Asynchronous Interactive Module (AIM)
Toxicology

Toxicology (from the Greek word *τοξικός* for poisonous) merges information from biology, chemistry and medicine. After watching the video lectures on the Introduction to Toxicology, complete the following exercises. We'll discuss the answers when we meet.

Objectives

By the end of this module, you should be comfortable:

- Given a toxin, list it's antidote
- Provide an example of derangements of each component of the toxicologic primary survey and how you'd address it
- List the components of the common toxidromes
- Calculate and use clinically: anion gap, osmolar gap
- Describe how you would decontaminate a patients with a toxicologic exposure

Preparatory Work

Before continuing, review this information

- Video: Primary and Secondary Survey, Toxidromes, Testing, and Decontamination
- CDEM: The Approach to Poisonings

Antidotes

For some toxins, we are lucky to have an antidote to reverse the effects. For the following poisons, list the corresponding antidote and its mechanism of how it reverses the poison.

Toxin	Antidote	Mechanism
Aspirin		
Benadryl		
Beta-blockers		
Cyanide		
Digoxin		
Ethylene Glycol		
Hydrofluoric acid		
Iron		
Isoniazid		
Lead		
Methanol		
Rattlesnake bite		
Sulfonylureas		
Tricylic Antidepressants		
Tylenol		

Asynchronous Interactive Module (AIM)
Toxicology

Case Presentation:

A 56-year-old male is brought to the Emergency Department after he was found intoxicated on the street. He was stumbling and could barely walk properly. His vitals are as follows.

100/70 110 12 98.6F 98% on room air

He appears confused, is grossly moving all his limbs, and slurring his speech.

As you walk to the room, what are your initial worries?

A	
B	
C	
D	

Initial Actions

What are the most important initial orders and why?

D	
O	
N	
T	

What about flumazenil, the agent which reverses benzodiazepine overdose?

Anything else you'd like to do?

Asynchronous Interactive Module (AIM)
Toxicology

Case Presentation:

You can get no real coherent history.

On physical, his speech is slurred and he smells of urine and possibly alcohol.

On exam, he has clear lungs and normal heart rate. No signs of trauma. He has difficulty coordinating movement and a lateral rectus palsy on the right. His pupils are midrange and reactive. His mucous membranes are moist. Abdomen is soft and his bowel sounds normal. He appears somewhat sleepy and confused. You notice that while his left eye moves toward you, the right doesn't.

Would you start any GI decontamination? If yes, which method? If no, why not?

Does this fit any toxidrome? Describe each toxidrome and what fits and what doesn't.

Anticholinergic
Sympathomimetic
Sedative-Hypnotic
Opioid
Cholinergic
Serotonin Syndrome

Analyze the labs

Case Presentation:

You order a whole bunch of labs, which come back. The results are below.

CBC: WBC=12.4 H/H=10/30 Plts=102K
Lytes: Na=132 K=4.0 Cl=100 HCO3=12
BUN/Cr: 28/0.9
Gluc: 72
Amylase: 92 LFTs: mildly elevated LFT's AST > ALT
KUB/CXR: Nonspecific bowel gas pattern, no free air
U/A: negative
UDS: negative
EtOH: 147.2
Tylenol: non-detectable
Aspirin: non-detectable
Serum osmoles: 324

Calculate and interpret the following:

What is the anion gap?
What does it mean?
What is the delta gap?
What does it mean?
What is the osmolar gap?
What does it mean?

Asynchronous Interactive Module (AIM)
Toxicology

Case Presentation:

Given he appears drunk, you send of levels of the toxic alcohols. You get a couple more labs back, a little bit later.

Methanol: 32
Isopropyl alcohol: 0
Ethylene glycol: 0

How do you interpret these values?

Okay what do you think is going on here and what do you want to do?

What is the pathophysiology of methanol ingestion?

Asynchronous Interactive Module (AIM)
Toxicology

Case Presentation:

A 26-year-old male presents to the Emergency Department in the custody of police complaining of chest pain. The pain is dull, constant, has been there for 30 minutes. He is a bit diaphoretic. The police suspect this is a ploy to get out of jail. They also said they saw him eating stuff prior to being apprehended and wanted him checked out.

He smokes, denies any drugs and only social alcohol.

His vitals are as follows:

220/110 130 30 102.4 98% on room air

On physical, he is quite agitated grabbing his chest. His pupils are 7mm and reactive, lungs are clear and heart tachycardic but regular. Abdomen is soft. Neuro exam unremarkable. A package of cocaine falls out of one of his pockets.

You order an EKG and send off some labs

CBC: WBC=12 H/H=14/42 Plt=250
Lytes: Na=140 K=4.0 Cl=110 HCO_3=23
BUN/Cr: 15/0.9
Troponin: 5.2
EKG: sinus tachycardia with ST-elevations in anterior leads
U/A: negative
UDS: + cocaine

Okay, what do you think is going on here and what do you want to do?

Asynchronous Interactive Module (AIM)
Toxicology

Case Presentation:

A 24-year-old female presents to the ED with her newly ex-boyfriend when he learned that she took 45 tablets of acetaminophen (325mg) in an attempted suicide attempt. Ingestion occurred 2 hours ago.

Shortly after taking acetaminophen she developed nausea and vomiting. Denies taking any other medication. Her vital signs

90/60, 110, 20, 98.7F

Her physical exam of her head, ears, eyes, nose and throat are unremarkable with supple neck. Her lungs are clear and her cardiac examination reveals tachycardia but with a regular rhythm and with no murmurs, rubs or clicks. Her abdominal exam reveals epigastric abdominal tenderness without signs of peritonitis and normoactive bowel sounds. Neurologic exam is unremarkable.

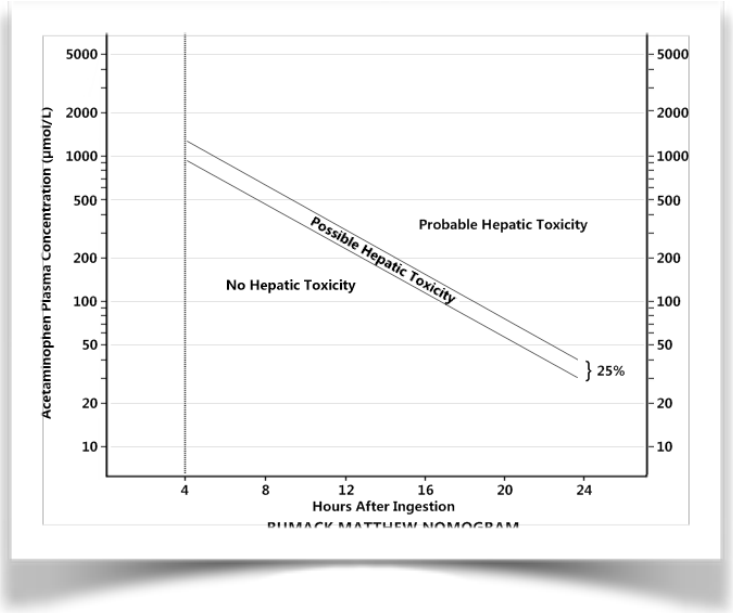
Okay, what do you think is going on here and what would you like to do immediately?

How does Tylenol exert its toxic effects?

What do you think about the single dose your patient took?

Describe the four stages seen in Tylenol overdose?

Stage I
Stage II
Stage III
Stage IV



How do you use the Rumack-Matthew Nomogram?

How would you manage this patient now?

GI Decontamination
Enhanced Elimination
Antidotes
Disposition

Now it's your turn to lead the discussion

Pick a toxin. Any toxin. It can be mushrooms you pick at the side of the road. Or maybe a lava lamp you dared someone to drink. Look up online how someone may present and create a scenario for this. During our class session, present your scenario.

Describe how you would manage this patient. Include the mechanism of action of the toxin, how any antidotes may work, and how you would treat the patient. Guide the class through this discussion.

Can't wait to hear what you come up with!