



“Meth”: Another Environmental Threat to Children

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Center for Children's Environmental Toxicology at Yale

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Methamphetamine

- Drug
- Environmental Hazard

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Methamphetamine Hazards

- Methamphetamine itself
- Methamphetamine production
 - Ingredients
 - Toxic wastes

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Methamphetamine

- Potent central nervous system stimulant
- Available by prescription
 - Treatment
 - Narcolepsy
 - Obesity
- Easily manufactured
 - Relatively inexpensive
 - OTC ingredients

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Methamphetamine Use

- Route
 - Ingestion
 - Insufflation (snorting)
 - Inhalation (smoking)
 - Injection

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Methamphetamine Effects

- Acts on neurotransmitters (catecholamines)
 - Signals between brain cells
- Increases levels
 - Dopamine
 - emotion, movement, pleasure
 - Serotonin
 - mood, personality, sexual activity, sleep, temperature regulation

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Methamphetamine Neurotoxicity

- Damages brain cells containing
 - Dopamine
 - Serotonin
- Chronic use
 - Reduced levels of neurotransmitters
 - Movement disorders
 - Similar to Parkinson's Disease

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Methamphetamine Production

- Recipes for “meth cooks”
 - Relatively simple
 - Available on Internet

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Methamphetamine Production

- House, Apartment
 - Kitchen
 - Bathroom
- Hotel, Motel
- Garage
- Vehicle

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Methamphetamine Production

- Ingredients

- Toxic waste

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Ingredients

- OTC cold medicine
 - Pseudoephedrine (ephedrine)

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Ingredients

- Acetone
- Alcohols
- Aluminum hydride
- Anhydrous ammonia (fertilizer)

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Ingredients

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- Chloroform
- Ether (engine starter)
- Freon (air conditioners, refrigerators)
- Hydrochloric acid

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Ingredients

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- Mercuric chloride
- Red phosphorus (matches)
- Sodium hydroxide (drain cleaner)
- Sodium or Lithium (batteries)

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Methamphetamine Production

- Ingredients
- Toxic waste

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Toxic Waste

- By-products, contaminants
- Vary according to production
- 1 lb processed meth --> 5-6 lb waste
- Fate
 - Dumped into rivers, fields, sewers
 - Permeate carpets, walls

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Toxic Waste

- Aluminum hydroxide
- Ammonia
- Hydrogen chloride gas
- Iodine

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Toxic Waste

- Lead oxide
- Mercury vapor
- Phosphine
- Yellow phosphorus

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Meth Lab Busts

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Clean-up

- Requires HazMat training
- Costs up to \$4000 per site
- Disposal
 - 90%: regular landfill
 - 10%: hazardous waste treatment facility

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Risks

- Explosions
- Fires
- Contamination
 - Buildings, soil
 - May be declared uninhabitable
 - Limited research to date

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Simulated Cooks

- Meth residues
 - Aerosolized during production
 - Persist > 6 months
 - Trapped in carpet, vents, wallboard
 - Worsened with vacuuming
- Other toxic waste

Martyny et al.

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- Red phosphorus
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Acetone, Alcohols

- Blindness
- Coma
- Gastric irritation
- Respiratory depression

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Ammonia

- Respiratory irritant
- Fluid overload in lungs

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Freon

- Frostbite
- Cardiac arrhythmia, arrest
 - Sudden Sniffing Death Syndrome

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Hydrochloric Acid, Sodium, Lithium

- Burns

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Red Phosphorus, Hydrogen Chloride Gas, Iodine

- Damage to eyes, nose, throat, skin
- Respiratory problems

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Lead, Mercury

- Neurotoxins
 - Acute
 - Chronic

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Methamphetamine

- Damages neurons
 - Dopamine
 - Serotonin

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Phosphine

- Headache
- Fluid overload in lungs
- Death

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Special Risks to Children

- Present at > 30% of meth busts
- Injuries
 - Burns
 - Needle sticks
 - Ingestion, inhalation
- Abuse and Neglect
- Displacement

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Risk Factors

- Activity
 - Crawling
 - Hand-to-mouth activity
- Physiology
 - More rapid respiratory rates
- Latency
 - Respiratory?
 - Neurological?
 - Cancer?

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Methamphetamine Supply

- Decrease in home-cooked meth
 - Restrict sale of OTC cold medicines
- Increase in imported meth
 - *Potent Mexican Meth Floods In as States Curb Domestic Variety* (New York Times, 1/23/06)

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 - *Potent Mexican Meth Floods In as States Curb Domestic Variety* (New York Times, 1/23/06)
 - “When we took away the local meth lab, they simply added methamphetamine to the truck.”

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Methamphetamine's Legacy

- Risk to new home owners
 - Children most susceptible
- Few states have health-based guidelines for cleanup

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What is Needed?

- More research
 - Environmental impact
 - Health effects
 - Cleanup coordination
- National remediation standards

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