One Pill, One Kill: Deadly Pediatric Poisonings

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Emergency Education Consultants
Who Am I?

• Started in EMS in 1992: UVAC: University of Maine
• EMT & ER Tech in 1994-1996
• Paramedic in 1996: Northeastern University
• Urban, Sub-Urban, Rural and Non-Transporting EMS
  – 1999-2004: Paramedic, Hospital-Based, Non-Transport EMS
  – Presently: Paramedic, Exeter Hospital EMS, Non-Transport EMS/ER Paramedic
• Teaching since 1997, Began EEC in 2005

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Conflict of Interest!?

• Clinical Educator: Teleflex
  – Mucosal Atomizer Device
  – EZ IO
  – QuickTrach
  – AirTraq

• We won’t be talking about any of those today!
Emergency Education Consultants

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“Resources” Tab

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Which are candy? Which are pills?
<table>
<thead>
<tr>
<th>Ferrous Gluconate</th>
<th>M&amp;M®</th>
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</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>Skittles®</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Amantadine</td>
<td>Good N' Fruity®</td>
</tr>
<tr>
<td>Mesoridazine</td>
<td>M&amp;M® (small)</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>Good N' Plenty®</td>
</tr>
<tr>
<td>Simethicone Chewable</td>
<td>Altoid® Mint</td>
</tr>
<tr>
<td>Phenezine</td>
<td>Skittles®</td>
</tr>
</tbody>
</table>

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Asymptomatic Presentation

GET More history

1. What did they have access to?
2. What medications were prescribed to family?
3. When was the child last seen?
4. What initial symptoms? & have they resolved?
5. Did you bring the substance to ED for ID?
6. If any S/S develop, Rx as unknown ingestion.

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Diagnostic Challenges

• Diagnosis is clinical (potential error)
• Young children can’t communicate
• Older children will not communicate
  – Especially if they think they are “in trouble”.
• Mom: “I’m not sure if he (she) took anything or not, I just found the pills spilled on the floor”
Approach to Treatment

- Always assume the worst-case-scenario
- Identify each agent as rapid or extended-release
  - CR, ER, EXT, TD, EXR, LA, SR, SA, XL, XR
- A, B, C’s, Skin, Pupils & EKG
- Bedside glucose testing
- Avoid false security in well appearing child
- Never use ipecac
- Call Poison Control

1-800-222-1222

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"I stopped taking the medicine because I prefer the original disease to the side effects."
Pediatric Poisonings

Why children get sicker...

1. Smaller mass = greater exposure
   1. 50 mg is < 1 mg/kg for an adult
   2. 5 mg/kg for a child

2. Immature CYP450 system = longer elimination ½ life
   1. Theophyline T ½ in adults is 4 hours
   2. Infants = 8 hours

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Developmental Pharmacology

Children versus Adults

3. Reduced glycogen stores = greater risk of hypoglycemia

4. Medications often have greater Vd, in children
   - $\rightarrow$ Vd the more tissue circulation of drug
   - $\rightarrow$ opportunity for receptor interaction
     - I.e. aspirin, theophylline

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Developmental Pharmacology

• Relative deficiency in key enzymes
  – Methemoglobin reductase
  – Infants more susceptible to methemoglobinemia after exposure to benzocaine.

• Exaggerated response to sustained-release medications
  – Differences in gut physiology

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Common and Dangerous

- Methyl salicylate
- Camphor
- Opioids
- Oral Hypoglycemics
- Tricyclics
- Calcium Channel Blockers
- Tetrahydrazoline
- Clonidine
Case Review

14 y/o F unresponsive, found lying in vomit (pill fragments noted) by side of bed with reported seizure like activity
Shallow noisy respirations
HR 120 regular, wide complex, pulses thready
SBP palpated at 70
Pupils – 7mm
Skin/mucous membranes - Dry

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Toxidromes

- Opiate/Narcotic
- Sedative-Hypnotic
- Sympathomimetic
- Cholinergic
- Anticholinergic
Anticholinergic Syndrome

- Tachycardia
- Mydriasis (dilated pupils)
- Warm, dry, flushed (red) skin and dry mucous membranes
- Urinary retention (abdominal pain)
- Hallucinations

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Anticholinergic Syndrome

- Hot as a hare
- Dry as a bone
- Red as a beet
- Mad as hatter
- Blind as a bat
- Seizing like a squirrel
Anticholinergic Syndrome

- Antihistamine (diphenhydramine - Benadryl)
- Phenothiazines (Thorazine)
- Cyclic antidepressants (Elavil, amitriptyline)
- Antispasmodics (Donnatol, Bentyl, Pro-Banthine)
- Bronchodilator agents (Atrovent)
- Skeletal muscle relaxants (Flexiril, Zanaflex)
- Anti-parkinsonian medications (Cogentin, Artane)
- Atypical antipsychotics (Seroquel, Resperdal)
Antidepressant - Tricyclic

- Block norepinephrine, serotonin and dopamine reuptake.
- Toxicity (2-3x daily dose of 75-150mg) due to
  - blocked myocardial Na+ pump
  - Anticholinergic
  - Adrenergic and alpha blocking effects
Have another beer dude, tomorrow you won’t find it nearly as funny.
Common Names & Doses

- **Imipramine (Tofranil)**
  - Tabs = 10/25/50mg
  - Caps = 75/100/125/150mg

- **Clomipramine (Anafranil)**
  - Caps = 25/50/75mg

- **Amitriptyline (Elavil)**
  - Tabs = 10/25/50/75/100/150mg

- **Nortriptyline (Aventyl, Pamelor)**
  - Caps = 10/25/50/75mg

- **Doxepin (Sinequan)**
  - Caps = 10/25/50/75/100/150mg
  - Oral concentration = 10mg/ml
  - Cream (eczema, dermatitis) = 5%

- **Desipramine (Norpramin)**
  - Tabs = 10/25/50/75/100/150mg
Sodium channel blockade toxidrome has been proposed and described, using the mnemonic “S-A-L-T”

- Shock
- Altered mental status
- Long-QRS interval duration
- Terminal {positive} R wave in aVR
Normal aVR

Terminal aVR
Tricyclic Toxicity Treatment

• Hypotension
  – Volume 10-20 ml/kg bolus
  – Dopamine 2-20mcg/kg/min
  – Norepinephrine 0.1-2 mcg/kg/min

• Dysrhythmias
  – NaHCO₃ 1-2 mEq/kg to a pH NO > 7.55
  – Lidocaine is BAD (Class 1b = Na channel blocker)

• Seizure management: benzo > phenobarb > dilantin

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“Good thing it has a child-proof cap.”
Case Review

• 3 y.o. male, after playing in garage all morning presents with:
  – ataxia (staggered gait)
  – slurred speech,
  – altered vision
  – abdominal pain.

• Upon arrival of EMS, he is tachycardic, tachypneic and hypotensive. Cardiac monitor shows prolonged QT.

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Sweet, liquid
Lethal after 1 or 2 gulps.

- Antifreeze, inks, brake fluid = **Ethylene glycol**
- Symptoms similar to Etoh toxicity.
- Calcium oxalate crystals w/ metabolic acidosis = poison
- Complications: hypotension, hypocalcemia, Renal Failure
- Treatment basics A,B,C supportive care.
  - Ethylene glycol level > 20 mg/dl Rx with fomepizole (Antizol)
  - Level > 50mg/dl --- hemodialysis

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Ethanol treatment if Fomepizole N/A

- **Indications:**
  - reliable history of significant ingestion
  - Unexplained anion gap
  - Unexplained osmolar gap

- **Load** 10cc/kg of a 10% ethanol solution IV over 1h

- **Maintenance** of 1-2ml/kg/h of 10% ethanol solution.
Olde Fashioned Snake Oil

- Mustard Oil
- Pine Oil
- Petroleum Oil
- Paprika
- Camphor Oil
- Oil of Wintergreen

Relatively snake free
Methyl salicylate

- Oil of Wintergreen
- A 17 year-old cross-country runner at Notre Dame Academy on Staten Island, died April 3, 2007, after her body absorbed high levels of methyl salicylate through excessive use of topical muscle-pain relief products.
- Concentrated form of aspirin
  - 1 tsp (5 mL) = 23 tablets of ASA (324mg)
- Rapid onset of hyperpnea, metabolic acidosis, coma, seizures.
Methyl Salicylate 15%
Methyl Salicylate 18.3%
Methyl Salicylate 30%
Methyl Salicylate 30%
Methyl Salicylate 40%
Methyl Salicylate ??%
Methyl Salicylate ??%
Methyl Salicylate 0.06%
Camphor

• Products are made from the wood of evergreen camphor trees that are native to Japan and China, or from synthetics.

• 10% concentration Campho-phenique
Camphor

- Toxic at 50-150 mg/kg
- 500 mg/tsp camphor
- 1 tsp produces seizures, confusion, irritability, neuromuscular hyperactivity
- Rapid onset
- US set limit of 11%

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<table>
<thead>
<tr>
<th>Product</th>
<th>Percent camphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapstick Medicated/Blistex Ointment</td>
<td>1%</td>
</tr>
<tr>
<td>Minit-Rub Cream</td>
<td>2.3%</td>
</tr>
<tr>
<td>Chapstick Cold Sore Therapy</td>
<td>3%</td>
</tr>
<tr>
<td>Anbesol Cold Sore Therapy Ointment</td>
<td>3%</td>
</tr>
<tr>
<td>Orajel Cold Sore Medication</td>
<td>3%</td>
</tr>
<tr>
<td>Flexall Plus Gel</td>
<td>3.1%</td>
</tr>
<tr>
<td>Heet Lotion/Spray</td>
<td>3%/3.6%</td>
</tr>
<tr>
<td>BenGay Ultrastrength</td>
<td>4%</td>
</tr>
<tr>
<td>Triaminic Vapor Patch</td>
<td>4.7% (now recalled)</td>
</tr>
<tr>
<td>TheraFlu Vapor Stick</td>
<td>4.8%</td>
</tr>
<tr>
<td>Vick’s VapoRub Ointment/Cream</td>
<td>4.8%/5.2%</td>
</tr>
<tr>
<td>Soltice Quick Rub Cream</td>
<td>5.1%</td>
</tr>
<tr>
<td>Vick’s VapoSteam Liquid</td>
<td>6.2%</td>
</tr>
<tr>
<td>Mentholatum Ointment</td>
<td>9%</td>
</tr>
<tr>
<td>Campho-Phenique Liquid/Gel</td>
<td>10.8%</td>
</tr>
</tbody>
</table>
No, I haven't seen your LSD....

Have you seen the *=!@#$@ DRAGONS in the kitchen?
Opioids

• Broad range of substances
  – Methadone
  – Propoxyphene
  – OxyContin
  – Tramadol
  – Heroin
  – Vicodin
  – Percocet
Oral hypoglycemic Agent OD-
Sulfonylurea

- biguanides (e.g., metformin)
- sulfonylureas (e.g. Glyburide (Diabeta, Micronase), Glipizide (Glucotrol, Glucotrol XL)
- meglitinides (e.g., repaglinide/Prandin)
- thiazolidinediones (e.g., pioglitazone/Actos)
- dipeptidyl peptidase IV inhibitors (e.g., sitagliptin)
- α-glucosidase inhibitors (e.g., acarbose)
Pharmakodynamics

- Block ATP-sensitive potassium channels in Beta cells of the islets (assuming active Beta cells).
- Reduce the potassium permeability of Beta cells.
- This causes: depolarization of the cells, calcium entry into the cell, which causes increased insulin secretion.
- The insulin released reduces plasma glucose concentrations.

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Sulfonylurea

- Children 12 years and under
- Hypoglycemia in 56/185 (30%)
- 54/56 (96%) developed hypoglycemia within 8 hours of ingestion

Case
- 2-year-old boy observed to ingest 5 mg glipizide
- Activated charcoal given within 35 minutes
- Hypoglycemia with serum glucose 49 mg/dL 11 hrs later
Sulfonylurea OD

• Hypoglycemia should initially be treated with dextrose therapy (D10).
• Octreotide is a synthetic somatostatin analog that inhibits insulin release from pancreatic beta islet cells, therefore acts as a specific antidote in sulfonylurea toxicity.
• Hypoglycemia can be delayed as much as 18 hours.
Calcium-Channel Blockers

- Nifedipine (Procardia), Verapamil (Calan/Calan SR, Diltiazem (Cardizem), Norvasc
  - All potentially fatal at 15 mg/kg = 1 to 2 tablets
- In 2008, the AAPCC reported 10,398 exposures to CCBs, resulting in 12 deaths and 63 major outcomes
- 1,430 of the 10,398 exposures (13.7% of reported cases) occurred in children younger than 6 years
- Bradycardia, hypotension, diaphoresis, Circulatory collapse

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Adalat

Verapamil

Cardizem

Norvasc
Dude, we totally forgot our slogan.
American Medical Marijuana Assn.
Tetrahydrazoline

- Visine (tetrahydrozoline), Afrin (oxymetolazine), other vasoconstrictors
- Mechanism: peripheral alpha-adrenergic agonist, central alpha-adrenergic agonist causing Toxicity:
  - 1-2 drops of 0.1% solution in infants
  - 2.5-5cc of a 0.05% solution
- Onset is delayed 2-6 hours after ingestion
- Initial hypertension followed by
  - Vascular collapse
  - Bradycardia
  - Coma/death

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Case Study

• You respond for a 2 y/o F at an urgent-care center
• Parents deny an accidental ingestion
• U/A pt presents:
  – Resp. rate = 6
  – Heart rate = 52
  – Pupils = 2 mm
  – Blood pressure = 72/p

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Clonidine

• Similar to Visine: Central alpha-2 agonist
• Causes hypotension, bradcardia, circulatory collapse, bradypnea, miosis (small pupils)

• Who is prescribed Clonidine??

• Treatment???
• Clonidine (Catapres) uses:
  – Antihypertensive
  – Opioid withdrawal
  – Prevention of vascular HA
  – Menopausal symptoms
  – Dysmenorrhea
  – ADHD
  – Autism
  – Diabetic neuropathy
  – Ethanol withdrawal
  – Tourette’s syndrome

• Tabs = 0.1/0.2/0.3mg
• Transdermal = 2.5/5/7.5mg delivering 0.1mg/0.2/0.3mg per hr
Clonidine

• Clonidine's inhibition of central sympathetic outflow may be mediated by endogenous opiate release.
• This is the assumed reason for the effect of naloxone in clonidine overdose.
• Treatment:
  – Address airway, breathing, and circulation (ABCs) as usual.
  – Intravenous access with crystalloid and pressor support with dopamine.
  – Remove clonidine patch from the skin and wash the area.
  – Initiate standard naloxone therapy and blood glucose checks.
Benzocaine

- Teething gels, Anbesol, Numzit, Benzocaine topical spray
- Toxicity at 25-40 mg/kg
- Onset within 1-6 hours of ingestion
- Oxidizer causing methemoglobinemia
  - Cyanosis
  - Agitation
  - Hypoxia
  - Metabolic acidosis
- Rx = Methylene blue 1-2mg/kg up to 4-7mg/kg
Questions???

Why is it called "beauty sleep" when you wake up looking like a troll.

IF YOU CHOOSE
A SMURF
WHAT COLOR DOES HE TURN?

WHY THE HELL ISN'T THE IPHONE'S BATTERY LIFE CALLED
APPLE JUICE

DEAR VEGETARIANS...

IF YOU'RE TRYING TO SAVE THE ANIMALS, WHY ARE YOU EATING THEIR FOOD?

Why am I in the Water?
And what the .... is THAT?
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