

# Too Much of a Good Thing

Presented by: Amber Hart, RVT, VTS  
(ECC)



# Analgesic Therapy

Analgesic therapy is a vital and important part of patient care.

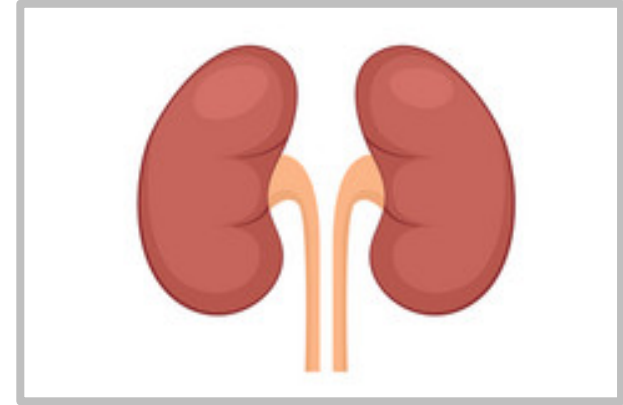
Most common classes used are  
Benzodiazepines and Opioids

What happens when our patients get too much of a good thing?



# How Are They Metabolized/Excreted

Drugs are metabolized in the liver via the cytochrome p450 enzymes



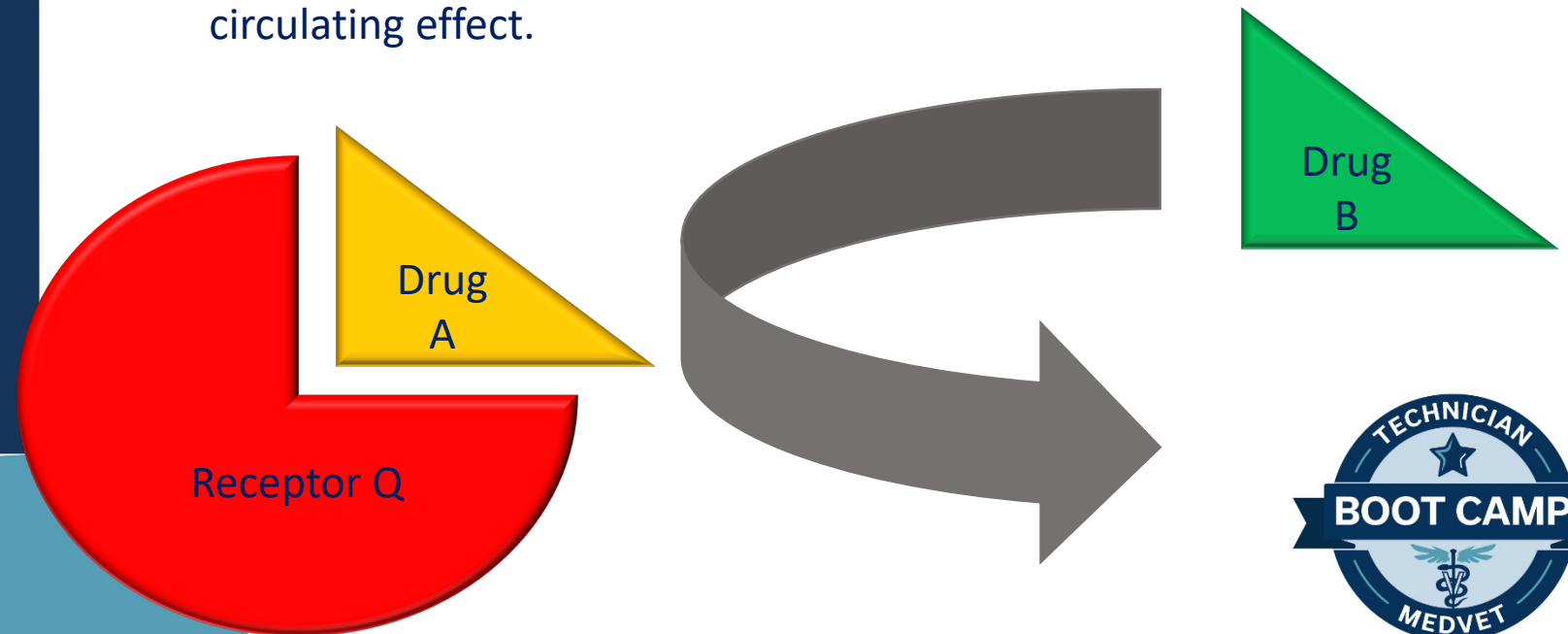
These enzymes conjugate the drug into metabolites that are then cleared by the renal system



# Why Do We Care About Cytochrome p450?

Cytochrome p450 (Cp450) is large family of enzymes and receptors.

- If a drug is metabolized by Cp450 it will bind to a specific receptor to metabolizes the drug
- If another drug, that utilizes the same Cp450 receptor, attempts to metabolize at the same time, it will be unable to bind which maintains its circulating effect.





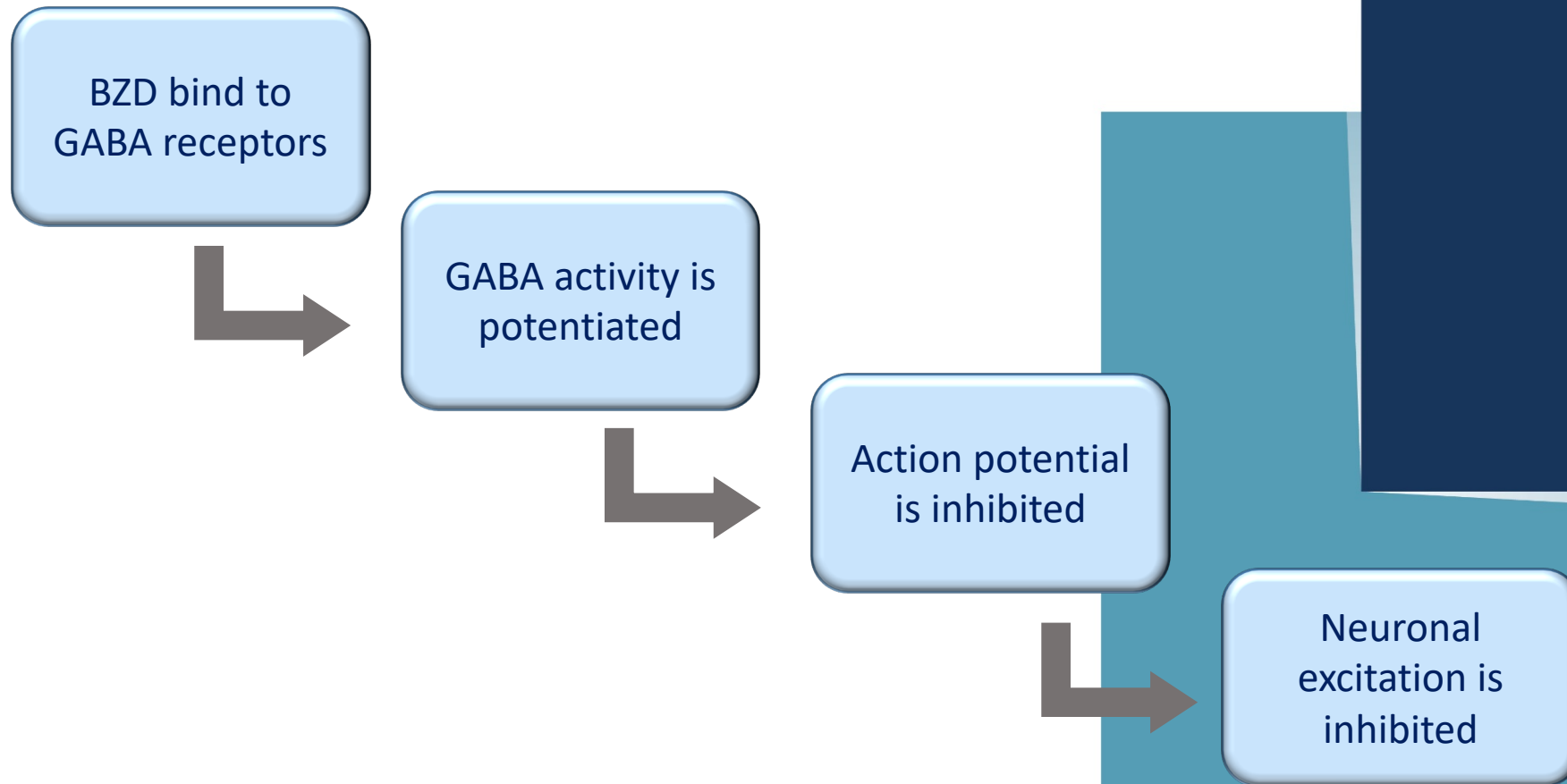
# Benzodiazepines



# What Do They Do?

Benzodiazepenes (BZD) affect gamma aminobutyric acid (GABA) receptors.

- GABA is an inhibitory neurotransmitter, blocking/inhibiting neuronal activity, decreases activity potentiated by the nervous system.



# Who Are They?

## Anxiolytics

Alprazolam (Xanax)  
Clonazepam (Klonopin)  
Lorazepam (Ativan)  
Diazepam (Valium)  
Chlordiazepoxide  
(Librium)  
Chlorazepate (Tranxene)  
Midazolam (Versed)  
Clobazam (Onfi)

## Sleep Aids

Triazolam (Halcion)  
Eszopiclone (Lunesta)  
Zolpidem (Ambien)  
Estazolam (Prosom)  
Flurazepam (Dalmane)  
Quazepam (Doral)



# What Effects Do We

# Want Them To

Human Medicine **Do?** Veterinary Medicine

Anxiety  
Insomnia  
Seizures  
Muscle relaxants  
Panic Disorders  
Alcohol Dependency

Muscle relaxants  
Seizure control



# When Do Overdoses Occur?

Patients can receive accidental or iatrogenic overdoses while hospitalized or they may have unique sensitivities to normal doses of medications.

Pets may ingest medications that were prescribed to the owners from the owners giving the pets medications in therapy attempts or in accidental ingestions.



# What Does An Overdose Look Like

BZDs are typically given to create suppression body system functions

- To relax muscles
- To create a sleepy or restful state
- To slow or dull reactions or perceptions

Overdoses most commonly create an intensified state of these effects.

Overdoses can present in a depressed or obtunded state, though as receptors are bound, the patient may swing into a state of excitation or agitation.



# What Does an Overdose Look Like?

Since in human patients we can assess mental function through conversation and response.

Symptoms can include:

- Drowsiness, lethargy, fatigue
- Impaired coordination
- Slurred speech
- Blurred vision
- Cognitive impairment
- Euphoria progressing to hostile/erratic behavior
  
- Antegrade amnesia – which is the reason this drug is observed to be used in sexual assault attempts



# What Does an Overdose Look Like?

In veterinary patients, evaluation is limited to physical assessment. Patients can present in depressive or stimulated states.

## Depressive presentations

- Obtundation
- Ataxia
- Weakness
- Paresis

## Stimulated presentations

- Hyperactivity
- Agitation
- Panting
- Tremors
- Nausea/vomiting
- Hyperthermia





# Treatment

Overdose treatment is targeted at supportive care

Most patients are hospitalized for 12-24 hours.

BZDs typically have a short half life (average of 12 hours).

There are some sustained relief formulas which will prolong the half life



# Treatment

Decontamination (discussed at the end)

Fluid therapy support (typically crystalloids)

- Supports hypotensive states Supports ongoing metabolism (60ml/kg/day)
- May need boluses at initially (bolus 10ml/kg)
- Adjust continued therapy to blood pressure/heart rate responses

Reversal with Flumazenil

- 0.01mg/kg IV
- Can be repeated if needed



# Treatment

If a patient is displaying signs of anxiety or hyperexcitability anxiolytics can be used to calm and relax the patient.

Do NOT give additional benzodiazepenes

Typically use phenothiazines

- acepromazine



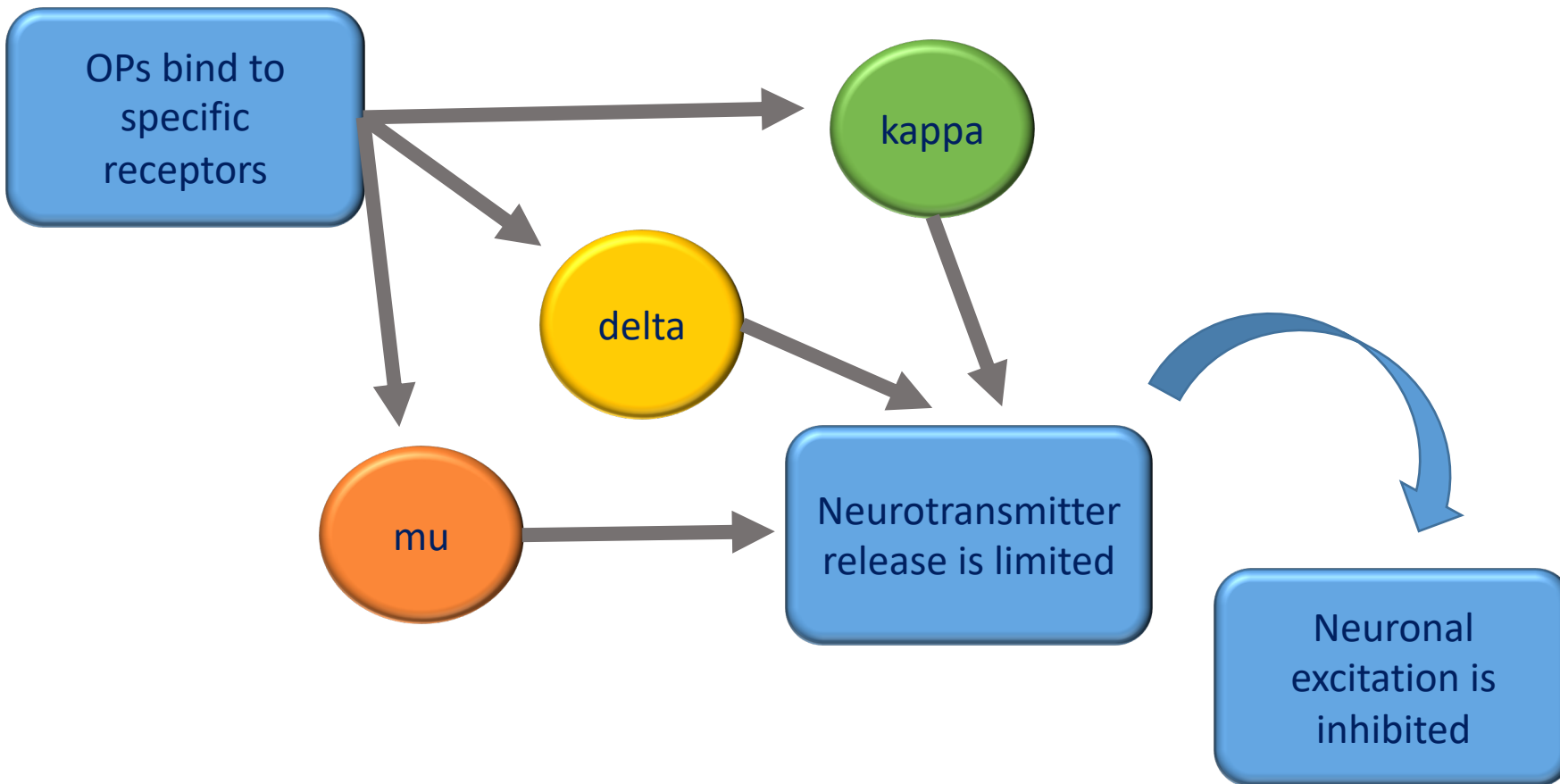
# Opioids



# What Do They Do?

Opioids (Ops) affect opioid receptors on presynaptic membranes.

- Several receptors have been identified including:  
mu, kappa, and delta



# Who Are They?

Opioids are controlled substances due to the addictive properties. They are classified into several classes, graded by level of dependency.

Class I drugs have no medically approved uses.

Classes II-V are seen in clinical practice.

Class V drugs have the lowest level of dependency.



# Who Are They?

## Class II

- Codeine
- Fentanyl (Duragesic)
- Hydrocodone (Vicodin)
- Hydromorphone (Dilaudid)
- Meperidine (Demerol)
- Methadone (Dolophine)
- Morphine (MS Contin)
- Oxycodone (Percocet)

## Class III-V

- Buprenorphine
- Codeine with Tylenol
- Tramadol



# What Effects Do We Want Them To Do

These medications are used as powerful analgesics and as components in multi-modal anesthetic induction and maintenance.

Due to their strong analgesic properties these medications have high level of dependency and subsequent abuse in human patients.





# When Do Overdoses Occur?

Patients can receive accidental or iatrogenic overdoses while hospitalized or they may have unique sensitivities to normal doses of medications.

Pets may ingest medications that were prescribed to the owners from the owners giving the pets medications in therapy attempts or in accidental ingestions.



# Street Drugs

There are many names for each drug; and even more so when they are cut/mix with each other and/or other non-opiate drugs



# What Doses An Overdose Look Like?

To their benefit dogs are about 5 times more tolerant of opioids than people.

Excessive sedation  
Bradycardia  
Hypothermia  
Respiratory Suppression



# Treatment

Overdose treatment is targeted at supportive care

Most patients are hospitalized for 12-24 hours.

Don't forget buprenorphine

Depending on formulation, dose, and route of exposure the half life can be quite long ( greater than 24 hours)



# Treatment

Decontamination (discussed at the end)

Fluid therapy support (typically crystalloids)

- Supports hypotensive states supports ongoing metabolism (60ml/kg/day)
- May need boluses at initially (10ml/kg bolus)
- Adjust continued therapy to blood pressure/heart rate responses

Reversal with Naloxone

- 0.04mg/kg IV
- Can be repeated every 2 minutes



# Precautions for Exposure

Dogs can encounter high doses of transmucosal/transdermal opioid exposure from illegal drug stashes.

An average adult dog, can receive a dose of naloxone from either an intranasal or intramuscular dosing pen

## Protect Yourself

- Wear gloves and a mask
- Muzzle, restrain, and contain all patients prior to therapy
- Be aware during recovery
  - The patient may be aggressive and unpredictable



# BZDs and Opioids

When given together these two drug classes will have a compounding action.

Dramatic respiratory suppression will occur

Potentiates the need for ventilator support.



# Decontamination

“Get Out What You Can”





# Decontamination

Even with rapid and successful vomiting, only 75% of the toxin will be removed from stomach

Do NOT use

Syrup of ipecac

Salt water

Mustard or hot sauces

Dishwashing soap

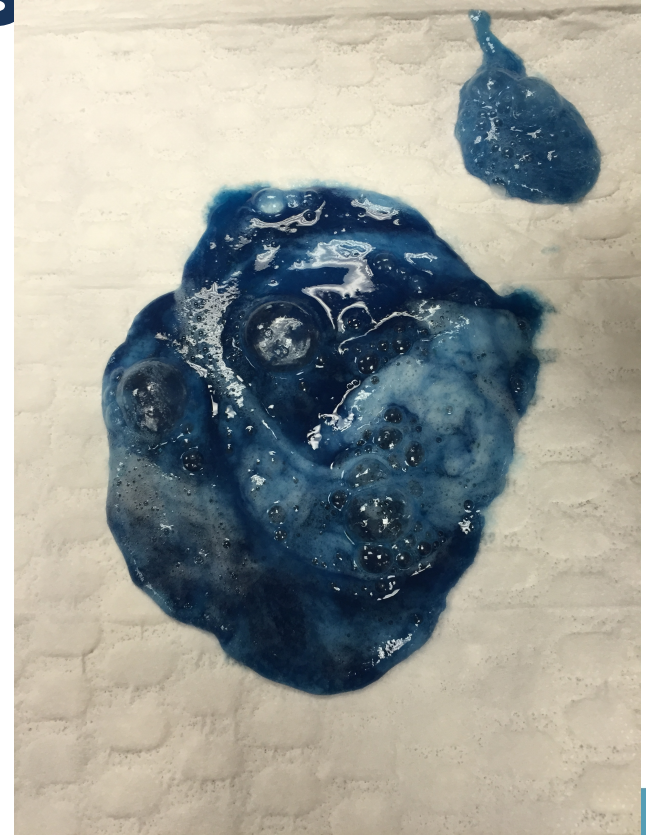
Sticking fingers down  
their mouth



# Decontamination in Dogs

## Apomorphine

- 0.03-0.04mg/kg
- Can repeat the dose
- Should see results in 1 minute
- Can reverse with naloxone 0.04mg/kg IV
- Subconjunctival capsule 0.25mg/kg
  - Flush generously afterwards



# Decontamination in Dogs

## Hydrogen peroxide

- 1 tsp per 5 lbs
- 2 dose limit; 10 tsp limit
- Should see results in 10 minutes
- Can give them a little food to eat with dose
  - Soak it into bread
- GI protectant afterwards!



# Decontamination in Cats

- No apomorphine or hydrogen peroxide
- Dexmedetomidine 7mcg/kg IM
  - atipamezole 50-100mcg/kg IM
- Xylazine 0.44mg/kg IM
  - yohimbine 0.4mg/kg IV





# When NOT To Induce Vomiting

- If patient is symptomatic
- $\geq 4$  hours since ingestion
- Brachycephalic breeds
- Decreased gag reflex or level of consciousness

Ingestion of the following toxicants

Salt (table salt, paint balls, homemade play-doh)

Corrosive or caustic agents (bleach, batteries)

Hydrocarbons (gasoline, kerosene, motor oil)



# Activated Charcoal

Binds to products in the GI tract and prevent absorption

The -ols don't respond to charcoal

- Alcohol/ethanol
- Xylitol
- Ethylene glycol

+/- the use of sorbitol as a cathartic

Dose dependent on product ~ 3-5ml/pound

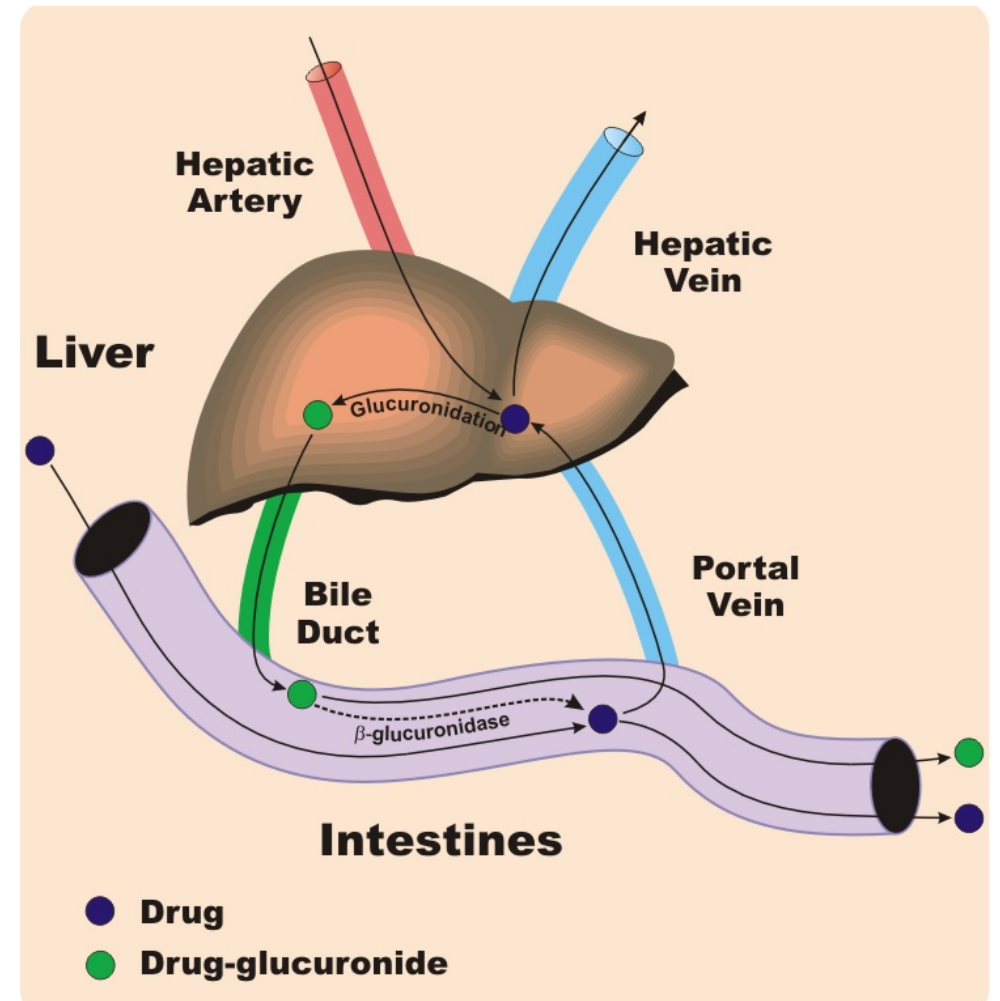


# Activated Charcoal

## Hepatic Recirculation

- Partially metabolized drug can be dropped back into gut by the bile duct
- Repeat dosing of charcoal helps to catch these remnants
  - Typically, every 6 hours

\*<https://repository.tdmu.edu.ua/handle/1/9663>



# Gastric Lavage

- It is a lesser used method of decontamination
- Used in patients with very high levels of toxicity
- Especially those that are displaying depressive or sedative effects
- Intubation is recommended to protect the airway





# Questions?



\*References available on request