Help is just a phone call away!

Clinical Cases

- Goals and Objectives
  - Provide an overview of common syndromes
  - Acute v chronic
  - Dose makes a poison
    - Dose related v idiosyncratic
  - Immediate action needed
  - Limited antidotes
  - Consult the Poison Center (1-800-222-1222)

DPPT Case Series

We will present a series of clinical vignettes and problem solve with you.

If you recognize the case and know the diagnosis, please do not spoil it for the others!

Case # 1

- A 38 year old male presents to the Emergency Department with urinary retention, hallucinations, agitation and mumbled speech

Introduction

- commonly occurs but is frequently unrecognized
- frequently AP is an unsuspected adverse effect of medications

Acetylcholine Receptors

- receptors
  - Muscarinic
  - Nicotinic

Anticholinergic Poisoning

- Central
- Peripheral

Anticholinergic Poisoning

- Children are particularly sensitive
- Down syndrome

Anticholinergic Poisoning

- Mad as a wet hen
- Blind as a bat
- Dry as a bone
- Red as a beet
- Hot as a hare

Anticholinergic Agents

- Medications
  - Anticholinergics
  - Antihistamines
  - Psychoactives
- Plants



Not so quiet Chamomile

- In March 1994 the New York City Health Department investigated 7 cases of AC poisoning
- Tea was prepared from leaves labeled as Paraguay tea
- Manifestations occurred within two hours of tea consumption

MMWR, March 24, 1995/vol.44/no.11

Adrenergic vs Anticholinergic

Mydriasis
Tachycardia/HTN
Hyperthermia
Disorientation
Agitation
Hallucinations
Bowel sounds present
Diaphoresis

Mydriasis
Tachycardia
Hyperthermia
Disorientation
Hallucinations
Decreased bowel sounds (unreliable)
Dry skin/mucous membranes

Physostigmine

- severe agitation and refractory seizures
- Phystogmine may be considered in tachycardia causing hemodynamic compromise
- Avoid use in patients with bradycardia, asthma or conduction delays

Case # 2

- A 40 year old female presents to the Emergency Department with abdominal pain, vomiting and blurry vision

Labs

- ABGs: pH=6.53, pO2 161, pCO2 16
- Lytes: Na=141 K=4.7 Cl=109 CO2=7
- BUN=11 Cr=0.9

Wide Anion Gap Acidosis

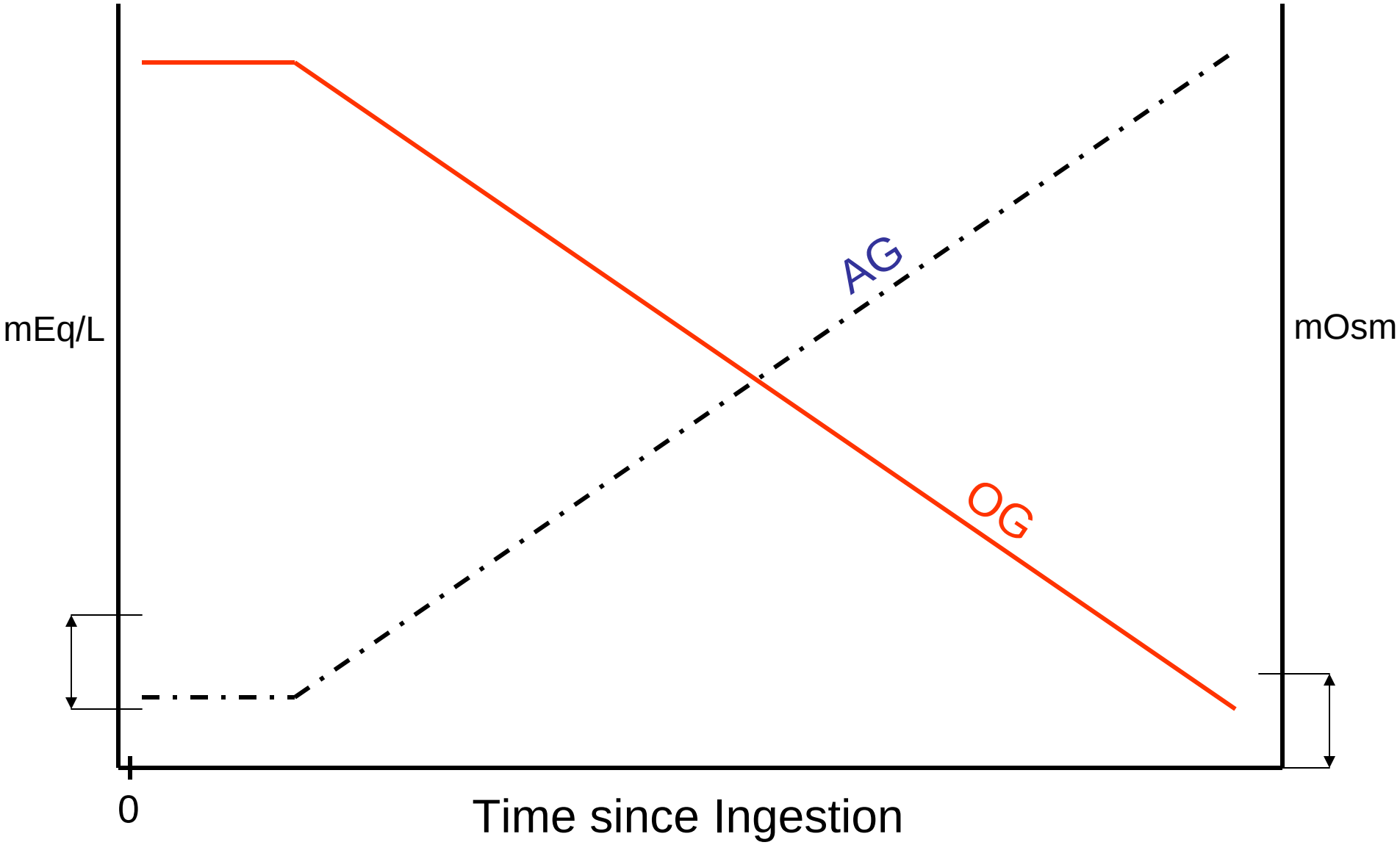
- C (carbon monoxide, cyanide)
- A (AKA)
- T (toluene)
- M (methanol)
- U (uremia)
- D (DKA)
- P (paraldehyde, phenformin)
- I (INH, iron)
- L (Lactic acidosis)
- E (ethylene glycol, everything else)
- S (salicylates, strychtnine)

Labs

- ABGs: pH=6.53, pO2 161, pCO2 16
- Lytes: Na=141 K=4.7 Cl=109 Co2=7
- BUN=11 Cr=0.9
- Serum osmolarity=338

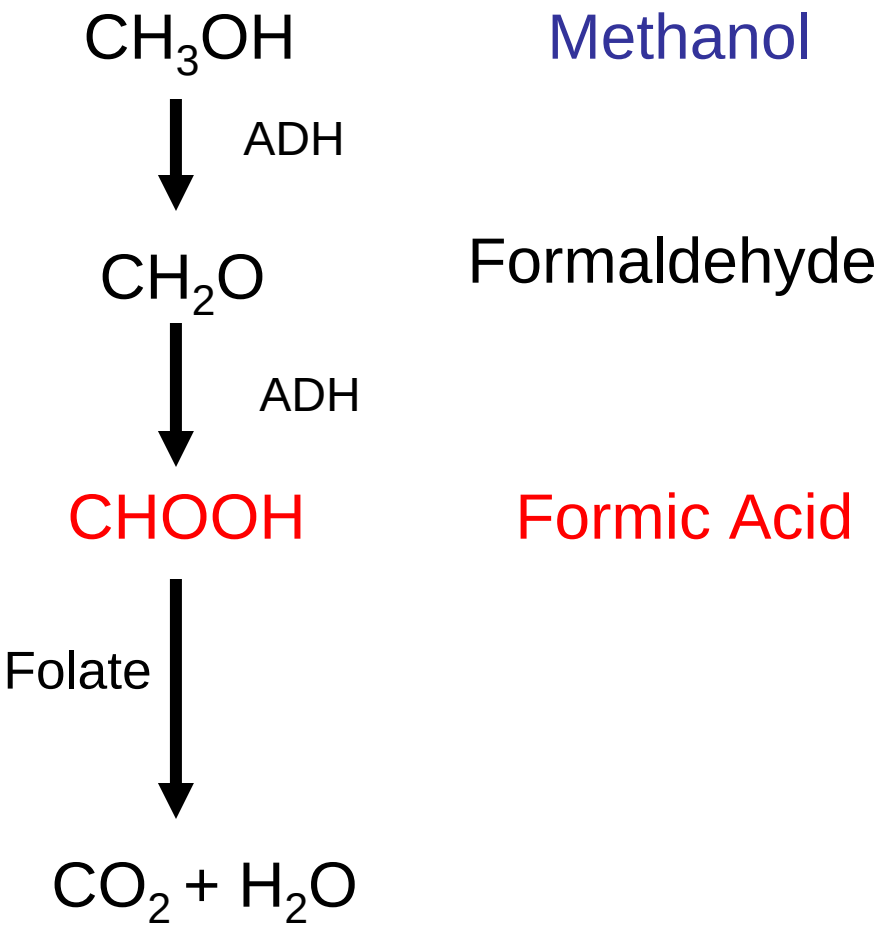
The “Osmolar Gap”

Measured Serum Osmolarity


mEq/L
mOsm
AG
OG
0
Time since Ingestion

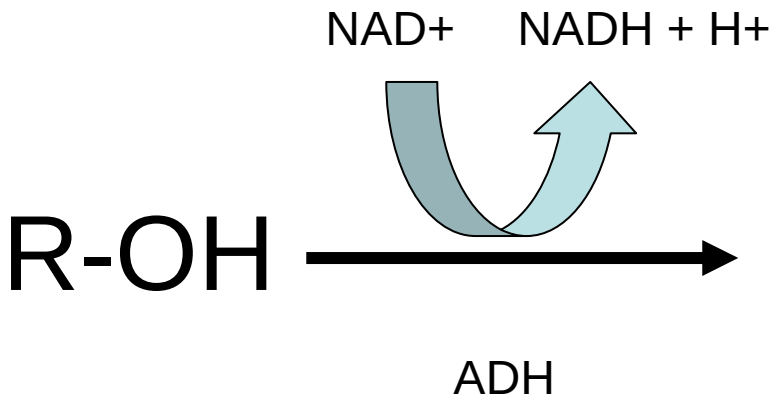
Methanol

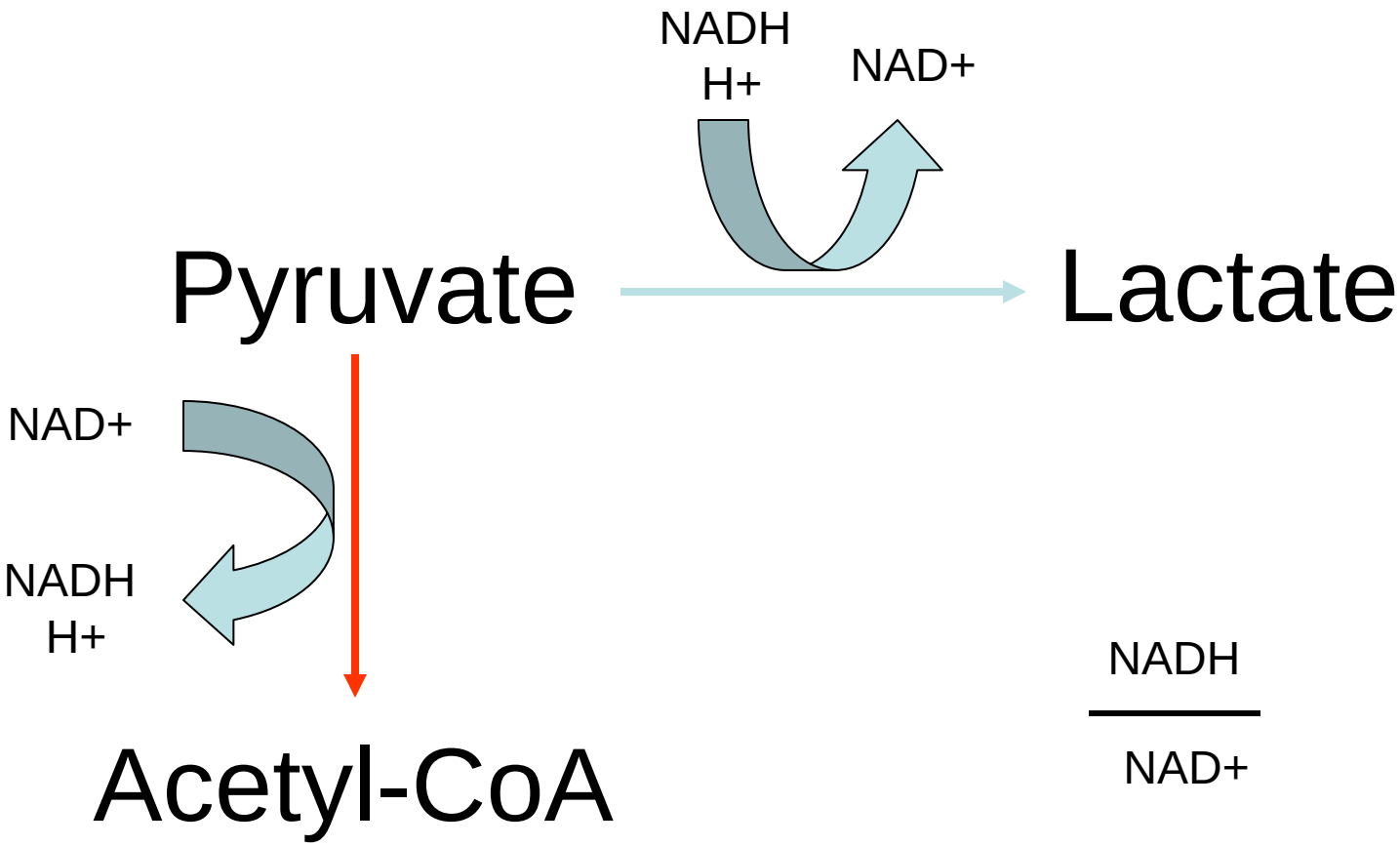
- Antifreeze (window washer fluid)
- Anti icing agent
- Octane booster
- Ethanol denaturant
- Extraction agent
- Solvent
- Fuel source


CH_3OH
Methanol
ADH
CH_2O
Formaldehyde
ADH
CHOOH
Formic Acid
Folate
$CO_2 + H_2O$

Formic acid

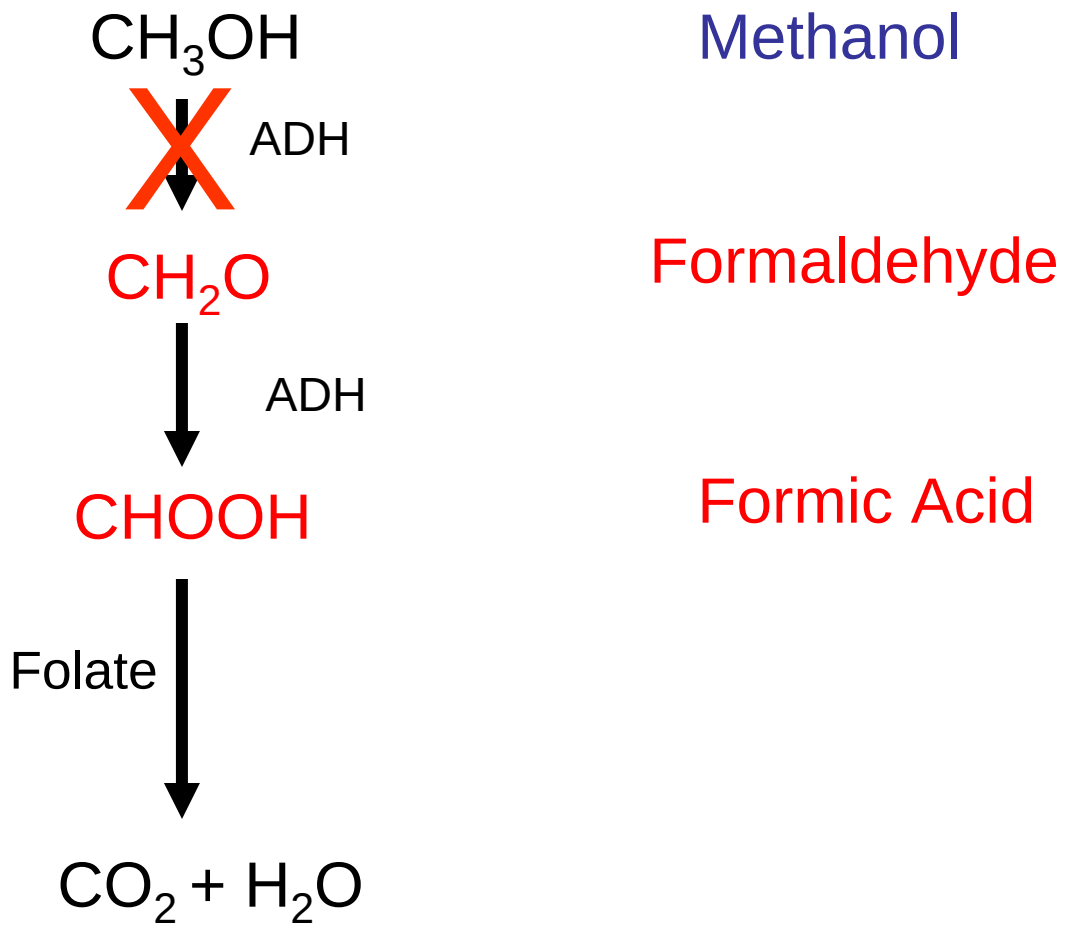
- Metabolic acidosis
- Inhibits cytochrome oxidase


NAD+
NADH + H+
R-OH
ADH


NADH
H+
NAD+
Pyruvate
Lactate
NAD+
NADH
H+
Acetyl-CoA
NADH
NAD+

Management

- Sodium bicarbonate as needed
- Inhibition of Alcohol dehydrogenase


CH_3OH
Methanol
ADH
CH_2O
Formaldehyde
ADH
CHOOH
Formic Acid
Folate
$CO_2 + H_2O$


NDC 62161-003-31
ORPHAN MEDICAL
ANTIZOL
(fomepizole) injection
1.5 mL, 1 g/mL four vials
Caution: Must be diluted before use.
Sterile
NDC 62161-003-31
ORPHAN MEDICAL
ANTIZOL
(fomepizole) injection
1.5 mL
Caution: Must be diluted before use.
Sterile
1 g/mL one vial


WHISKEY

Case #3

Know the community you deal with!

35 yo female presents to ED with cellulitis

History

- Doesn’t remember how it started
- Can’t remember where she was or what happened over a 3 hour period three days before presentation

What to do next?

- Blood work
  - CBC slight elevation in WBC, no shift
- Wound culture
  - No growth
- X-ray?

What does this suggest?

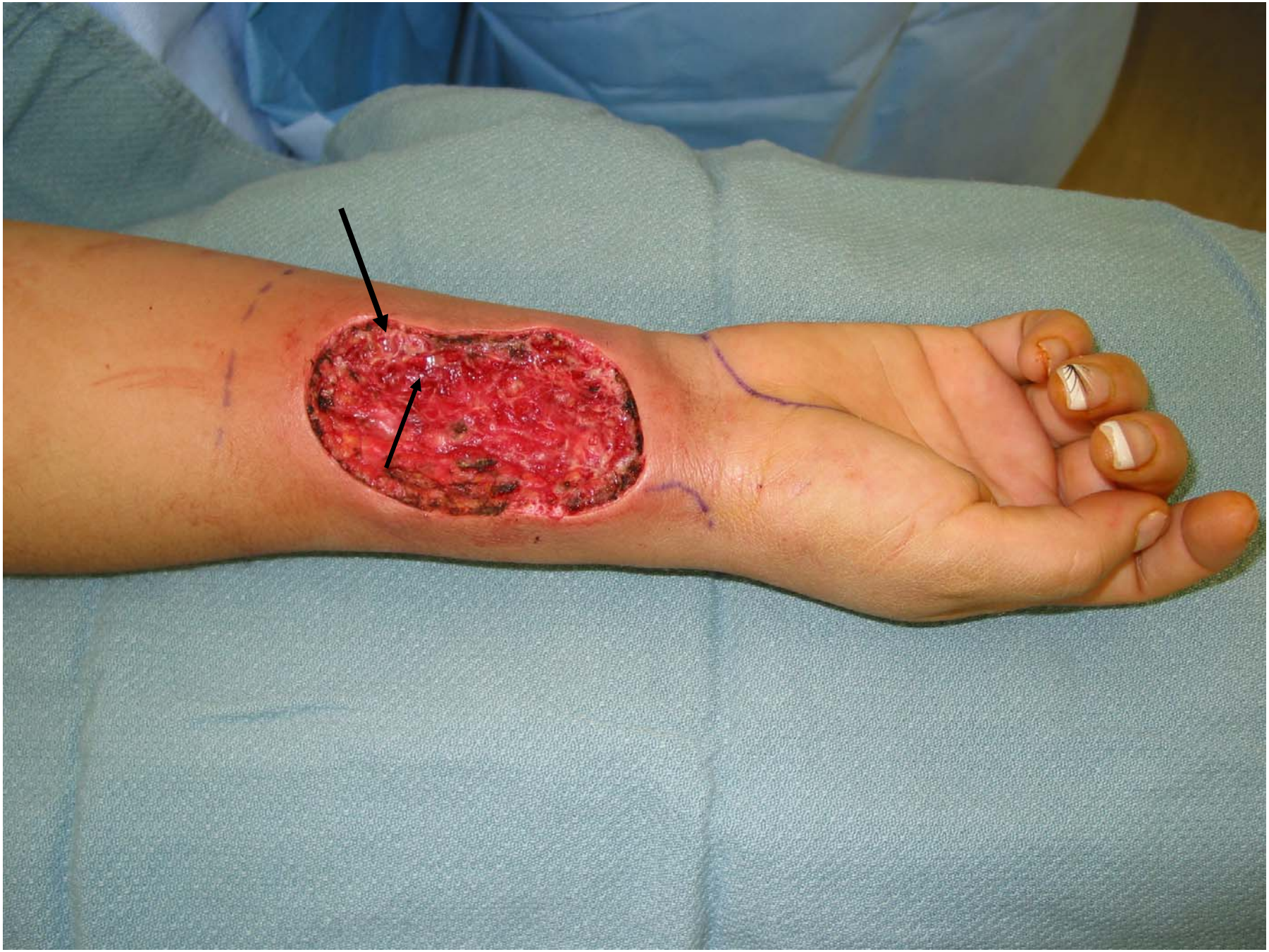
Course in hospital

- Started on antibiotics
- Surgery suggested by PCC
- Pt transferred to tertiary care facility day 5
- Day 6 did debridement in OR
  - Dangers to patient
  - Dangers to treatment team

Cultural aspects

- Day 4 patient related she had visited a “healer”
- Other uses of this substance:
  - Injected prior to travel to “ward off evil spirits”
  - Boxers: build muscle mass/strength
  - Esperitismo, Santeria, voodoo: often carried personally or spread

- Toxicity to those contaminated
- Environmental/community contamination



Pre-op

Post-op

Forms of mercury exposure

- Elemental (liquid)
- Inorganic salts
- Organic salts
  - Methyl mercury
  - Ethyl mercury

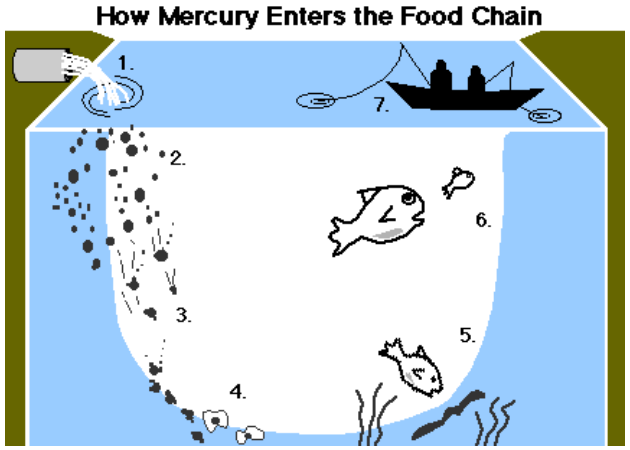


Figure 1. Pelvis anteroposterior view showing scattered areas of metallic density in penile shaft and pelvic area.

Espanto

4 yo Mexican female was involved in an accident and developed “espanto.”

Espanto

The child did not recover so the father's cousin performed a sweeping ceremony.

An herbal product was mixed with a solution and the child washed down with this. The child was then wrapped in a blanket and placed in bed to sleep.

Three hours later the mother tried to awaken the child and could not. Mother stated child had a 5 second seizure.

The child was taken to the ED

VS: T 98 HR 132 RR 24

What would you do?

Na: 141 mequiv/L

K: 3.2 mequiv/L

Cl: 108 mequiv/L

CO_2: 20 mequiv/L

BUN: 17

Cr: 0.9

Glucose: 130 mg/dl

Serum osmolarity: 356

Ethanol:	0
Methanol:	0
Isopropyl alcohol:	9 mg/dl
Acetone:	146 mg/dl

In a 1985 study performed by Trotter in which patients in multiple clinic settings were asked what folk conditions had been treated in their families, 42.8% of informants (2,009 interviews) said they had treated susto at least once.

Trotter RT. Folk medicine in the Southwest: myths and medical facts. Postgrad Med. 1985;78(8):167-170, 173-176, 179,

Empacho

- 25 year old Latina mother brings her 1 yo daughter for an intestinal disorder. She describes fever, vomiting and diarrhea. She calls it empacho.

- MD doesn't find anything on PE so suggests acetaminophen and clear fluids.

- 3 days later mother returns with child reporting no change.

- Physician prescribes an antibiotic.

- Child returns for regular check up.
- Physician asks about the prior illness and mother replies:

  “It was okay.”
- The child seems lethargic and inattentive.
- Lead test reveals a lead of 60 mcg/dl

Mother has been using Greta: 99% lead

Azarcon a bright orange powder

also known as *Rueda, Coral, Maria Luisa, Alarcon, Liga*

Greta a yellow powder

Empacho

- Thought to be caused by intestinal blockage from clump of food attaching to stomach or intestional wall
- PRs seek a *santiguadora;* MAs seek a *sobadora*
- Treatment = combination of special massage, prayers, and diet modification

A Very Bad High

Case #2 “Bad Heroin”

- ED doctor calls the PCC re: 25 year old male complains he got bad heroin
- “feels funny”
- What would you ask?

Bad Heroin

- Snorts drug, uses 2-3X/week
- Tightness in chest
  - Heart racing
- Headache
- Feeling of impending doom

Does this help?

Bad Heroin

- HR 127
- RR 25
- BP 85/38
- Pupils 9 mm

Any thoughts?

Bad Heroin

- ECG: “ischemic changes”
- Chemistries
  - Na 143
  - K 2.2
  - Gluc 228
- Patient not making urine

Bad Heroin

- Given 5 liters of IVF
  - Starts to void
- New labs:
  - pH 7.27, pCO2 29.5 mm/Hg
  - Lactate 10.6

Bad Heroin

- Patient has persistent hypotension and acidosis
- Patient persistently tachycardic and tachypneic

Center blood is control blood (actually that of S. Marcus, MD) the bloods on either side are mixed venous bloods from central catheters of 2 patients

Why so red?

Bad Heroin

- pVO_2 76!

What is happening?

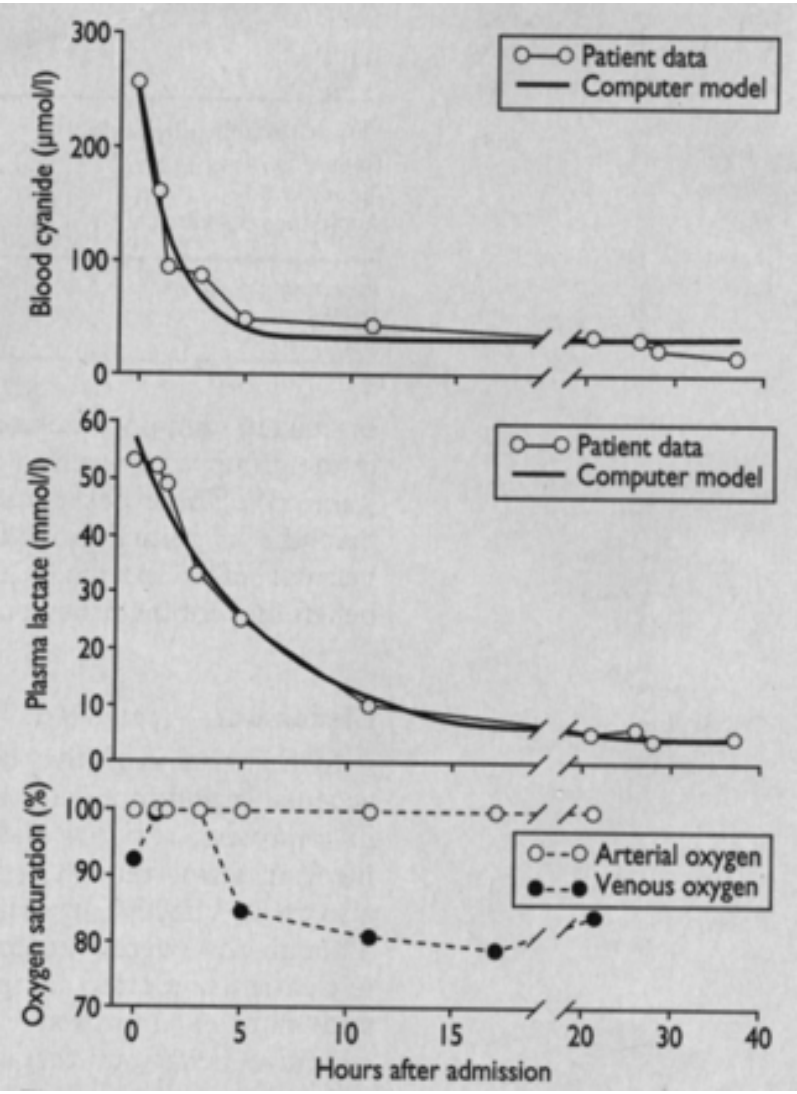
Pulmonologist: “This isn’t physiologically possible!”

Bad Heroin

- Other case in NJ
  - 3 in Middlesex
  - 3 in Monmouth

Who would you alert?

What now?



Curves from Baud et al article on cyanide poisoning

BMJ 1996;312:26-27

Unfortunately no literature citing pVO2 levels

Bad Heroin

- Improves after sodium thiosulfate

Bad Heroin

- 2 other young men present same hospital same s/s

Is this an outbreak?

What do you do?

Who do you contact?

Bad Heroin

- Other case in NJ
  - Middlesex
  - Monmouth

What now?

Confiscated drug analyzed

- And they found?
  - Tachycardia
  - Acidosis
  - Hypokalemia
  - Hyperglycemia

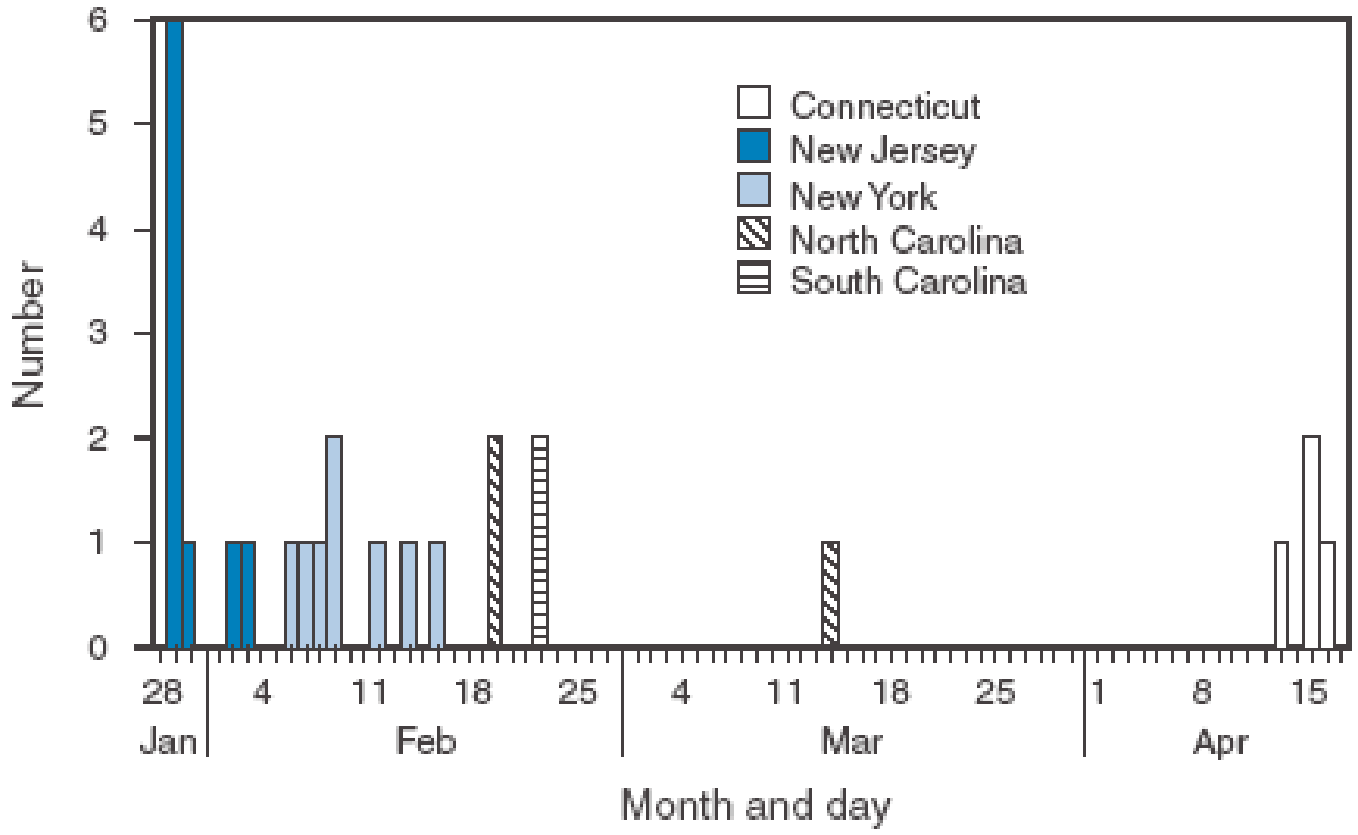
clenbuterol

Bad Heroin

- Reported through Epi-X
- Other cases in other states

Usually when you hear hoof beats you see horses

FIGURE. Number of suspected, probable, or confirmed cases of heroin-related clenbuterol poisoning, by state and date of exposure — five states, January 28–April 17, 2005



Other outbreaks reported by NJPIES

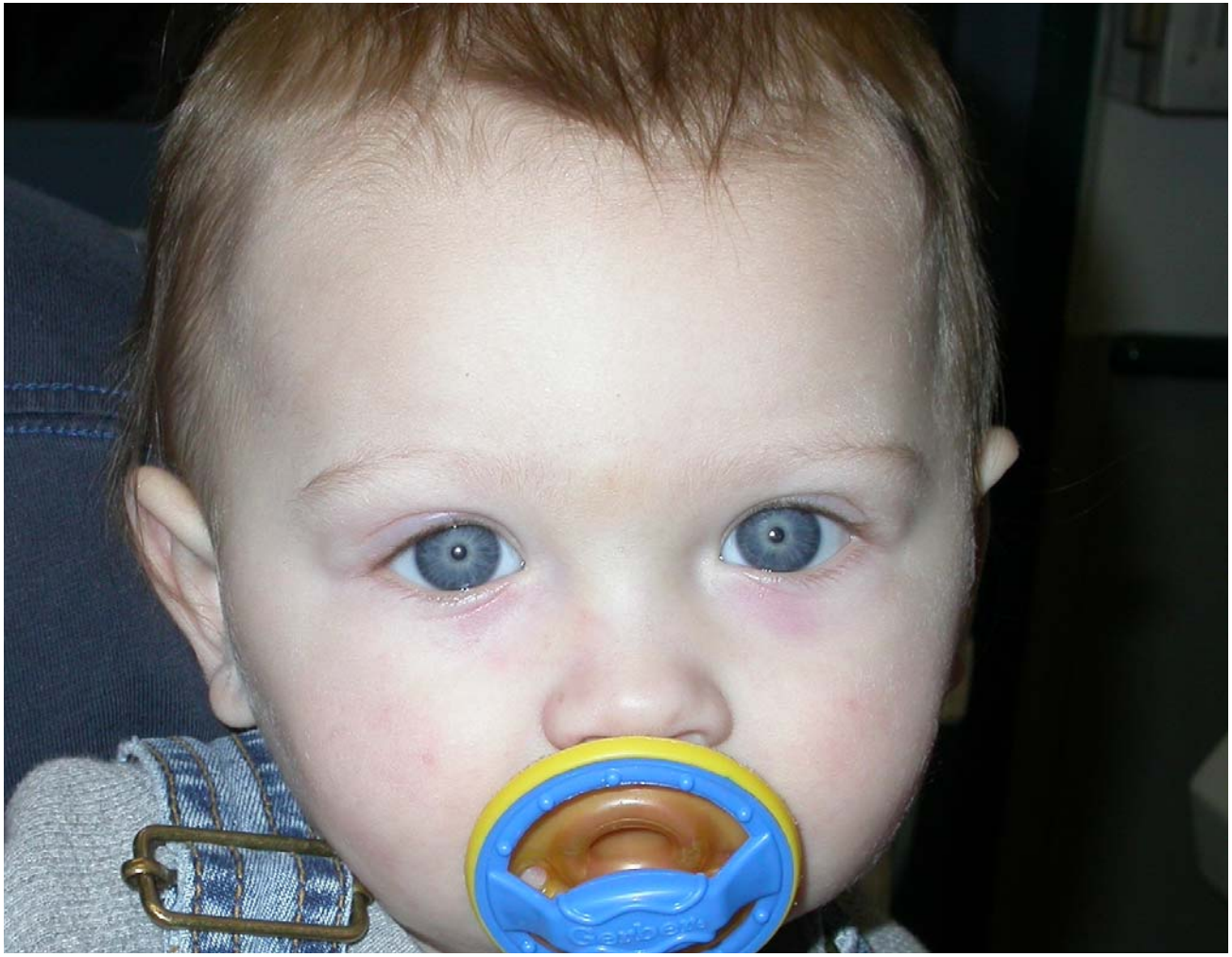
- Methemoglobinemia in school and office
- Puffer fish paralysis
- Fentanyl
- Botulism from non pharmaceutical grade
- Phosphatidyl choline
- Cullen

Case #5

A 2-year old boy presents in ED with lethargy, vomiting, and diarrhea

Case

- 2yo boy “licked” bottle in garage ~ 1h ago
- Presents with lethargy, vomiting, diarrhea, coughing, “twitching”
- Physical exam:
  - HR 95 BP 113/59 RR 18 95% on RA
  - Skin, mucous membranes moist
  - Pupils



What's going on here?

- Lethargy
- Vomiting, diarrhea
- Miosis

Differential Diagnosis:

- Miosis
- Mydriasis

Toxidrome??

“Toxidromes”

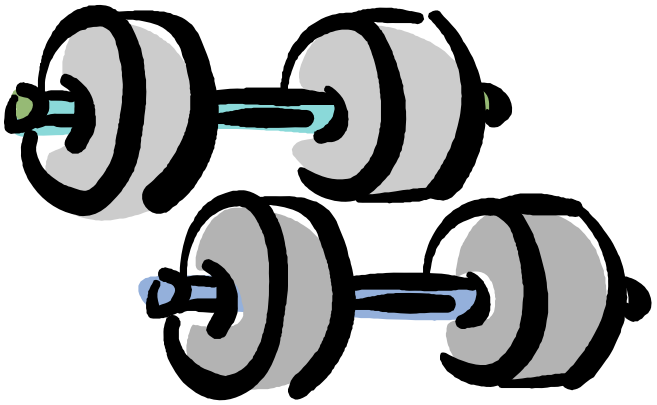
- Sympathomimetic
- Anticholinergic
- Cholinergic
- Opioids
- Sedative-Hypnotic

Sympathomimetic Toxidrome

- "Fight or Flight"
  - ↑HR, ↑BP, ↑RR, ↑Temperature
  - Mydriasis
  - ↑ Peristalsis
  - Diaphoresis

Cholinergic Toxidrome

- “DUMBBELS”:
  - Diarrhea
  - Urination
  - Miosis
  - Bronchorrea
  - Bradycardia
  - Emesis
  - Lacrimation
  - Salivation



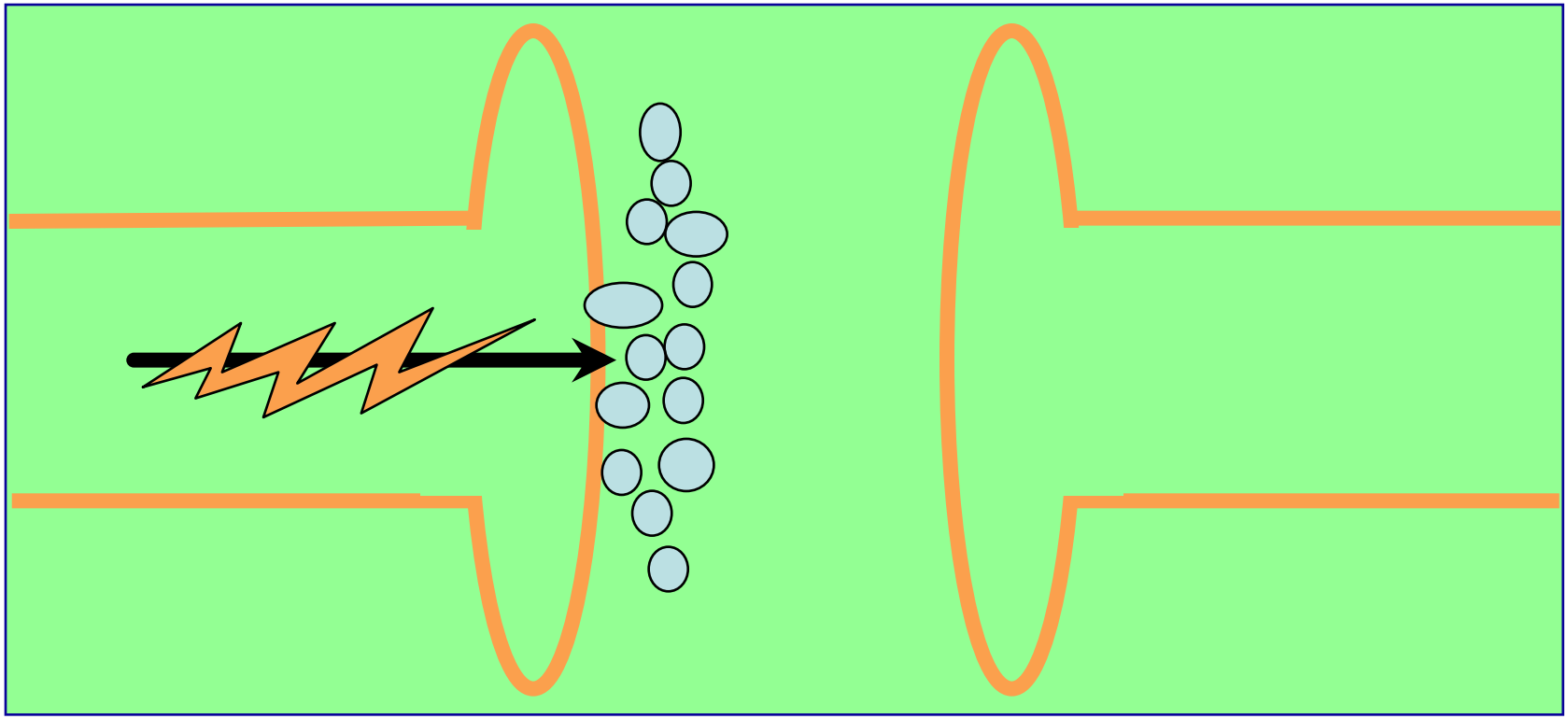
Opioid Toxidrome

- Miosis
- Lethargy
- Respiratory depression
- ↓ peristalsis

What was in that bottle?

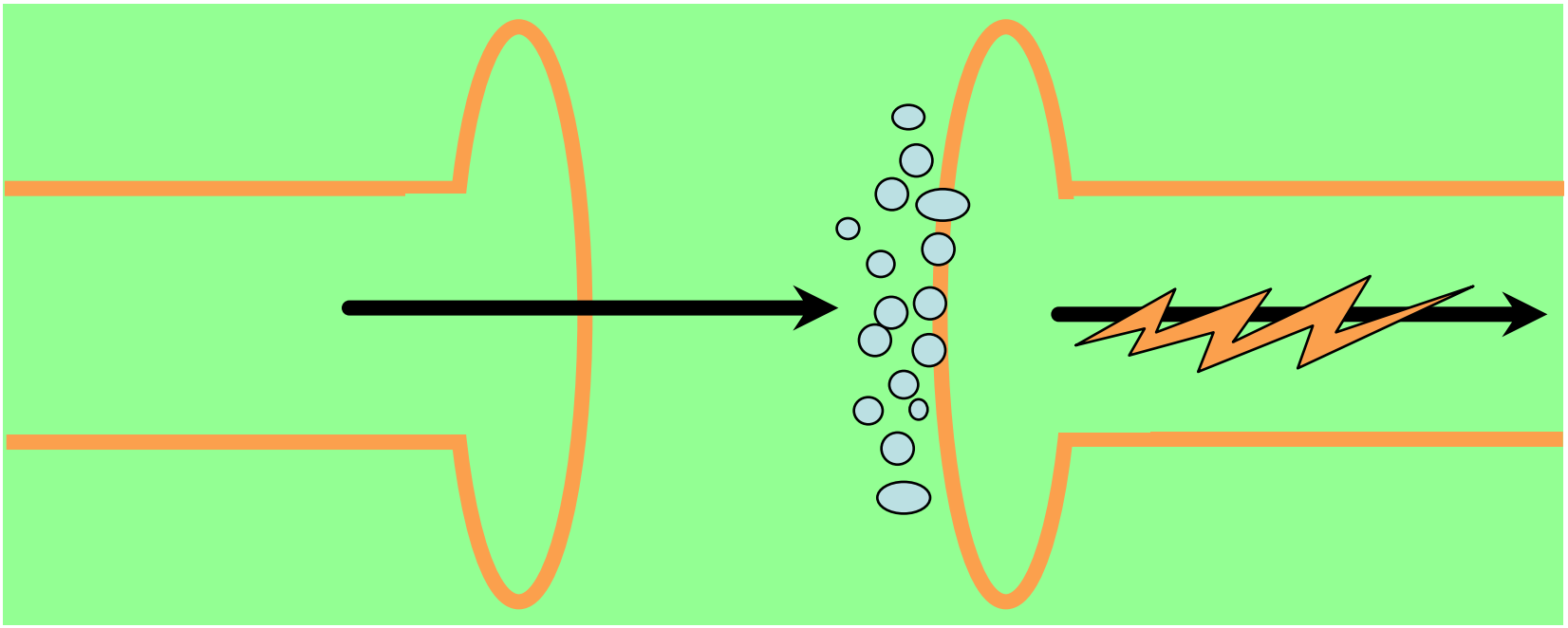
Chlorpyrifos 11.2%

Normal Nerve Function



neuro-transmitter=Acetylcholine

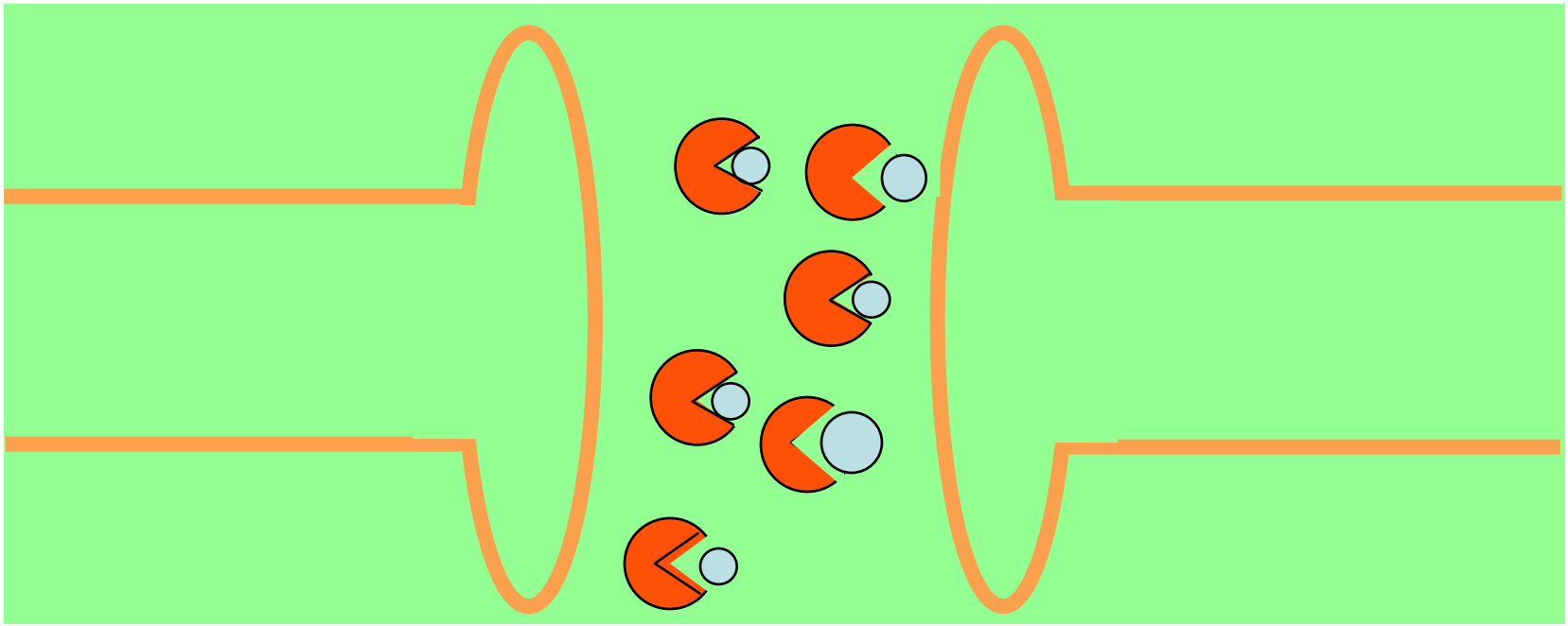
Normal Nerve Function



Acetyl choline

Normal Nerve Function

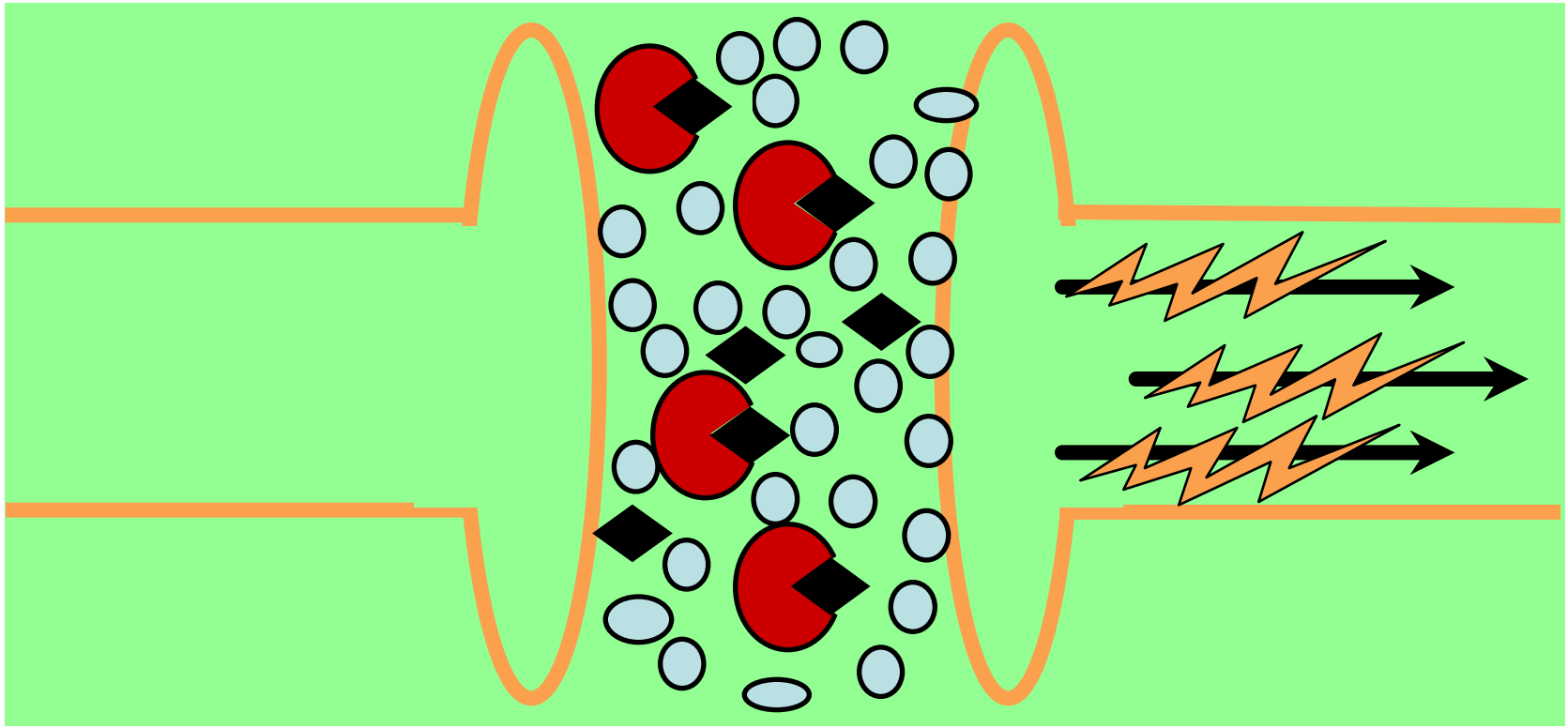
Termination of Action



Acetylcholine esterase

Acetylcholine

How Carbamates/OP Insecticides Work



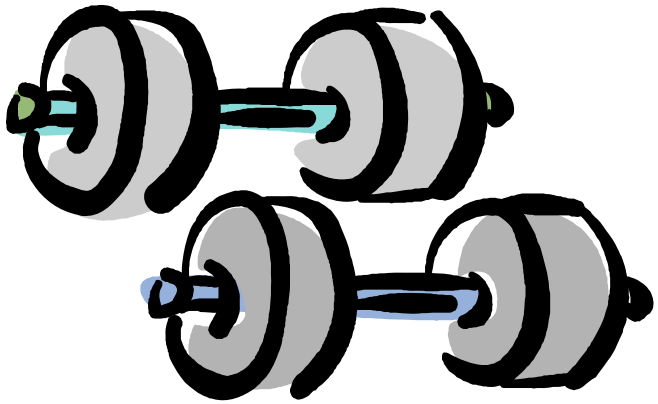
Acetyl choline esterase

Organo phosphate/Carbamate

Acetyl choline

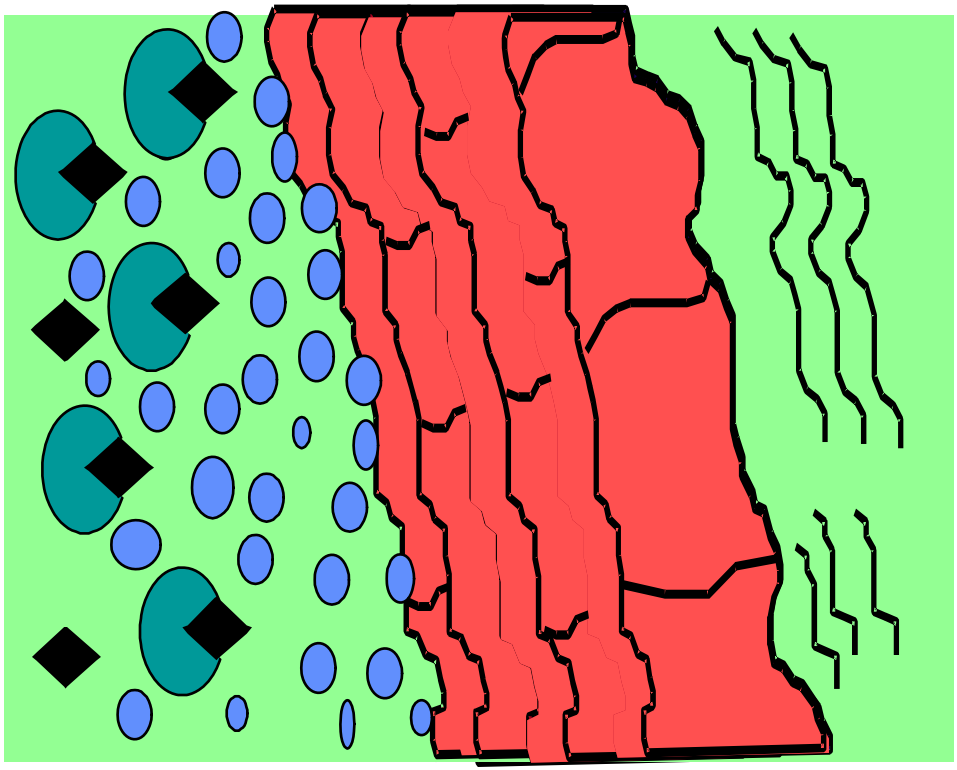
Cholinergic Toxidrome

- “DUMBBELS”: Muscarinic Effects
  - Diarrhea
  - Urination
  - Miosis
  - Bronchorrea
  - Bradycardia
  - Emesis
  - Lacrimation
  - Salivation



Cholinergic Agents: Nicotinic Effects

- Skeletal muscles
  - Fasciculations
  - Twitching
  - Weakness
  - Flaccid paralysis
- Other (ganglionic)
  - Tachycardia
  - Hypertension

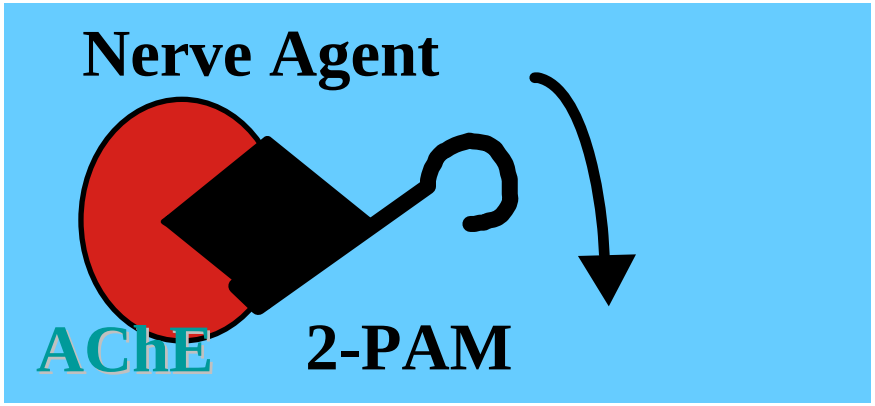


OP/C Toxicity: Atropine

- Antagonizes muscarinic effects
- Dries secretions; relaxes smooth muscles
- Given IV, IM, ET
  - No effect on pupils
  - No effect on skeletal muscles
  - IV in hypoxic patient

OP/C Toxicity: Treatment Pralidoxime Chloride (2-PAM)

- Remove nerve agent from AChE in absence of aging
- 1 gram slowly (20-30) in IV infusion
  - Hypertension with rapid infusion
- No effects at muscarinic sites
- Helps at nicotinic sites



Bioterrorism 101

Case #6

- 15yo boy found “unresponsive” by friends, brought in by EMS
- last seen 4 hours ago
- may have taken “blue chewies”
- In resuscitation bay:
  - Afebrile, HR 106, RR 14, BP 95/30, 98%
  - Lethargic, responds to painful stimuli
  - Pupils reactive
  - Skin warm, dry
  - Fingerstick 180

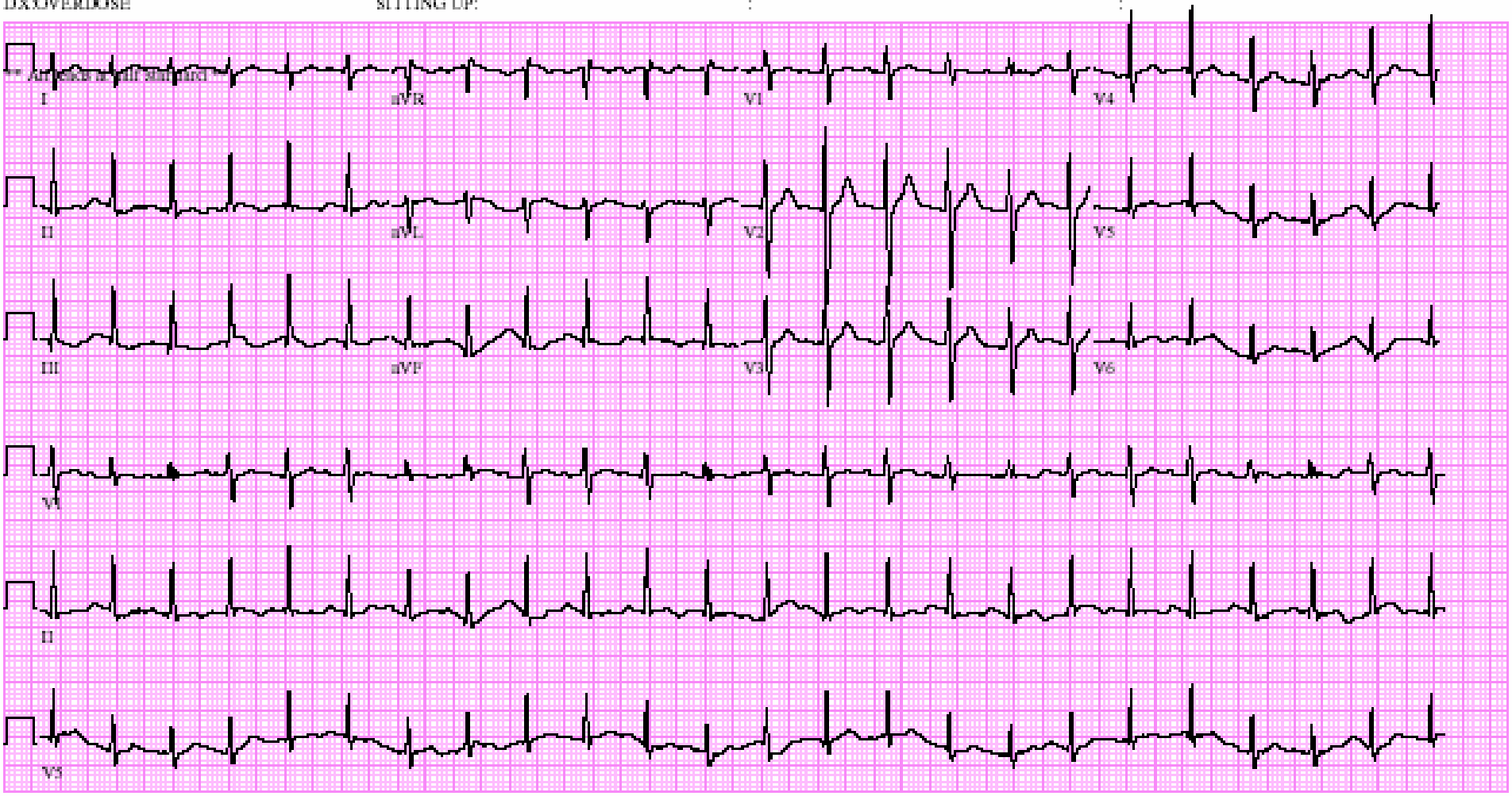
Case Presentation

- PMHx: Depression, suicide attempts
- Known ETOH, marijuana use
- Known meds in home: Xanax®, Ibuprofen
- Labs:
  - Electrolytes, CBC WNL
  - no osmolar gap
  - ABG 7.34/42/141/-3.6
- Head CT : normal
- Drug screen: + Benzos + THC

DX:OVERDOSE SITTING UP:

Referred by: S SCHULTZ MD :

Confirmed By: LARRY A. RHODES, M.D. :



25mm/s 5mm/mV 150Hz 005C 12SL 250 CID: 7

EID:29 EDT: 18:11 02-DEC-2002 ORDER:

Differential Diagnosis

- “Blue chewies”
  - www.addictions.org
  - www.whitehousedrugpolicy.gov
  - www.drugarm.org

Toxins causing hypotension?

Toxins causing hypotension AND bradycardia

Toxins causing Hypotension, Bradycardia

	Pupils	Glucose	ECG	Other
α blockers	↔	↔	**Normal or AV block**	
ß blockers	↔	↓	**Normal or AV block**	
CCBs	↔	↑	**Normal or AV block**	**Mental status may be normal**
CNS depressants	↔	↔	**Sinus brady**	
Clonidine	↓	↔	**Sinus brady**	**Responds to stim**
Organophos-phates	↓	↔	**Sinus brady**	**Cholinergic toxidrome**
Digoxin	↔	↔	Abnormal	**Hyperkalemia**

Case Presentation

- Friend offering more information states that patient may have taken something else…..

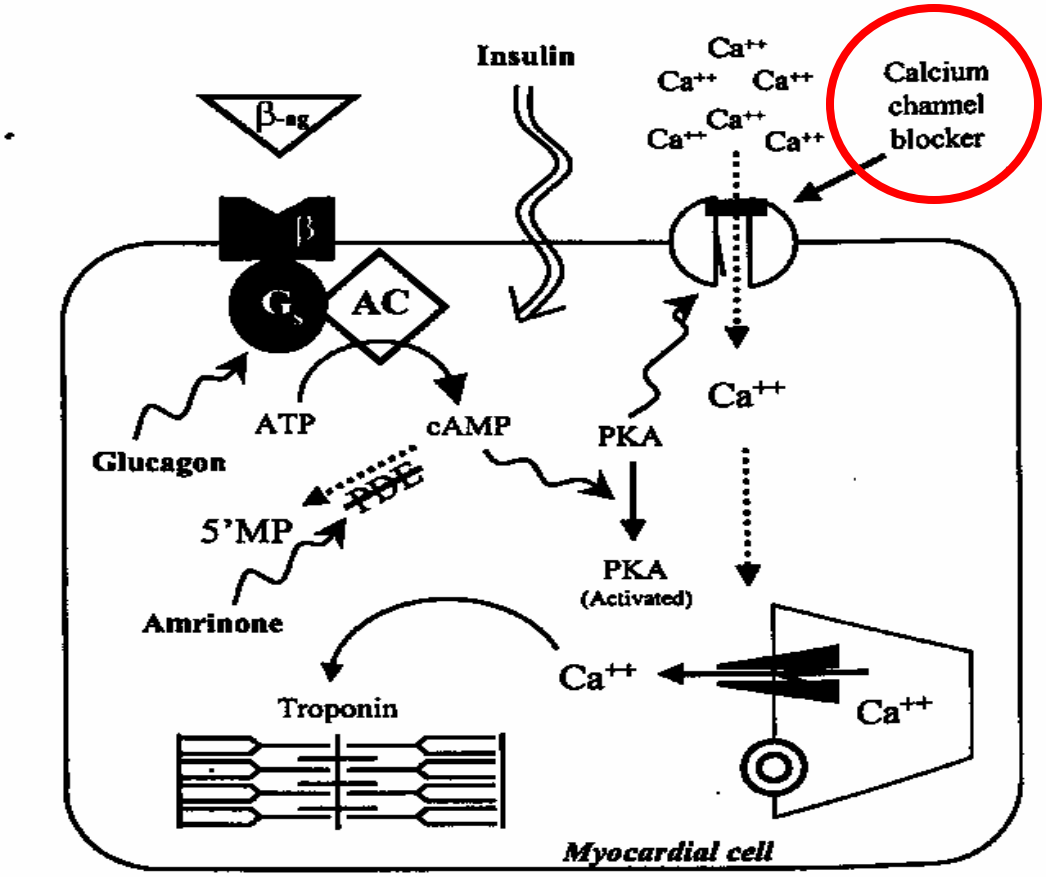
"What's Norvasc®?"

(Nifedipine)

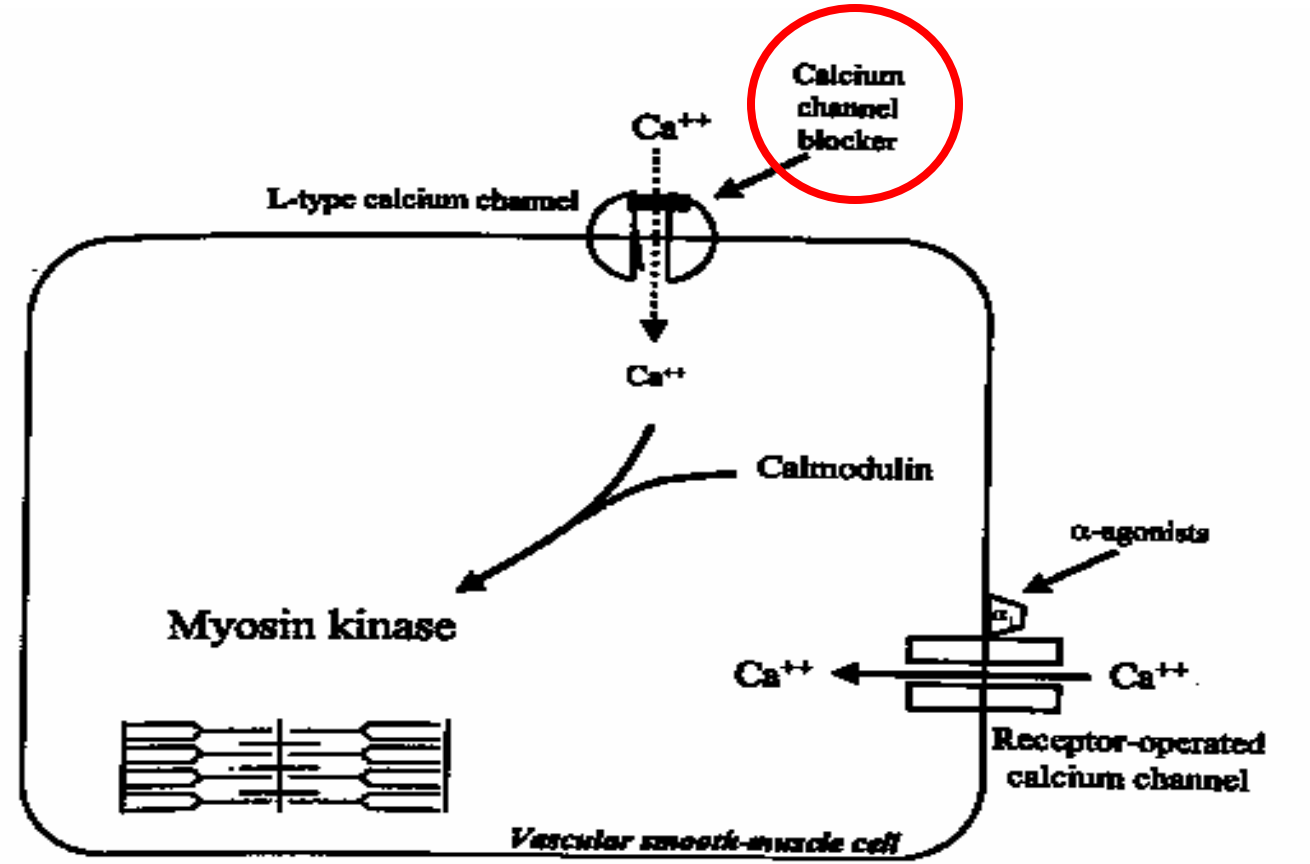
Calcium-Channel Antagonists

- frequently prescribed
- Available in sustained-release (SR) preparations
- 1999 PCC data: 5th leading cause of poisoning deaths

Calcium channel blockade: Myocardial Cell



Vascular smooth muscle cell



Calcium-channel antagonists: Clinical Manifestations

- Hypotension=most common
- Receptor selectivity lost in overdose but:
  - Verapamil: AV nodal block
  - Amlodipine: tachycardia or “normal” HR
- Hyperglycemia
- Acute lung injury
- Usually within 2-3 hrs unless SR

Calcium-channel antagonists: management

- Serial EKG
- Decontamination: AC, WBI
- Hypotension:
  - Fluids
  - Calcium
  - Pressors
  - Insulin/glucose
  - Glucagon
  - Other therapies

Case #7

- A 28 year-old man is found unconscious indoors at a construction site.

- He had been working with a power washer all morning before his colleagues left him alone to get lunch.

Most common inhaled poison

- Incomplete combustion of fossil fuels
- Fire-related deaths/suicides
- U.S. averages about 500 deaths per year

Sources of CO

- Cookers/heaters
  - Gas, coal, wood, kerosene – burning
- Automobile exhaust
- Engir ools, equipment
  - Gas e, propane
- Buildi

Nation

"It Was Death, Absolute Death"

Clinical Effects:

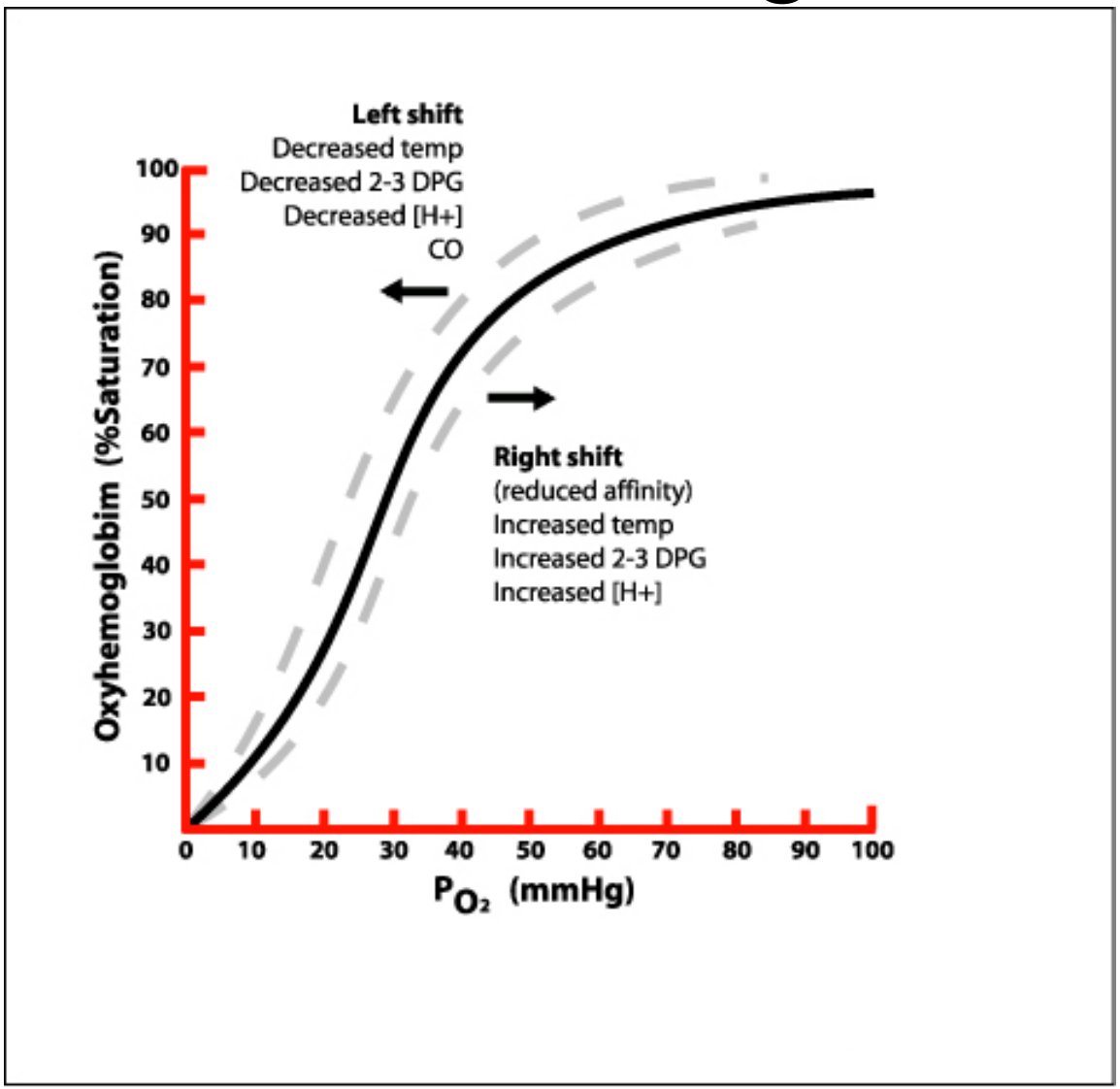
Flu-like syndrome!

NO COUGH

Pharmacokinetics

- Hgb Binding
- Myoglobin
- Elimination:

CO Decreases Oxygen Unloading



Cardiovascular-Pathophysiology

- Myoglobin also binds CO with 60-times affinity of O_2
- Binding is enhanced with hypoxia
- Myocardial depression
- Displaced NO and vasodilation

Management

- Emergency Safety Net
  - IV, Monitor, Fingerstick glucose
- Inotropes?
- Oxygen 1-3 ATA

Indications for HBO

- Generally accepted
- Controversial

Case # 8

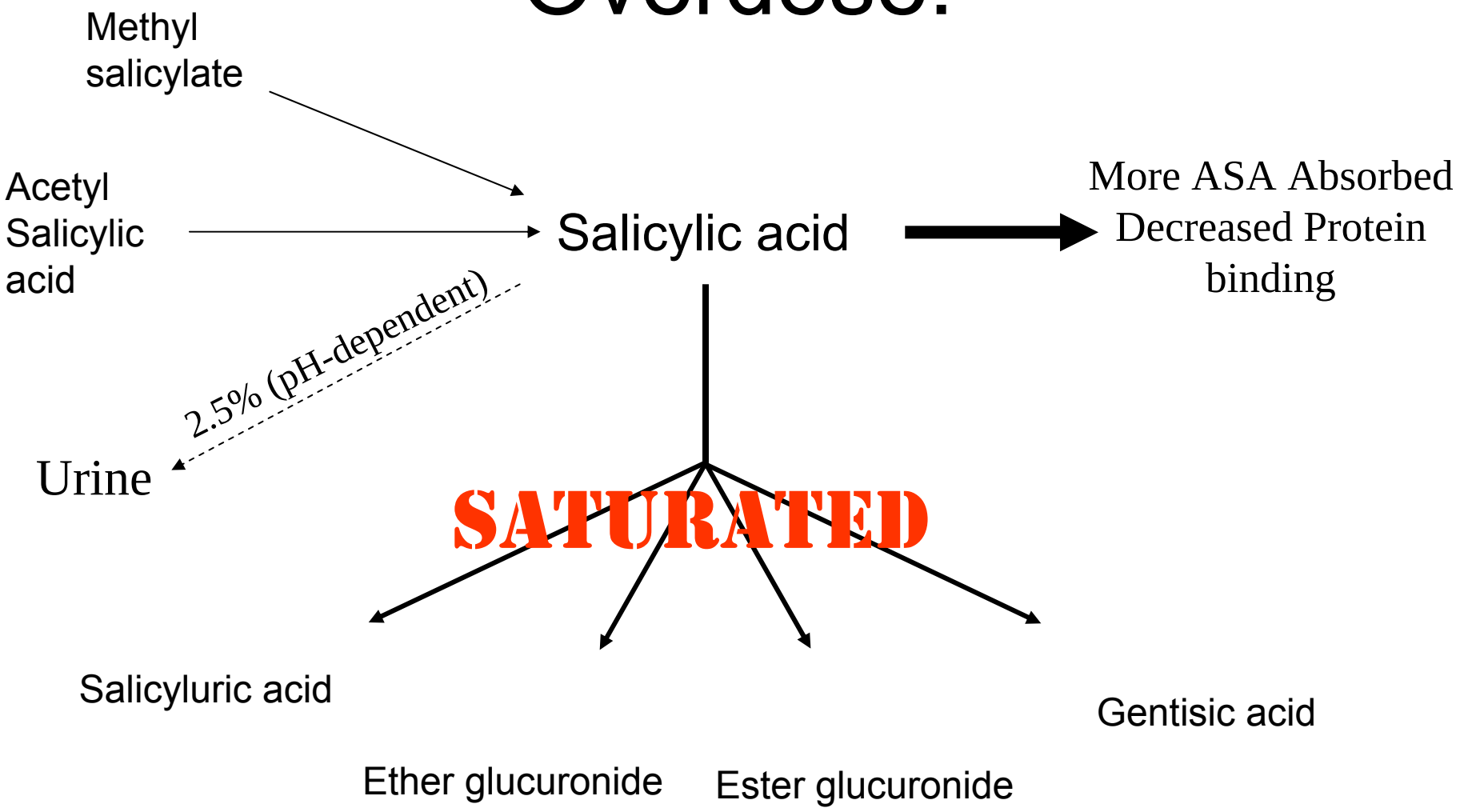
- A 17 year-old woman is brought to the ED by her mother for shortness of breath.

- She argued with her mother and then locked herself in the bathroom.
- HR 108 bpm, BP 121/73 mmHg, RR 28 bpm, T 96.7ºF

Salicylates

- Pharmacokinetics
- Toxicokinetics

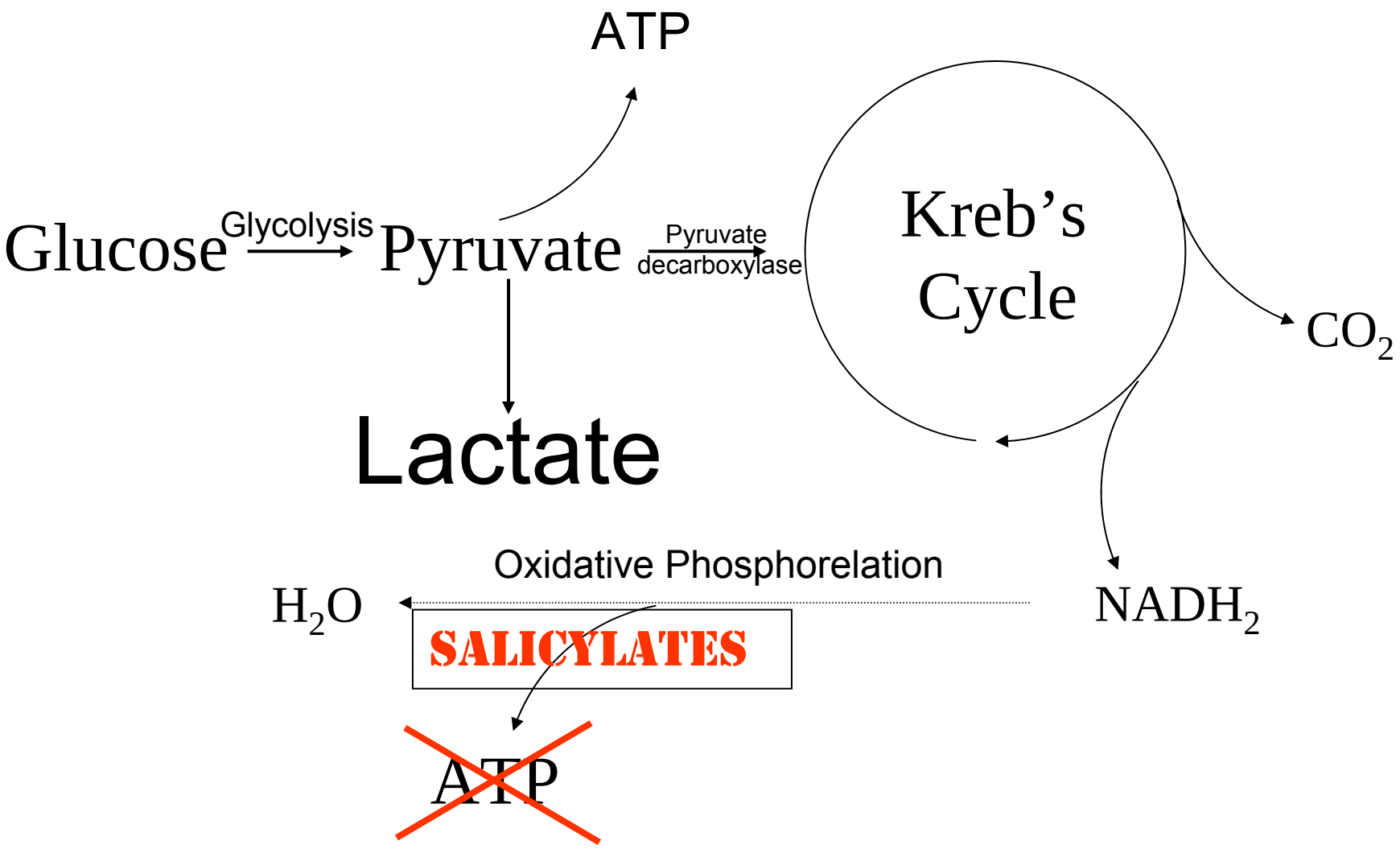
Overdose!


Methyl salicylate
Acetyl Salicylic acid
Salicylic acid
More ASA Absorbed
Decreased Protein binding
2.5% (pH-dependent)
Urine
SATURATED
Salicyluric acid
Gentisic acid
Ether glucuronide
Ester glucuronide

Toxicity

- Primary respiratory stimulant
- Tinnitus
- Gastrointestinal upset and pylorospasm
- Diaphoresis
- **Mental status changes**
- **Acute Lung Injury**
- **Increased brain utilization of glucose**
- **Metabolic acidosis**

Salicylate Uncoupling



Management

- Decontamination
- Blood work
  - ABG
  - ASA level – mg/dL
  - Electrolytes – K^+, BUN/Cr

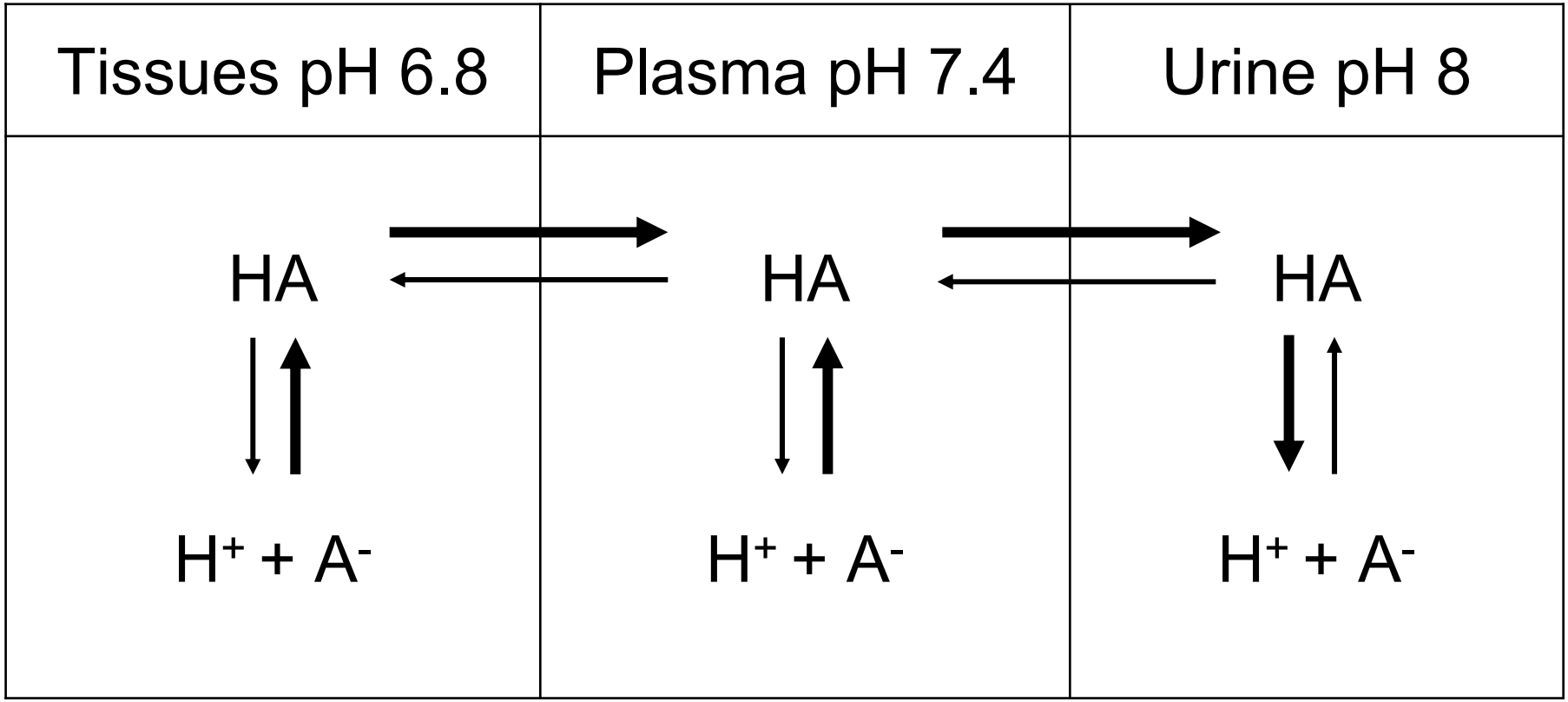
- An appropriate cry for help?

Urinary Alkalinization

- Acidemia facilitates transfer of ASA into tissue
- NaBicarbonate – increases urinary elimination 10-20 times
  - Target Urine pH 7.5-8.0
  - Serum pH not to exceed 7.55
- Carbonic anhydrase inhibition: creates alkyluria AND metabolic acidosis

Effects of Urinary Alkalinization

After Alkalinization



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