

## Child Maltreatment by Poisoning

Lynn K. Sheets, MD, FAAP  
Child Advocacy and Protection Services, CHW  
Associate Professor, Dept. Pediatrics MCW  
414-266-2090

---

---

---

---

---

---

---

---

## Child Maltreatment Statistics

- 3 Million referrals for suspected maltreatment
  - 872,000 cases confirmed=11.9 cases/1,000
- 65% Neglect
- 18% Physical Abuse
- 10 % Sexual Abuse- Rates are decreasing
- 7% Psychological Maltreatment

US Department of Health and Human Services, Year 2004

---

---

---

---

---

---

---

---

## Drug Exposure

- Intentional versus unintentional
- Unintentional exposures and ingestions
  - Neglect
    - Drug exposure during pregnancy or breastfeeding
    - Supervisory neglect - examples
      - Toddler who gets into grandmother's digoxin
      - Teenagers partying and overdose on alcohol
    - Dangerous environment
      - Toddler finds methadone on floor in drug-abusing home
      - Drug manufacturing home- exposure to chemicals or drugs
  - Momentary lapse of supervision or other such as child picks up a pill on the playground

---

---

---

---

---

---

---

---

## Occult drug exposure

- Rosenberg- 460 children 1-60 months presenting to urban ED for routine complaints- 5.4% had cocaine metabolite in urine
- Shannon- 1,120 children's hospital patients with urine or blood specimens- 4.6% had cocaine or metabolite and 1.3% had ethanol, benzo or narcotic and cocaine
- Lustbader- Using very sensitive testing, found 36.3% of infants presenting to ED for routine concerns were positive for cocaine

Rosenberg NM, Meert KL, Knazik SR, et al. Occult cocaine exposure in children. Am J Dis Child 1991;145(12):1430-2.  
Shannon M, Lacouture PG, Roa J, et al. Cocaine exposure among children seen at a pediatric hospital. Pediatrics 1989;83:337-41.  
Lustbader AS, Mayes LC, McGee BA, et al. Incidence of passive exposure to crack/cocaine and clinical findings in infants seen in an outpatient service. Pediatrics 1998;103:e5.

---

---

---

---

---

---

---

---

## Intentional Poisonings

- Self-inflicted
  - Recreational use of drugs
  - Suicide attempts
  - Experimentation
- Inflicted by another
  - Caregiver under influence gives wrong med to child
  - Drug supplied to decrease responsiveness
    - Drug-facilitated sexual abuse/assault (abuse)
    - **Infant/toddler/young child sedated to diminish unwanted behaviors (abuse or reckless behavior)**
  - **Intentional poisonings to inflict harm or gain attention (medical child abuse or Munchausen Syndrome by Proxy (abuse)**

---

---

---

---

---

---

---

---

## Intentional Poisonings- Routes

- Inhalation- for example, forced pepper as a punishment (really an ingestion) or blowing marijuana smoke into the face of a toddler (11% in teen girls in tx program-see Schwartz RH Am J Dis Child 1986;140:326)
- Dermal- for example, chemical applied to the skin resulting in burns
- Parenteral (IV, IM injection)- most are MSbP
- Oral
  - Most common route of exposure
  - Purpose can be to gain attention (MSbP) or to cause harm/sedation

---

---

---

---

---

---

---

---

## Ways that poisoning can present

- Presents with concern of poisoning- fear of accidental ingestion
- Child presents with unexplained symptoms
- Child has recurrent unexplained illness or symptoms (overlap with Munchausen Syndrome by Proxy)
- Child fatality
- Occult injury in a child suspected of being maltreated
- Incidental finding in universal screening

---

---

---

---

---

---

---

---

## Medical evaluation

- Complete medical history:
  - Medical history from the child if possible
  - Medical history of all drugs/medications in the environment
- Level of suspicion!
- Comprehensive metabolic panel- blood glucose and electrolytes
- KUB- some drugs actually show up on x-rays!
- Consultation with a child abuse pediatrician and toxicologist
- Drug tests

---

---

---

---

---

---

---

---

## Screening for drugs

- Many different types of tests exist
- Substrates- Usually blood or urine but can include hair, saliva, meconium (fetal stool), umbilical cord, finger nails
- Tests are usually for specific drugs or chemicals and miss those that are not in the screen
- Typical 'screens' only test above a NIDA threshold, thus missing lower levels of drugs
- Tests may miss many non-drug chemicals.

---

---

---

---

---

---

---

---

## Screening vs. Testing

- Screening for drug use-
  - Screen by medical history and/or nonspecific lab tests
  - Lab testing- should always confirm positives
  - Keep in mind that the screen may miss many chemicals and drugs
- No clear, evidence-based guidelines exist on when to perform screening, except neonatal drug screening, unexplained change in level of consciousness, or symptoms of a “toxidrome”

---

---

---

---

---

---

---

---

## Types of Drug Tests

- “Test” sounds definitive but could refer to screening tests and/or tests with confirmation
- Screening tests- Very sensitive but not specific!
  - Immunoassay often used but false positives can result
- Tests with confirmation- Usually very specific but not sensitive
- Best to perform a screening test with “reflex” confirmation (automatic confirmatory test if the screening test is positive)

---

---

---

---

---

---

---

---

## False Positives

- Positive screening tests require confirmation

**TABLE 2. Possible causes of false positive immunoassay testing.**  
12,28,21,23

Substance Tested by Immunoassay	Cross-Reacting Substances
Amphetamines	Amantadine, bupropion, chloroquine, chlorpromazine, desipramine, dextroamphetamine, ephedrine, labetalol, methyphenidate, phentermine, phenylephrine, phenylpropanolamine, procainamide, promethazine, pseudoephedrine, carbidine, selegiline, thioridazine, trazodone
Cannabinoids	Dronabinol, efavirenz, nonsteroidal anti-inflammatory drugs, proton pump inhibitors
Cocaine	Salicylates, topical anesthetics with cocaine
Opiates	Dextromethorphan, diphenhydramine, quinolones, poppy seeds, rifampin
Phencyclidine	Chlorpromazine, dextromethorphan, diphenhydramine, ibuprofen, imipramine, ketamine, meperidine, thioridazine, tramadol, venlafaxine

2012 Farst

---

---

---

---

---

---

---

---



## Top 10 Drug Exposures 2000-2008: AAPCC data

All Exposures	Malicious Exposures
Analgesics	Analgesics
Topical preparations	Stimulants/street drugs
Cold/Cough preparations	Sedatives/hypnotics/antipsychotics
Vitamins	Cold/cough preparations
GI preparations	Unknown drug
Antihistamines	Ethanol
Antimicrobials	Topical Preparations
Hormones	GI preparations
Electrolytes and minerals	Antihistamines
Cardiovascular drugs	Antidepressants

From Farst 2012 – poison control data

---

---

---

---

---

---

---

---

---

---

## Symptoms and drugs that can cause them (Meadows, BMJ 1989)

- Seizures/apnea
  - Table salt
  - Phenothiazines
  - Tricyclic antidepressants
  - Hydrocarbons
- Hyperventilation
  - Salicylates
  - Acids
- Drowsiness/stupor
  - Benzodiazapines
  - Opiates/opioids
  - Hypnotics
  - Insulin
  - Anticonvulsants
  - Methadone
  - Marijuana
- Vomiting- Ipecac and MANY drugs

---

---

---

---

---

---

---

---

---

---

## Symptoms and drugs that can cause them (Meadows, BMJ 1989)

- Hallucinations-atropine-like agents
- Bizarre movements
  - Phenothiazines
  - Metoclopramide
  - Antihistamines
- Diarrhea
  - Laxatives
  - Salt
- Mouth burns/ulcers
  - Corrosives
- Bloody emesis
  - Iron
  - Salicylates
- Extreme thirst
  - Salt with or without water deprivation
- Bizarre lab results
  - Insulin
  - Salt
  - Salicylates
  - Sodium Bicarbonate

---

---

---

---

---

---

---

---

---

---

## Pepper aspiration

- First report by Adelson L in 1964 (J Forensic Sci. 9:391-395)
- Cohle in 1988 (AJDC 1988;142:633-636) reported 8 children with fatal pepper aspiration:
  - Case 1- Mother of 2 ½ y/o girl admitted to pouring pepper down her throat because she took the baby's bottle
  - Case 2- 2 ½ y/o boy. Initially the mother's BF said the child had poured pepper into his own mouth. BF would beat child and made child hold rag in his mouth to muffle cries. Right before event, BF asked for pepper, uncapped it and took boy to another room

---

---

---

---

---

---

---

---

## Fatal pepper aspiration

- Usually young children under age 5
- 2005 study (Chang, *Pediatrics*;e331-e337) of harsh discipline- 3/1,000 parents reported using hot pepper
- Punishment is the usual motive but often concealed, however almost all are due to abuse
- Commonly (about 50%) have other evidence of abuse
- Death often through mechanical obstruction of airway (large quantities of pepper) however swelling or spasm of the airway may also contribute

---

---

---

---

---

---

---

---

## Salt (NaCl) poisoning

- Often combined with water withholding so THIRST is a prominent complaint
- Case report:
  - 5 y/o brought to ED with seizures and found to have a high sodium of 189 mmol/L (normal is 140)
  - History of child eating salt
  - Child adopted at age 2; small for age
- Despite aggressive care, child's sodium rose to 220 and she died
- Autopsy- corrosion of the stomach and small SDH
- Mother convicted of force-feeding salt to the child

---

---

---

---

---

---

---

---

## Ipecac

- Ipecac (emetine) used to be kept by new parents in case of an accidental ingestion.
- Sold over the counter
- Used by some children with eating disorders
- Used by some parents to induce vomiting and apparent illness in their child leading to aggressive medical evaluations.
- Does not show up on standard drug screens, yet can be detected if suspected (urine and emesis are good substrates).

McClung 1988. AJDC;142:637-639

---

---

---

---

---

---

---

---

## Ipecac case

- 10 mo girl referred for recurrent diarrhea and vomiting
- Prior admissions had negative work ups for similar symptoms
- Major work up included stool tests, blood tests, colonoscopy
- Sporadic emesis even with ice chips yet barium swallow was normal
- Child became more irritable and weak so was started on IV feeds.
- Another parent tipped off the medical team that the mother had bottles of ipecac in her purse. Testing was positive for ipecac

---

---

---

---

---

---

---

---

## Ipecac toxicity- chronic exposure

- Gastrointestinal symptoms
  - Nausea/Vomiting
  - Diarrhea
  - Esophageal stenosis
  - Hemorrhage
  - Mucosal irritation
- Cardiovascular symptoms:  
Tachycardia, Arrhythmias,  
Cardiomyopathy, Shock
- Miscellaneous symptoms
  - Edema
  - Weight loss
  - Electrolyte imbalance
  - Macular rashes
  - Fever
- Neurologic symptoms  
Prolonged weakness  
Peripheral neuritis  
Convulsions

---

---

---

---

---

---

---

---

## Cocaine

- Clinically presents with
  - Tachycardia
  - Hypertension
  - Neurologic symptoms
    - Drowsiness
    - Tremulousness
    - Unsteady gait
    - Seizures
- By-products after ingestion:
  - Benzoylcegonine
  - Ecgonine methyl ester
  - Norcocaine
  - (Methylecgonine from Crack)

---

---

---

---

---

---

---

---

## Toxidromes:

- Sympathomimetic (meth, amphetamines, cocaine, opiate withdrawal, PCP)
  - Hyperthermia, tachycardia, hypertension, mydriasis, warm/moist skin, agitated
- Cholinergic (organophosphates, betel nut, VX, Soman, Sarin)
  - SLUDGE (Salivation, Lacrimation, Urinary incontinence, Diarrhea/Diaphoresis, GI upset/hyperactive bowel, Emesis)
- Anticholinergic (antihistamines, atropine, phenothiazines, TCA)
  - Hyperthermia, tachycardia, HTN, hot/red/dry skin, mydriasis, unreactive pupils, urinary retention, absent bowel sounds
- Opioids (codeine, dextromethorphan, heroin)
  - Miosis, respiratory depression, mental status depression

---

---

---

---

---

---

---

---

## Common Toxidrome Findings

Physical Findings	Adrenergic	Anti-cholinergic	Anti-cholinesterase	OPIOID	Sedative-hypnotic
RR	Increased	No change	No change	Decreased	Decreased
HR	Increased	Increased	Decreased	Normal/decreased	Normal/decreased
Temp	Increased	Increased	No change	Normal/decreased	Normal/decreased
BP	Increased	NoChange/increased	No change	Normal/decreased	Normal/decreased

---

---

---

---

---

---

---

---

## Common Toxidrome Findings

Physical Findings	Adrenergic	Anti-cholinergic	Anti-cholinesterase	OPIOID	Sedative-hypnotic
Mental status	Alert/agitated	Depressed/Confused/hallucinate	Depressed/Confused/	Depressed	Depressed
pupils	Dilated	Dilated	Constrict	Constrict	Normal
Mucus membrane	Wet	Dry	Wet	Normal	Normal
skin	Diaphoretic	Dry	Diaphoretic	Normal	Normal

---

---

---

---

---

---

---

---

## Other agents:

- Benedryl
- Insulin
- Haloperidol
- Marijuana
- Muriatic acid
- Many others!

---

---

---

---

---

---

---

---

## Recommendations:

- Consider poisoning in many NAT scenarios
  - Need to obtain specimen as soon as possible
  - Cases to consider testing:
    - History of change in level of consciousness or altered behavior even if other injuries are present
    - Infants and toddlers with acute injuries likely due to abuse
- Suspected Child Maltreatment: DUI – the new skeletal survey?
  - 2011 – Oral et al – 15% of children suspected of being abused or neglected had positive screens
  - Also 2009 Hayek

---

---

---

---

---

---

---

---

# **Wisconsin Child Abuse Network – WI CAN**

Lynn K. Sheets, MD, FAAP

414-266-2090

# False Positives

- Positive screening tests require confirmation

**TABLE 2. Possible causes of false positive immunoassay testing.**<sup>12,20,21,23</sup>

<b>Substance Tested by Immunoassay</b>	<b>Cross-Reacting Substances</b>
Amphetamines	Amantadine, bupropion, chloroquine, chlorpromazine, desipramine, dextroamphetamine, ephedrine, labetalol, methylphenidate, phentermine, phenylephrine, phenylpropanolamine, procainamide, promethazine, pseudoephedrine, ranitidine, selegiline, thioridazine, trazodone
Cannabinoids	Dronabinol, efavirenz, nonsteroidal anti-inflammatory drugs, proton pump inhibitors
Cocaine	Salicylates, topical anesthetics with cocaine
Opiates	Dextromethorphan, diphenhydramine, quinolones, poppy seeds, rifampin
Phencyclidine	Chlorpromazine, dextromethorphan, diphenhydramine, ibuprofen, imipramine, ketamine, meperidine, thioridazine, tramadol, venlafaxine

# Urine testing – Time limits

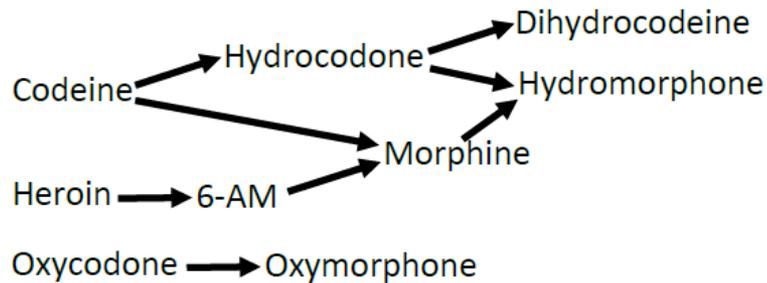
Length of Time Drugs of Abuse Can Be Detected in Urine	Drug	Time
Alcohol		7-12 h
Amphetamine		48 h
Methamphetamine		48 h
Barbiturate		
Short-acting (eg, pentobarbital)		24 h
Long-acting (eg, phenobarbital)		3 wk
Benzodiazepine		
Short-acting (eg, lorazepam)		3 d
Long-acting (eg, diazepam)		30 d
Cocaine metabolites		2-4 d
Marijuana		
Single use		3 d
Moderate use (4 times/wk)		5-7 d
Daily use		10-15 d
Long-term heavy smoker		30 d
Opioids		
Codeine		48 h
Heroin (detected as morphine)		48 h
Hydromorphone		2-4 d
Methadone		3 d
Morphine		48-72 h
Oxycodone		2-4 d
Propoxyphene		6-48 h
Phencyclidine		8 d

-- Mayo Clinic Proc. 2008; 83(1)66-76

- Sometimes the specific drug ingested is not detected, but instead one of its metabolites is found.

# Opiate/Opioid Metabolites

## Opiate/Opioid Metabolism



Drug	Half-life (hr)	Metabolites	Concentrations above the cutoff will screen positive for
morphine	1.5 - 6.5	normorphine, <b>hydromorphone</b> (<2.5%)	Opiates
codeine	1 - 4	<b>morphine, hydrocodone</b> (<11%), norcodeine	Opiates
oxycodone	4 - 12	<b>oxymorphone</b> , noroxycodone	Oxycodone
oxymorphone	3 - 6	6-hydroxy-oxymorphone	Oxycodone
hydrocodone	3.5 - 9	<b>hydromorphone</b> , norhydrocodone, <b>dihydrocodeine</b>	Opiates
hydromorphone	3 - 9	hydromorphol	Opiates

\* **bolded** metabolites are identical to pharmaceutically available drugs

# Toxidromes:

- Sympathomimetic (meth, amphetamines, cocaine, opiate withdrawal, PCP)
  - Hyperthermia, tachycardia, hypertension, mydriasis, warm/moist skin, agitated
- Cholinergic (organophosphates, betel nut, VX, Soman, Sarin)
  - SLUDGE (Salivation, Lacrimation, Urinary incontinence, Diarrhea/Diaphoresis, GI upset/hyperactive bowel, Emesis)
- Anticholinergic (antihistamines, atropine, phenothiazines, TCA)
  - Hyperthermia, tachycardia, HTN, hot/red/dry skin, mydriasis, unreactive pupils, urinary retention, absent bowel sounds
- Opioids (codeine, dextromethorphan, heroin)
  - Miosis, respiratory depression, mental status depression

# Common Toxidrome Findings

Physical Findings	Adrenergic	Anti-cholinergic	Anti-cholinesterase	OPIOID	Sedative-hypnotic
RR	Increased	No change	No change	Decreased	Decreased
HR	Increased	Increased	Decreased	Normal/ decreased	Normal/ decreased
Temp	Increased	Increased	No change	Normal/ decreased	Normal/ decreased
BP	Increased	NoChange /increased	No change	Normal/ decreased	Normal/ decreased

# Common Toxidrome Findings

<b>Physical Findings</b>	<b>Adrenergic</b>	<b>Anti-cholinergic</b>	<b>Anti-cholinesterase</b>	<b>OPIOID</b>	<b>Sedative-hypnotic</b>
Mental status	Alert/ agitated	Depressed/ Confused/ hallucinate	Depressed/ Confused/	Depressed	Depressed
pupils	Dilated	Dilated	Constrict	Constrict	Normal
Mucus membrane	Wet	Dry	Wet	Normal	Normal
skin	Diaphoretic	Dry	Diaphoretic	Normal	Normal