>
<td>Fourth degree</td>
<td>Complete burns</td>
<td>Extend into the subcutaneous tissue to include muscle, fascia or bone. They may generate systemic toxic reactions or rapidly lead to infection or sepsis.</td>
</tr>
</tbody>
</table>
Burns

- Scalds make up the majority of burns, with majority caused by tap water
  - Immersion
  - Splash/Spill
Scalds

- Forced Immersion: symmetrical with clear lines of demarcation
  - Most commonly involves buttocks, perineum, and lower extremities
  - Features: stocking and glove distribution, zebra stripes, donut hole sparing
Contact Burns

- As the name implies, caused by direct contact with a hot object
  - Hot irons, curling irons, stoves, cigarettes
  - Cigarette burns pretty common
    - Suggestive of abuse when burn present on a protected area of the body
    - Dorsum of hand can be suggestive
Contact Burns

- hot plate
- light bulb
- curling iron
- car cigarette lighter
- steam iron
- knife
- grid
- cigarette
- forks
- immersion

Images of contact burns on skin and feet.
Cigarette burn or Impetigo?
Chemical Burns

- In general, chemical burns account for a small proportion of burns in children...
- HOWEVER, chemical burns are often associated with more morbidity:
  - Requires specific first aid ➔ damage CONTINUES until the offending agent is removed!
  - Burns can go deeper
  - Can cause systemic symptoms
Chemical Burns

- Burns can range from mild erythema to severe tissue loss or even death
- Depends on multiple factors:
  - Specific agent
  - Concentration
  - Duration of exposure
Chemical Burns

Increased Exposure Risk to Children in Drug Endangered Homes

- Developmental:
  - Grabbing/ Hand-to-mouth behaviors
  - Close to ground/floor
  - Attracted to bright colors/ sweet tastes
  - Unknowingly imitate caregivers
  - Playing outside
  - Wrong place/wrong time
Chemical Burns

**Acidic**
- Coagulative Necrosis
  - denature proteins

**Basic**
- Coagulative and Liquefactive Necrosis
  - denature proteins and fat saponification
- WORSE than acidic burns
- Initially can seem superficial, but damage can progress to full thickness within 48-72 hr
**pH Scale**

- **Increasing Acidity**
  - 0: battery acid, strong hydrofluoric acid
  - 1: hydrochloric acid secreted by stomach lining
  - 2: lemon juice, gastric acid (stomach acid), vinegar
  - 3: grapefruit, orange juice, soda, wine
  - 4: tomatoes, acid rain, beer
  - 5: soft drinking water, black coffee, pure rain
  - 6: urine, egg yolks, saliva, cow's milk
  - 7: pure water
  - 8: sea water
  - 9: baking soda
  - 10: Great Salt Lake, milk of magnesia, detergent
  - 11: ammonia solution, household cleaners
  - 12: soapy water, baking soda
- **Neutral**
  - 7: pure water
- **Increasing Alkalinity**
  - 8: baking soda
  - 9: Great Salt Lake, milk of magnesia, detergent
  - 10: ammonia solution, household cleaners
  - 11: soapy water, baking soda
  - 12: bleaches, oven cleaner, household lye
  - 13: liquid drain cleaner
## Chemical Burns

### Specific agents

<table>
<thead>
<tr>
<th>Domestic item</th>
<th>Chemical agent</th>
<th>Pathological process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In the garage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batteries (car)</td>
<td>Sulphuric acid</td>
<td>Potent acid causing coagulative necrosis</td>
</tr>
<tr>
<td><strong>In the laundry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaners</td>
<td>Ammonia</td>
<td>Potent alkali causing oxidization and liquefactive necrosis</td>
</tr>
<tr>
<td></td>
<td>Sodium hypochlorite</td>
<td></td>
</tr>
<tr>
<td>Bleach</td>
<td>Sodium hypochlorite</td>
<td>As previous</td>
</tr>
<tr>
<td>Pool cleaner</td>
<td>Sodium hypochlorite</td>
<td>As previous</td>
</tr>
<tr>
<td><strong>In the kitchen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oven cleaners</td>
<td>Sodium (or potassium) hydroxide</td>
<td>Potent alkali causing oxidation and production of heat (exothermic)</td>
</tr>
</tbody>
</table>
# Chemical Burns

In the bathroom

<table>
<thead>
<tr>
<th>Toilet cleaner</th>
<th>Drain cleaner</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Precursors of sulphuric acid</td>
<td>• Sulphuric acid</td>
<td>Potent acids and alkalis as previous</td>
</tr>
<tr>
<td>• Hypochlorite</td>
<td>• Sodium hydroxide</td>
<td></td>
</tr>
<tr>
<td>• Hydrochloric acid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Image of cleaning products]
Chemical Burns - Management

1. Removal of the chemical is KEY!
   A. Remove all contaminated clothing
   B. **COPIOUS irrigation with tap water or sterile saline**
      - For at least 20 minutes
      - DO NOT attempt to use a neutralizing substance (ex: for an acidic burn, using a basic solution) can WORSEN damage!
      - Using “neutralizing” substance can result in an exothermic reaction and further damage
Chemical Burns-Management

2. Evaluation of the wound
   A. Word of caution: Assessment of chemical burns are notoriously difficult, since burns may be deceptively superficial
   B. Requires frequent evaluation
   C. Debridement of non-viable tissue
3. Systemic Toxicity
   A. Depends on what chemical is spilled
      1. Metabolic changes: most often acid-base imbalance, can monitor with CBG
      2. Electrolyte disturbance: monitor BMP’s -HFA a/w hypocalcemia and cardiac arrhythmias 😞
      3. Hypothermia: result of prolonged duration of irrigation; try and keep fluid close to body temp
Chemical Burns - Senna

Retrospective study conducted by Spiller et al in 2003 on children <5 y/o who ingested senna (used in laxative)

- In 33% patients (29/88), severe skin breakdown and blistering consistent with chemical burns appreciated

More prominent in diapered patients as opposed to toilet-trained children

Exact Mechanism unknown, but thought that when ingested senna is held in diapers over time, it can result in severe skin burns
Chemical Burns- Bleach

- In 2013, 3 case reports made of cutaneous burns from bleach
  - All three cases involved unsupervised children sitting in spilled bleach (time variable 5 minutes to ??)
  - pH range from 11.9-12.6
  - All had red-brown discoloration of skin with surrounding erythema
  - All three had symptom resolution within ~1 week, however had residual pigment changes (PIHP)
Chemical Burns - Bleach
Chemical Burns - Laundry Detergent

- In 2007, burn unit contacted for child who has spilled concentrated biologic laundry detergent on clothes and suffered subsequent partial thickness burn
  - Unknown how long detergent was on her
  - Patient did fine with resolution of burn within 1 week
- One of the authors of the paper tested prolonged biologic detergent use on himself
  - After 2 hrs → no burn
  - After 12 hrs → superficial partial thickness burn
Acetone: nail polish, paint thinner
Lithium: batteries
Toluene: brake fluid
Pseudoephedrine: cold medicine

Red Phosphorus: matchbox
NaOH: lye
Sulfuric acid: drain/toilet bowl cleaner
Anhydrous ammonia: fertilizer or countertop cleaners
Drug-endangered children

How are children harmed from drug-labs?

- Chemical exposures:
  - Ingestion, inhalation, spills, explosions
- Effects on the caregiver:
  - Neglect, abuse, use while pregnant
- Violence of the drug-trade world:
  - Firearms/weapons, booby-traps, drug paraphernalia, witness parents' arrest
- Stress on the child protection system


