

Health Hazards Found in
a Clandestine
Methamphetamine
Laboratory

Nationwide Phone Number
Works just like 911

24 hours a day, 7 days a week

DISCLAIMER

Making Meth is a really **BAD** idea
It is also a **FELONY**
It can **KILL YOU** or get you **KILLED**
DON'T DO IT !!!!!

Neither I, nor the ISPCC, nor the University of Iowa College of Public Health, nor the Iowa Department of Public Health, nor the Iowa Health System, nor the University of Iowa Hospitals and Clinics advocate, promote, or condone (1) the use, sale, purchase or synthesis methamphetamine or (2) anything else that is illegal, immoral or just plain wrong

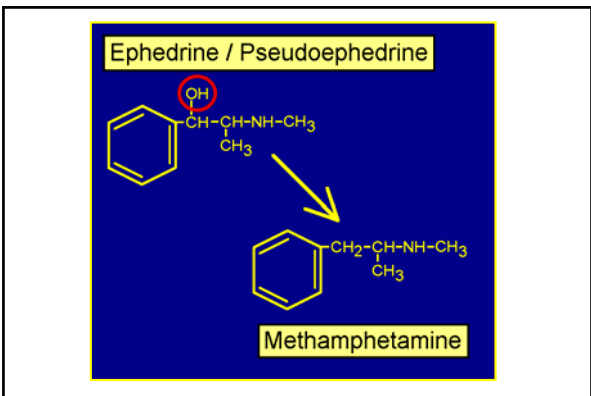
Please do not call the FBI or DEA or DHS on me

NOTIFICATION

All of the information in this presentation is freely available through open-source materials

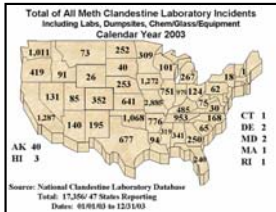
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Some of the images are courtesy of Captain Steve Hergenreter, Ft. Dodge Fire Department and HazMat Team



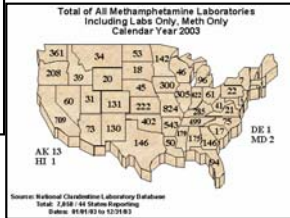
Incidents v. Laboratories 2003

Reported by US Drug Enforcement Agency



INCIDENTS
Total: 17,356
Iowa (3): 1,272

LABORATORIES
Total: 7,050
Iowa (8): 300



Iowa and Methamphetamine



● Superlab seized in Black Hawk county in 2003

- In 1996, the Midwest High-Intensity Drug Trafficking Area (HIDTA) Program was started (IA, ND, SD, MO, NE, KS)
- National Drug Threat Assessment 2003 listed IA as a primary market area for meth because of extent of distribution and proliferation of small capacity labs

Iowa and Methamphetamine in 2004

- The Iowa Division Narcotic Enforcement seized 119,227 grams of methamphetamine
\$4.1M street value ~500,000 doses
- DNE's Clandestine Lab Emergency Response Team (CLERT) responded to / seized 630 meth labs
- 842 labs seized by local agencies; total = 1,472
- US DEA reported federal seizure of 39.1 kg of meth
- DEA also reported seizure of 418 meth labs (DEA, state, local)

At The Meth Lab



Methamphetamine Synthesis The Anhydrous Method

“Birch Reduction” “Cold” “Nazi” “Anni

1. Extract / obtain ephedrine or pseudoephedrine
2. Add anhydrous ammonia and lithium metal
3. Let reduction run (~3 hours) then quench with water
4. Add sodium hydroxide
5. Extract methamphetamine with toluene
6. Salt out the free base
7. Purify (if necessary)

Extraction of Pseudoephedrine



Active Ingredient and Gak

Drug Facts

Active ingredient (in each tablet)	Purpose
Pseudoephedrine HCl 30 mg.....	Nasal decongestant

Inactive ingredients acacia, candelilla wax, corn starch, FD&C red no. 40 aluminum lake, FD&C yellow no. 6 aluminum lake, hydroxypropyl methylcellulose, lactose monohydrate, magnesium stearate, pharmaceutical glaze, poloxamer 407, polyethylene glycol, polyethylene oxide, polysorbate 60, povidone, sodium benzoate, sodium lauryl sulfate, stearic acid, sucrose, talc, and titanium dioxide. Printed with edible black ink.

Getting the Gak Out

- The polymers, soaps, and waxes are destroyed with either acid or alkali hydrolysis
- Extract with 91% isopropanol
- Boil with KOH to hydrolyze the gak
- Extract with toluene
- If do acid hydrolysis, need do repeated toluene extraction / re-crystallization

Hydrocarbon Hazards



Hydrocarbon Hazards

- Universal Properties
 - * Fire, explosion, simple asphyxiant
- CNS Depression
 - * Toluene, trichloroethane (TCE), benzene, ether, naphtha, chloroform, acetone, methanol
- Irritants
 - * Toluene, benzene, methyl-ethyl ketone (MEK), naphtha, acetone
- Myocardial Sensitization
 - * Toluene, TCE, benzene, chloroform

Hydrocarbon Hazards

- Unique Properties
 - * Toluene: Chronic exposure causes CNS demyelination, myopathy, renal damage
 - * TCE: CNS excitation before CNS depression
 - * Benzene: Chronic exposure causes aplastic anemia & AML
 - * Ether: Heavier than air (space heater hazard)
 - * Chloroform: Liver & renal toxicity 1-3d after ingestion
 - * Ethylamine and ethylenediamine: generates nitrogen oxides and possibly ammonia when burned

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Metals: Lithium and Sodium

- Lithium used more frequently than sodium
- Typically stripped out of lithium batteries
- Caustic metal
- When burned, produces toxic lithium oxide
- Reacts violently with water, producing heat and hydrogen gas



- Must be stored under oil



Anhydrous Ammonia



Anhydrous Ammonia

- Highly water soluble gas; reacts with water in mucous membranes of eyes, nose, and throat
- Converted \rightarrow NH_3OH in an exothermic reaction
- Causes caustic / alkali burns
- Inflammation, edema, ulcerations, sloughing
- If to alveoli, get pulmonary edema and bleeding
- May cause alkali burns to the cornea
- Frostbite from rapid release of gas from tank

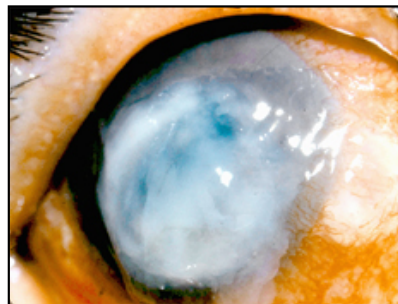
Corrosion of Tank Couplings



Anhydrous Tank Decompression



Cornea Opacification



Soda and Home-Brewery Kegs

- Alternate carrier for anhydrous ammonia
- Less suspicion (so far)
- Stainless steel



Anhydrous Ammonia Additives

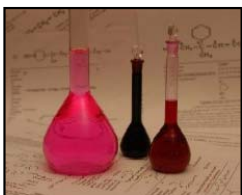
Electron Scavengers

- 2-chloro-6-(trichloromethyl)-pyridine
 - * Ingestion has caused CNS and respiratory depression; respiratory and dermal irritant
- Fe (III) citrate: Complexes calcium
- 1,1,1,2-tetrafluoroethane
 - * Displaces oxygen
 - * Combustion → fluorine, HF, Cl₂, phosgene gasses
 - * Can cause myocardial sensitization and arrhythmias
- Ferrocene: Irritant
- Calcium nitrate
 - * Strong oxidizer → hemolysis & methemoglobinemia

Anhydrous Ammonia Additives

Added Dyes and Colorings

- Intended to color product and person, and “traceable for three days under UV light”
 - * Rhodamine WT (acid red 338) plus fluorescein (patented)
 - * Both dermal and respiratory irritants
 - * Rhodamine B possible carcinogen; decomposes to Cl₂, NH₃, NO_x



Generation of Ammonia

- Fertilizer (NH₄NO₃) + NaOH → ammonia + heat
- Condensed with dry ice
- Typically done with 2-liter plastic pop bottles as the generator and condenser
- Hot, bubbling, ↑ pressure liquid can explode
- Home-made apparatus typically leak

ST. LOUIS POST-DISPATCH

Thursday, September 2, 2004

Man is killed in explosion of anhydrous ammonia in car

A man was killed and a woman was critically injured Wednesday when a tank of anhydrous ammonia exploded in the rear of their vehicle near Stanton, according to the Franklin County Sheriff's Department.

The department says the explosion and accident occurred about 5:30 p.m. on county Route JJ north of Interstate 44, about 50 miles southwest of St. Louis. The report said the car apparently was moving when the tank exploded.

Names of the two occupants of the vehicle were not released. The woman was able to walk to a nearby residence. She was taken by ambulance helicopter to a hospital in the St. Louis area for treatment of severe burns, the report says. The man was pronounced dead after emergency personnel tried to revive him.

Anhydrous ammonia is a corrosive gas used in fertilizer, but its transportation is regulated by state law. It must be documented and carried in proper containers. It also is used in the illegal manufacture of methamphetamine. The report said an investigation was under way.

Methamphetamine Synthesis

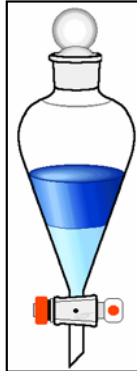
The Anhydrous Method

“Birch Reduction” “Cold” “Nazi” “Anni”

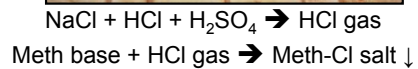
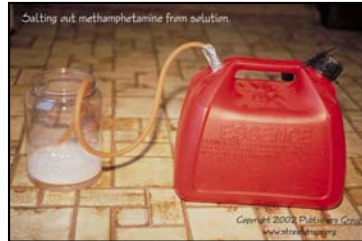
1. Extract / obtain ephedrine or pseudoephedrine
2. Add anhydrous ammonia and lithium metal
3. Let reduction run (~3 hours) then quench with water
4. Add sodium hydroxide
5. Extract methamphetamine with toluene
6. Salt out the free base
7. Purify (if necessary)

Toluene Extraction

- Misdirection of separatory funnel commonly leads to meth solution going in the eye
- Over pressurization can cause explosion of funnel (rare)



Salting Out Methamphetamine



Acids and Bases



Acids and Bases

- All highly reactive
 - * Also: Strong acid + Strong base \rightarrow violent exothermic rxn
- Acids
 - * Hydroiodic, phosphorous, hydrochloric, and sulfuric
 - * Cause coagulation necrosis
 - * Give off toxic fumes
- Bases
 - * Sodium hydroxide, potassium hydroxide
 - * Cause liquefactive necrosis and saponification with deeper damage

With friends like these ...

- 52yo M comes to ER from a friend's garage after accidentally drinking:
 - Beer and anhydrous ammonia
 - or
 - Beer and engine cleaner and 3 degreasers
- He is diaphoretic and vomiting blood
- EGD: large laryngeal edema and severe esophageal and stomach burns
- The friends store HCl, which they use to make meth, in beer bottles in the garage



Gasses

- Simple Asphyxiants
 - * Hydrocarbons, hydrogen, dry ice (carbon dioxide)
- Chemical Asphyxiants
 - * Phosphine, hydrogen sulfide
- High Water Solubility Airway Irritants
 - * Hydrogen chloride, sulfuric acid, ammonia
- Low Water Solubility Airway Irritants
 - * Nitrogen oxides, lithium oxide
- Hydrogen Peroxide
 - * Liberates oxygen when decomposes

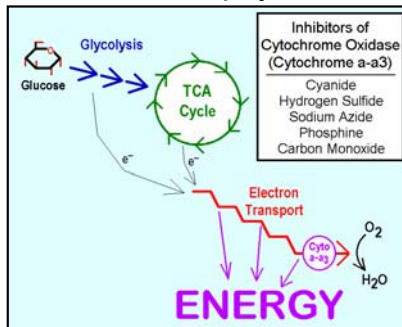
Lack of Appropriate Ventilation



Simple Asphyxiants

- Displacement of oxygen / oxygen deprivation
- Need a lot of non-O₂ gas or a confined space
- Sx: HA, nausea, SOB, dizzy, confusion, death
- Rx: Oxygen
- Dry Ice
 - * When filling flasks with anhydrous ammonia, dry ice is sometimes used to cool the flask
- Hydrogen
 - * Reaction of lithium with water

Chemical Asphyxiants



Chemical Asphyxiants

- Inability to use oxygen on the cellular level
 - * Poisons block the cells ability to donate electrons to oxygen to make water
- Sx: HA, SOB, confusion, syncope, death
- Rx: Oxygen; some poisons have specific antidotes
- Phosphine
 - * Generated during cooking phase with RP and HI
 - * Smells like rotting fish
- Hydrogen Sulfide
 - * Rotten egg smell. A.K.A. "sewer gas"

High Water Solubility Airway Irritants

- Dissolve in moisture of eyes, nose, upper airway
- Produces immediate symptoms = warning sign
- Large inhalations affect lower airways also
- HCl, H₂SO₄, NH₃, hydrogen sulfide
- Symptoms:
 - * Tearing, cough, SOB, edema, laryngospasm
- Treatment:
 - * Good supportive care, nebulized beta-agonists and anticholinergics, consider steroids

Low Water Solubility Airway Irritants

- Does not dissolve in upper airway moisture
 - * Does not have immediate warning properties
- Nitrogen Oxides
 - * Direct reaction with lung tissue
 - * Converted into peroxyxynitrites, nitrous acid, and nitric acid
- Symptoms
 - * May be delayed for several hours
 - * Cough, dyspnea, sputum production then pulmonary edema
 - * Lesser exposures: cough and dyspnea for several weeks
- Treatment
 - * Good Supportive Care, removal from source

The "One Bottle" Birch Method

Unpurified PE + Solvent

+

$\text{NH}_4\text{NO}_3 + \text{NaOH}$

+

Lithium metal



BOOM !!!

+

Bad Product



Red Phosphorus / Iodine Method



Methamphetamine Synthesis

Reduction with Hydroiodic Acid

"Hot" "HI" "Red P" "RP" "HIRP"

1. Extract / obtain ephedrine or pseudoephedrine
2. Add red phosphorous and iodine compound
3. Cook for 6 to 24 to 72 hours (recipe and reagent specific)
4. Cool; filter out red phosphorus
5. Add sodium hydroxide
6. Extract methamphetamine
7. Salt out the free base
8. Purify (if necessary)

Red Phosphorous

- Red Phosphorous
 - * Relatively harmless; when over heated, generates toxic oxides and is converted to white phosphorous
 - * Matchbook RP is ~30% antimony sulfide; S_5Sb_2 is converted into hydrogen sulfide during processing
- White phosphorous
 - * Non-specific cellular poison; 1 mg/kg can be fatal
 - * Significant burns; luminescent ; pyrophoric
- Can use H_3PO_2 instead; also pyrophoric

Iodine Compounds

- Can use hydroiodic acid but usually use I_2
- Commonly get I_2 crystals from tincture of iodine
 - * $\text{KI} / \text{I}_2 + \text{HCl} + \text{H}_2\text{O}_2$ (30%) \rightarrow I_2 crystals precipitate
 - * Generates heat and liberates I_2 and HI gas
- Iodine strong oxidizer and corrosive
- Gasses are respiratory irritants
- Allergic reactions have occurred



Hydrogenation Devices

- Inside of extinguisher needs a chemical-resistant coating
- Palladium catalyst preparation
 - * HNO_3 , formaldehyde, HCl
 - * H_2SO_4 , HClO_4
- Mix acetic acid, HCl, PE
- H_2 gas to 30-40 PSI(g)
- Heat to 80-90°C x 2-3 hours



Human Hazards

- Firearms VERY common
- Surveillance systems becoming more common
- Booby-traps and bombs encountered, especially in sophisticated or larger labs
- Labs fire bombed when the police were still inside



Light bulb bomb booby-trap

Methamphetamine Lab Fires



Toxic Waste Dump



- For every **ONE** pound of meth made, **SIX to SEVEN** pounds of toxic waste is generated
- Meth lab clean up averages \$2,500 to \$5,000
 - * Certified chemical disposal is also costly
 - * MT spent \$631,884 in FY01 cleaning up 86 labs



Protecting Yourself

- If you have not been specially trained to enter or investigate a clandestine meth lab,

DON'T GO IN !!!

- Call the appropriate authorities
- Level B PPE (full body covering, positive pressure SCBA, appropriate gloves) as a minimum until specific chemicals and hazards identified
- Cooks and victims who are contaminated, not just exposed, should be appropriately decontaminated



