Toxic Inhalation

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*Simple asphyxiants
*Systemic asphyxiants
*Chemical irritants

Toxic Inhalations

One
*1746 (est) people killed overnight
*3000 Cattle
*Countless wild animals
*There was no evidence of bleeding, physical trauma, or disease, and no sign of exposure to radiation, chemical weapons, or poison gas. And there was no evidence of suffering or “death agony”: The victims apparently just blacked out, fell over, and died.

* August 22, 1986
*Water in lake Nyos among most still in world
*Temperate climate
*Constant temperature from top to bottom
*Very deep lake, disturbances on top do not stir up the bottom

*CO2 not dissipated

*Methane
*Ethane
*Propane
*Butane
*Nitrogen
*Argon
*Helium
*Carbon dioxide

*Simple asphyxiants
Little risk of secondary contamination
* Remove patient from exposure
* Fresh air
* Symptomatic and supportive

*Treatment for simple asphyxiants

*Two
the sole physician covering the emergency department (ED) was inundated with patients seeking treatment for exposure to the unidentified gas.

A disaster alert was initiated immediately, and 2 additional physicians quickly arrived.
The train had been carrying 3 carloads of chlorine and 1 carload of sodium hydroxide. Based on patient presentation and communications from the poison center, an irritant gas was suspected. The triage and management of more than 110 patients arriving at the local ED was based on this identified toxic syndrome. Chlorine, a respiratory irritant, was later confirmed as the sole causative agent.

Graniteville disaster

Swimming pools
Disinfectants
Industrial accidents
Chemical warfare

Chlorine exposure
### Irritant Gases

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<td>Airway</td>
<td>Corrosive local effects. Dissolve in H₂O of mucous membranes of upper airway</td>
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* Moderate water solubility
* Dissolves in water to form hydrochloric and hypochlorous acid
* Chlorine 20 x more toxic than HCL
* Pulls hydrogen off of water for form free radical oxygen species

### Chlorine

### Diagnostic Clue: Smell

* Zinc Phosphide
* Garlic or fish
* Sulfur Mustard
* Garlic
* Phosgene
* Freshly mown hay
* Cyanide
* Bitter almonds
* Lewisite
* Geraniums
* Acetic and OP
* Garlic
*“Dilution is the solution to pollution”

*Decontamination

*three
*What is the poison? What are the Antidote(s)?*
**Carbon Monoxide**

**SIGNS AND SYMPTOMS**

0-10% No symptoms
10-20% Tightness/forehead & headache
20-30% Headache and throbbing temples
30-40% Severe h/a with n/v & dim vision
40-60% Coma and Convulsions
>60% Cardiovascular collapse and respiratory failure
HYPERBARIC OXYGEN

WILL HBO PREVENT DELAYED NEUROPSYCHIATRIC SEQUELAE (DNS) FROM CARBON MONOXIDE?

- A prospective randomized, controlled study comparing 100% Oxygen and HBO. N=60
- Outcome measure was the development of a neurologic or psychiatric complication.
  - DNS developed in 7/30 getting Oxygen
  - DNS developed in 0/30 getting HBO
- DNS could not be predicted by symptoms or by carboxyhemoglobin level.

The patient had several seizures on route to the hospital.

In the E.D. an ABG showed pH 6.7, pCO\textsubscript{2} 36, pO\textsubscript{2} 288 on an FIO\textsubscript{2} 100%. Lactate 12 mEq/L., COHb = 18%, MeHb= 0%.

*How commonly does cyanide poisoning occur with smoke inhalation?*

*There was a significant correlation between CO and CN levels in fire victims.*
*Among 114 victims of fires in France*
*74% had CN levels > 40 umol/L*
*46% had CN levels > 100 umol/L*
*Plasma lactate levels > 10 mmol/L were a sensitive predictor of CN toxicity.*

Blood at left is from "control" patient, those on the right are from patients in the series.
0.00011 to 0.00033 ppm
Typical background concentration

0.01 to 1.5 ppm
Rotten egg odor

2 to 5 ppm
Headaches, watery eyes, nausea and sleep problems. Airway constriction in asthmatics.

20 ppm
Severe headaches, dizziness, memory loss, irritability and fatigue

50 to 100 ppm
Lung and eye irritation after one hour. Loss of appetite, upset stomach.

100 ppm
Two to 15 minutes: eye irritation, coughing and a complete loss of smell will occur. Lethargy, resp diff.

Death may occur within 48 hours.

100 to 150 ppm: Olfactory extinction

200 to 300 ppm
One hour: respiratory collapse and pulmonary edema

500 to 700 ppm
Death within one hour.

700 to 1000 ppm
Collapse and death within minutes

1,000 to 2,000 ppm
Death may occur with a single breath

Hydrogen sulfide concentration
* Avoid secondary contamination!
* Fresh air/oxygen
* Irrigation of eyes/folds
* Nitrites
* Hyperbaric?

* Treatment of hydrogen sulfide

WEATHER
HURRICANE KATRINA
Perfect storm hits Gulf Coast - Borks New Orleans