

## Environmental Hazards in Clandestine Labs

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## No Disclosures

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## Objectives

- Describe the chemical and environmental hazards surrounding clandestine lab operations and exposures
- Understand the potential health effects of clandestine lab chemical hazard

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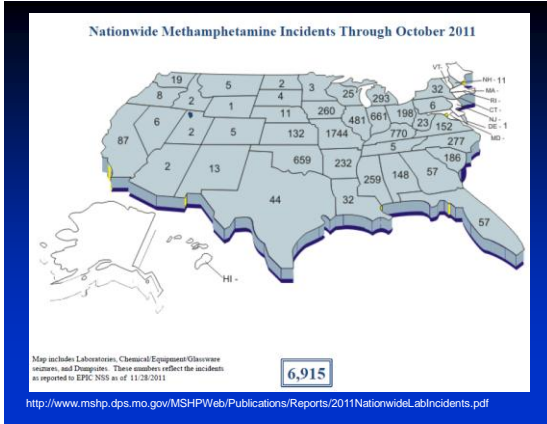
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### Basic Hazard Types

- Chemical
  - Hazardous chemicals
  - Uncontrolled reactions
  - Spills
- Environmental
  - Suspects, bullets
  - Explosions and Fires
  - Booby Traps and IEDs
  - Ambient Oxygen Concentration
  - Heat Stress
  - Waste Dumping Pits
  - Rerouting of Electricity

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### Probably Not Wired To Code

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## Burns

"Fires at covert improvised laboratories used to produce illicit methamphetamine are producing a new type of burn patient."  
-AP Photo Caption



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## Burns

### Methamphetamine Laboratory Explosions: A New and Emerging Burn Injury

Ariel P. Santos, MD, MPH,\*† Ashley K. Wilson, MD,\*  
Carlton A. Hornung, PhD, MPH,† Hiram C. Polk, Jr., MD,\*  
Jorge L. Rodriguez, MD,\* Glen A. Franklin, MD\*

The proliferation of clandestine methamphetamine laboratories (meth labs) as a result of the growing popularity of the drug has resulted in an increasing incidence of burn injuries associated with laboratory accidents. We undertook this study to characterize these injuries. Fifteen consecutive patients were identified and case-matched by age and TBSA to 45 control subjects. Most meth lab patients were men, Caucasian, unemployed, and positive for polysubstance abuse. Resuscitation requirements were 1.8 times greater in these patients. There was a higher incidence of inhalational injury corresponding to higher intubation and tracheostomy rate and longer ventilator days among meth lab patients. The rate of nosocomial pneumonia, skin graft loss, and mortality were not different between the two groups. Meth lab injury is unique and requires more critical care resources. It also is associated with lack of insurance coverage and poor follow-up after injury. This injury has a significant impact not only on patients but also on the healthcare system. (J Burn Care Rehabil 2005;26:228-232)

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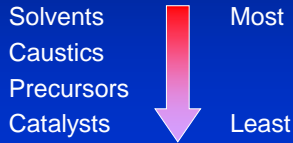
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## Chemicals

- Over 350 chemicals have been associated with meth labs
- 50 – 60 chemicals are commonly found
- By volume/quantity




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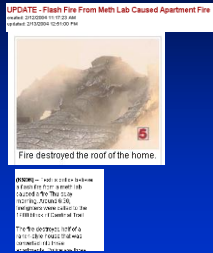
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## Solvents

- Solvents are the most commonly encountered class of chemicals and the most common dermally-absorbed class of chemicals
- Leading cause of fires and explosions at clandestine labs.




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## Meth Lab Waste




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### Shake and Bake



- Little more than a 2-liter soda bottle filled with the toxic ingredients
- The waste and debris cannot be dumped in a regular landfill, only in specially approved waste sites.

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### Shake and Bake

Also known as the "one-pot" approach that uses less pseudoephedrine

It also yields meth in minutes rather than hours, and it's cheaper and easier to conceal.

Meth cooks can carry all the ingredients in a backpack




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### What risks do meth labs pose to human health and the environment?

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### Cooks



- Cooking meth poses a high danger of explosion because of volatile, unstable compounds are mixed, usually without the proper safety equipment.

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### Clinical effects from exposure to chemicals (cooks or waste)

- Exposure can lead to chemical burns, shortness of breath, damage to the central nervous system, headaches, vomiting, confusion, and, in some cases, death.




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### Health Effects

- Most commonly reported adverse effects are headache and airway irritant symptoms
- Most associated with "processing phase"
- 7 to 15 fold risk of becoming ill during a seizure of active lab compared to setup and in-transit<sup>1</sup>

Burgess et.al. Am J Ind Med. 20:488-494 (1996)

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### HSEES System

- Most common methamphetamine lab toxicants
  - Ammonia
  - Ethyl ether
  - Hydrochloric acid
- Most common methamphetamine lab symptoms
  - Respiratory irritation
  - Headache
- 33.9% treated at hospital & released
- 11.2% admitted, 2.5% deaths

Melnikova et. Al. Public Health Reports. 2011; 126: 116-123

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### Waste from meth labs

- Chemicals that are improperly disposed of can contaminate ground water and wells; kill plants; and harm aquatic life and animals




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### Public Health Implications

- Indiscriminate contamination
- Lack of proper storage
- Eliminated in urine and feces
- Chemical dumping into ground or sewers or septic systems
  - Contamination of surface water , ground water and wells
  - Requires extensive cleanup efforts

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## Wastewater and Surface Waters

- Study to quantify drugs of abuse in different water matrices before water treatment
- Presence of cocaine and amphetamines in influent and effluent samples.
- Cocaine metabolite and MDMA in surface waters
- Nicotine and caffeine found in all samples.

Huerta-Fontela et al. Analytical Chemistry. 2007; 79: 3821-3829

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## Surface Water Residue

- Presence may have potential implications for human health and wildlife (even with low levels)
- Pharmacologic interactions between drugs of abuse and therapeutic drugs
- Biological effects even at low concentrations

Pomati et al. Chemosphere. 2007; 70: 65-73

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## Microbial Degradation

- Study to look at the impact that microorganisms have on drug (precursors and by-products) degradation.
- Soil microorganisms P2P was rapidly metabolized to many breakdown products.
- Methylamphetamine sulfate remained unchanged.

Janusz et al. Forensic Science International. 2003; 134: 62-71

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**Product Contamination - Lead**

- Lead acetate as a P2P reagent
- Using the amalgam method, high levels of lead may be found
- Patients may present with abdominal pain, nausea, weakness, weight loss and anorexia due to lead.

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**Product Contamination - Mercury**

- "Mercury method" uses P2P and methylamine using mercuric chloride
- Inadequate purification has resulted in mercury amounts ranging from 0 – 1300 ppm

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**Chronic Health Effects**

- Little is known
- Animal and human toxicology data
  - May cause cancer, brain damage, liver and kidney problems, and birth defects and reproductive problems.
- No current scientific evidence that human health risk continues once site is properly decontaminated

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**Rural Environmental Fallout**



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**Questions?**



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