



Toxicology Letter

SCHEDULED EVENTS:

Date and times for Grand Rounds
January 9, 2001
February 13, 2001
March 13, 2001

Toxicology Case Conference
CNYPCCC, 550 E Genesee Street
Poison Center Conference Room
Every Thursday 1:30 PM – 2:30 PM

PROGRAM ANNOUNCEMENT:

Thanks for participation in our Fifth Annual Toxicology Teaching Day. Our Sixth Annual Toxicology Teaching Day will be held on October 30, 2002 at the University Sheraton. Preliminary information will be available in the April issue of this newsletter.

CNYPCCC TIDBITS:

Bio/Chem Weapons – Match

- | | |
|-------------|------------------------------------|
| A. Phosgene | 1. Can be mistaken for spider bite |
| B. Sarin | 2. Pulmonary edema |
| C. Cyanide | 3. Wet and paralyzed |
| D. Anthrax | 4. Thiosulfate for treatment |

TOX TRIVIA:

1. What does “p450” stand for?
2. Why does aspirin cause a fever in overdose?
3. What unintentional toxin exposure is most lethal each year?

Case History

Contributed by: Richard M. Cantor, MD, FACEP

DIFFERENTIATING POISONING VERSUS MEDICAL PROBLEMS

The toxic overdose patient may present with a variety of clinical symptoms. In many cases, during the initial emergency assessment and management, the offending agent is unknown.

How valuable is the history and the physical examination?

Unfortunately, the patient's recollection may be unreliable. It is important for the clinician to utilize all resources available at the time of presentation, including family and friends, paramedics, a private physician who may be familiar with the patient's medical condition.

In the emergency setting, a thorough physical examination is often overshadowed by efforts focused on patient stabilization. However, even a directed examination can yield important diagnostic clues. The following cases illustrate unusual chief complaints involving patients of all ages.

WIDE EYED AND BUSHY TAILED

A 3 year old child is rushed to your emergency department by his parents who claim that he suffered a generalized 2 minute seizure at home. No fever or intercurrent illness is described. Past medical history is negative and there is no family history of seizures. Physical examination includes vital signs: T 39C, HR 140, RR 20, BP 140/95, the patient is combative with dilated pupils. Otherwise the physical examination is significant only for hyperactive bowel sounds and diaphoresis.

What are some of the toxins that cause DILATED PUPILS?

A.A.A.S

- A Antihistamines
- A Antidepressants
- A Anticholinergics, Atropine
- S Sympathomimetics

What are some of the toxins that cause SEIZURES?

O.T.I.S C.A.M.P.B.E.L.L

- O Organophosphates
- T Tricyclic Antidepressants
- I INH, Insulin
- S Sympathomimetics

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- C Camphor, Cocaine
- A Amphetamines
- M Methylxanthines
- P Phencyclidine (PCP)
- B Benzodiazepine Withdrawal, Botanicals
- E Ethanol Withdrawal
- L Lead, Lithium
- L Lidocaine, Lindane

It is important here to distinguish the classic features shared by the anticholinergic and sympathomimetic toxidromes. Common to both presentations includes hyperthermia, tachycardia, hypertension and mydriasis. Sympathomimetics are distinguished by the presence of diaphoresis and active bowel sounds.

What are the commons forms of stimulant exposure or abuse?

Pertinent toxins include cocaine, amphetamines, weight loss products, over the counter analeptics, and in some cases, bootleg products.

Cocaine, when utilized by the general public, comes in many forms. The pediatric patient may be exposed to cocaine by placental transfer, breast milk contamination, or passive exposure. The mechanism of action of cocaine involves central nervous system stimulation and inhibition of catecholamine uptake. Presenting symptoms and signs may include severe hypertension, tachycardia, fatal arrhythmias and seizures.

Amphetamines enjoy a long history within our culture. The older formulations included diet pills which have now been replaced by abusers with methamphetamine (speed, ice) and MDMA (ecstasy).

Phenylpropanolamine (PPA), although removed from standard distribution, remains within medicine chests nationwide. It is a noncatecholamine, sympathetic amine which acts as an indirect alpha stimulant.

Caffeine is our most widely used psychoactive substance. It is an anorexiant, co-analgesic, a diuretic, and sleep suppressant.

What was the emergency department outcome of our patient?

Laboratory studies, CT and a spinal tap in this child were normal. Urine toxicology was positive for metabolites of cocaine. After interviewing the parents they admitted to liberal use of cocaine in the home resulting in secondary exposure to cocaine.

YOU'RE NEVER ALONE WHEN YOU'RE SCHIZOPHRENIC

A 15 year old girl arrives with her parents who claim that ever since she woke up this morning she has behaved as if she was "possessed!" She is presently

recovering from an active case of chicken pox and had been doing well. She reports no fever, stiff neck, nausea, vomiting, or new rash. Physical examination included vital signs: T 40C, HR 140, RR 20, BP 140/95. The patient was combative, with dilated, reactive pupils. Her pharynx was dry and she exhibited a distended, suprapubic mass, with absent bowel sounds..

What is the problem list concerning this patient?

This adolescent presents with fever and altered mental status and pupillary dilation. In addition, she demonstrates signs of encephalopathy involving posturing and hyperreflexia.

What is some of the toxins that cause hyperthermia?

N.A.S.A

- N Neuroleptic Malignant Syndrome, Nicotine
- A Antihistamines
- S Salicylates, Sympathomimetics
- A Anticholinergics, Antidepressants

What investigations should be performed in the emergency department?

Workup of this patient's encephalopathy included a CBC, electrolytes, liver function tests, and a serum pregnancy test . All were normal. CT scanning was unremarkable. A spinal tap failed to reveal any abnormalities.

Could this patient represent a toxidrome?

Careful review of the physical findings in this patient reveals the presence of the classic anticholinergic syndrome: warm, dry, flushed skin, dry mouth, dilated pupils, tachycardia, ileus, and delirium.

What are the most common drugs presenting with anticholinergic effects?

A complete list of anticholinergic medications would be quite lengthy. The most common drugs involved with this toxidrome include antihistamines, antipsychotics, antispasmodics, muscle relaxants, and tricyclic antidepressants.

What was the resolution of this case?

A careful review of the history and physical findings in this child revealed that the parents had been administering topical antihistamine lotions to the pruritic lesions involved with chicken pox. The active drug within this compound was Benadryl® (diphenhydramine).

What treatment is indicated in this case?

Most cases of anticholinergic syndrome need only supportive measures. Physostigmine, a centrally active anticholinesterase inhibitor, has been administered in patients who present with coma, delirium, or unstable vital signs. Side effects are many and this drug should

be reserved for single toxin exposures after consultation with a qualified toxicologist.

HEAVY BREATHING

A 3 year old presents with a three day history of fever, progressive sleepiness, and respiratory distress. Previously healthy, his parents report that he developed a fever (101) at first, for which they gave Tylenol. His behavior has become that of a lethargic and irritable child, with a “funny, fast breathing pattern”. Physical examination includes vital signs: T 40C, HR 140, RR 70 and deep, BP 140/70. The patient is sleepy and the remainder of the physical examination is non-contributory. The patient exudes a “medicinal smell”.

What is the initial problem list involving this patient?

This patient presents with fever, lethargy, and hyperpnea. It is important to distinguish patients who are tachypneic from those who are truly hyperpneic.

What are some of the toxins that cause hyperventilation?

P.A.N.T.

P	PCP, Pneumonitis (Chemical)
A	ASA (Salicylates)
N	Noncardiogenic Pulmonary Edema
T	Toxic Metabolic Acidosis

A review of this patient’s primary survey revealed that airway, breathing, and circulation was not impaired. A standard finger stick glucose was 100 mg/dL. The initial differential diagnosis included sepsis, pneumonia, or meningitis. A careful secondary survey was performed which failed to reveal any pupillary or specific neurologic abnormalities. The family denied any significant past medical history, medication, or allergies.

What investigations were performed in the emergency department?

A complete blood count was normal. A review of the electrolytes revealed an anion gap of 30. Arterial blood gases performed in room air demonstrated a pH of 7.50, pCO₂ =20, pO₂ =100, BE= -15. Chest radiographs were normal.

What are some of the toxins that cause anion gap acidosis?

M.U.D.P.I.L.E.S.

M	Methanol
U	Uremia
D	DKA
P	Phenformin, Paraldehyde
I	Iron, INH
L	Lactate
E	Ethanol, Ethylene Glycol
S	Salicylates

Further laboratory investigations revealed a normal serum osmolarity, a negative ethanol level, and an elevated salicylate level (66 mg/dL).

What are the characteristics of salicylate toxicity?

The classic toxic presentation of salicylate exposure is fascinating. Initially the patient presents with hyperpnea secondary to central stimulation of the respiratory center. A respiratory alkalosis will develop in most cases. Salicylates then act as cellular poisons, uncoupling oxidative phosphorylation and interrupting glucose metabolism. A profound acidosis will also develop. As the patient’s clinical status deteriorates, the central respiratory alkalosis dissipates and the patient becomes profoundly acidotic.

What are the clinical manifestations of salicylate exposure?

Patients present with vomiting, hyperpnea, tinnitus, and lethargy. In severe intoxications, coma, seizures, hypoglycemia, hyperthermia, and pulmonary edema will occur. Death is due to cardiovascular collapse and central nervous system failure.

What therapy is indicated in these patients?

The use of intravenous sodium bicarbonate has the potential for increasing the blood and urine pH, ion trapping available salicylates. The clinician should attempt to keep the blood pH between 7.45 and 7.55 and the urine pH over 7.5. In severe cases hemodialysis may be indicated.

What was the toxin in this case?

Although salicylates were not found in the home nor administered by the parents, the grandparents had been administering topical oil of wintergreen liniment to this child in an attempt to provide comfort for his viral illness. Oil of wintergreen contains very high concentrations of salicylates per unit volume and can be cutaneously absorbed.

Summary

While medical conditions certainly are possible etiologies in these presentations, careful evaluation of each patient for the presence of a classic toxidrome will often point the way to an accurate diagnosis.

CNYPCC Tidbits answers:

- A. 2
- B. 3
- C. 4
- D. 1

Tox Trivia answers:

1. Pigment at 450 wavelength of light
2. It uncouples oxidative phosphorylation leading to inefficient energy production
3. Carbon monoxide

SPI CORNER TOPIC: NO₂ ABUSE

Contributed by: Margo Spain, R.N., SPI

The following is a list of the daily diet of the LSD "60's" drug culture Dr. Timothy Leary, who died May 1996 at 75 years of age: Forty four cigarettes, Three cups of coffee, Two glasses of wine, One beer, One marijuana joint, Tylenol PM, Two morphine pills, Twelve balloons of Nitrous oxide and Three "leary biscuits" (a cheese soaked marijuana bud on A ritz cracker).

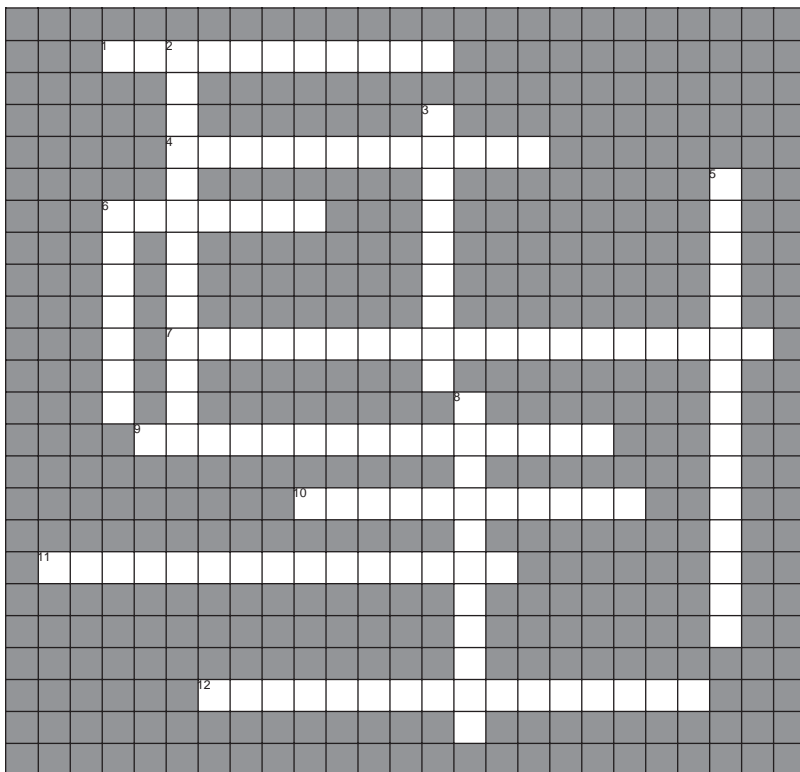
Thirty-five years later, health care professionals continue to see the effects of the recreational use of nitrous oxide gas. Teens today easily obtain nitrous balloons, also called "whippets" at rock concerts and clubs. Nitrous oxide gas is commonly used as a medical anesthetic. It is found as a propellant gas in food aerosols and is available for purchase at head shops, bar supply stores and the Internet. It is readily used as octane booster in race cars. The NO₂ abuser will experience intoxication within minutes of inhalation. Because the intoxication effects last only a few minutes, abusers frequently seek to prolong the high by continuing to inhale repeatedly over the course of several hours, a very dangerous practice.

The main complications seen are due to an acute lack of oxygen. Asphyxiation occurs after repeated inhalations, resulting in symptoms including respiratory distress, headache, dizziness, excitation proceeding to CNS depression, seizures, increased intracranial pressure and death due to anoxic brain injury. Cardiac dysrhythmias may also occur, a result of hypoxia.

Treatment is aggressive, symptomatic and supportive. The mainstay of therapy includes respiratory and cardiovascular support. Oxygen, 100% should be administered and ventilations assisted/intubation initiated as needed. Careful monitoring of oxygen saturation through pulse oximetry and arterial blood gas measurements is imperative. An ECG and continuous cardiac monitoring is useful to monitor for ectopy. Cyanotic patient should be screened for methemoglobinemia. When chronic exposure is suspected, hematologic changes such as anemia may be seen on a complete blood count. There are also rare reports of myeloneuropathy after chronic inhalation. Early identification and interventions are the best ways to stop inhalant abuse. Parents, educators, health care professionals should be alert to the following signs of a serious abuse problem: (1) Drunk or disoriented appearance, including slurred speech, altered perception and motor coordination. (2) Inattentiveness, lack of coordination, irritability and depression. (3) Chemical odors on breath or clothing. (4) Stains on face, hands, and clothes. (5) Hidden empty containers, chemical soaked rags and clothing.

References:

- National institute on drug abuse research report series: inhalant abuse
- Arizona poison center trivia report.



PHARMACEUTICALS

Contributed by: Laurie Piwinski, RN, CSPI

Down

- Hepatotoxic drug in many OTC cold and cough remedies
- Selective beta 2 agonist used in asthma therapy
- May make you see "little people"
- Cough suppressant that may cause respiratory depression, especially in children
- Antitussive with local anesthetic properties

Across

- Non-toxic expectorant in OTC preparations
- Methylxanthine that may cause sudden seizures refractory to standard anticonvulsant therapy
- Mom used to rub ointment with this toxin on your chest
- Banned by the FDA due to the risk for hemorrhagic stroke
- Antihistamine toxidrome
- In nasal and ophthalmic preparations, resembles clonidine in overdose
- Decongestant of choice
- Cough suppressant commonly abused among teenagers

Answers:
Down 2. Acetaminophen 3. Albuterol 5. diphenhydramine 6. Dextromethorphan 8. Benzonatate
Across 1. guaifenesin 4. Theophylline 6. Camphor 7. Phenylpropanolamine 9. Anticholinergic 10. Imidazole decongestants 11. Pseudoephedrine 12. Codeine