Hydrocarbons

A 15 year old male is found unconscious with an empty spray paint bottle next to him. Which of the following treatments should be avoided?

a) Epinephrine
b) Intubation
c) Decontamination
d) IV fluids for hypotension

Hydrocarbons - Basics

- Group of organic substances composed of hydrogen and carbon molecules
- Derived from petroleum (kerosene, gasoline, naphtha) OR wood (turpentine, pine oil)
- Aliphatic (linear or branched) OR aromatic (ring)
- Some are halogenated - one of the H molecules substituted for halogen – (carbon tetrachloride, trichloroethylene, chloroform, etc.)
- May be liquid (gasoline), gas (butane), or solid (waxes) at room temp
Hydrocarbons - Causes of Exposure

• Occupational
  – Manufacturing: May be subclinical over time (Toluene)
  – More likely with halogenated hydrocarbons

• Accidental
  – Ingestion most common in kids < 5

• Intentional
  – Suicide attempts are possible

• Recreational
  – Inhalation Common in adolescents (huffing for a high)
  – Refrigerants or propellants in aerosols

Hydrocarbons, if ingested in large amounts, may be absorbed systemically and cause CNS or hepatic toxicity, which is more likely with halogenated hydrocarbons (eg, carbon tetrachloride, trichloroethylene). Recreational inhalation of halogenated hydrocarbons (eg, glues, paint, solvents, cleaning sprays, gasoline, fluorocarbons used as refrigerants or propellants in aerosols—see Volatile Solvents), called huffing or bagging, is common among adolescents. It can cause euphoria and mental status changes and can sensitize the heart to endogenous catecholamines. Fatal ventricular arrhythmias may result; they usually occur without premonitory palpitations or other warning, often when patients are startled or chased.

Chronic toluene ingestion can cause long-term CNS toxicity, characterized by periventricular, occipital, and thalamic destruction.

Signs / Symptoms

• Oxygen displacement / Hypoxia (esp with volatile hydrocarbons)
• Respiratory symptoms consistent with aspiration
  – Cough, may be transient or prolonged
  – Gagging or choking sensation (acute or delayed)
  – Pneumonitis / Respiratory distress can develop
• Cardiovascular (Most prominent with inhalation)
  – Syncope, tachyarrhythmias, possible V-fib w/o warning
  – Epinephrine should be avoided - it can precipitate fatal ventricular arrhythmias
• CNS: At first may cause a transient euphoria (Huffing)
  – Headache, altered mental status, then lethargy
• GI: Nausea and vomiting, burning in epigastric area
• Liver – chlorinated hydrocarbons cause hepatotoxicity

Renal – acidosis, severe hypokalemia
Skin and Eyes - Burning
Lung is the primary site of most common toxicity. After ingestion of even a very small amount of liquid hydrocarbon, patients initially cough, choke, and may vomit. Young children may have cyanosis, hold their breath, and cough persistently. Older children and adults may report burning in the stomach. Aspiration pneumonitis causes hypoxia and respiratory distress. Symptoms and signs of pneumonitis may develop a few hours before infiltrates are visible on x-ray. Substantial systemic absorption, particularly of a halogenated hydrocarbon, may cause lethargy, coma, and seizures. Nonfatal pneumonitis usually resolves in about 1 wk; mineral or lamp oil ingestion usually resolves in 3 to 6 wk. Arhythmias usually occur before presentation and are unlikely to recur after presentation unless patients have excessive agitation.

Some of the TPH compounds, particularly the smaller compounds such as benzene, toluene, and xylene (which are present in gasoline), can affect the human central nervous system. If exposures are high enough, death can occur. Breathing toluene at concentrations greater than 100 parts per million (100 ppm) for more than several hours can cause fatigue, headache, nausea, and drowsiness. When exposure is stopped, the symptoms will go away. However, if someone is exposed for a long time, permanent damage to the central nervous system can occur.

### Treatment
- **Initial focus on decontamination**
  - Remove clothing
  - Decon skin
  - Flush eyes with copious amounts of water
- **ABCs**
- **Mostly supportive**
- **Airway management may be necessary** (intubation, PEEP)
- **Cardiac monitoring** – anticipate and treat dysrhythmias
  - DO NOT use epinephrine in these patients!
- **Ongoing symptoms warrant observation beyond 6 hours**
  - Need to have negative chest X-Ray at 6 hours
  - Prophylactic antibiotics and steroids have not shown benefit

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