Equine Surgery and Anesthesia

What is Anesthesia?

- Anesthesia is reversible brainstem death!
  - Basically, we want to turn off the brainstem for a certain period of time and then be able to turn it back on when we are done.
  - We do this by causing toxicity with certain drugs, but we control the level of toxicity.
  - As you can imagine, this comes with many risks and side effects!

Common Anesthesia Complications

- Hypotension = low blood pressure
  - Anything under a mean of 70 mmHg
- Hypoventilation = low respiratory rate
  - Exhaled CO2 levels (ETCO2) less than 45 mmHg
- Hypothermia = low body temperature
  - Under 99℉
- Bradycardia = low heart rate
  - Below 20 bpm

Remember, we are turning off the brainstem! So, this all makes sense. All the body systems slow down and cannot regulate as well!

Process

1. An intravenous (IV) catheter is placed into the jugular vein
2. A sedative medication is administered through the IV catheter that was placed
3. An endotracheal tube is placed. This is a tube that goes into the trachea allowing the anesthesia and oxygen to flow through
4. After the animal is anesthetized the procedure may begin
5. During the procedure it is very important to monitor the patient vital signs
6. After the procedure, the patient is taken off the anesthesia and oxygen, and the endotracheal tube is removed
7. The patient will awaken in a recovery room/area. The IV catheter will also be removed.

Recovery from Anesthesia

- While recovering from anesthesia horses may become uncoordinated which can lead to injury
- There are measures that can be taken to help ensure a safer recovery
  - Patients may be placed into stalls that are fully padded
  - Ropes/Harnesses may be used to help prevent the patient from falling

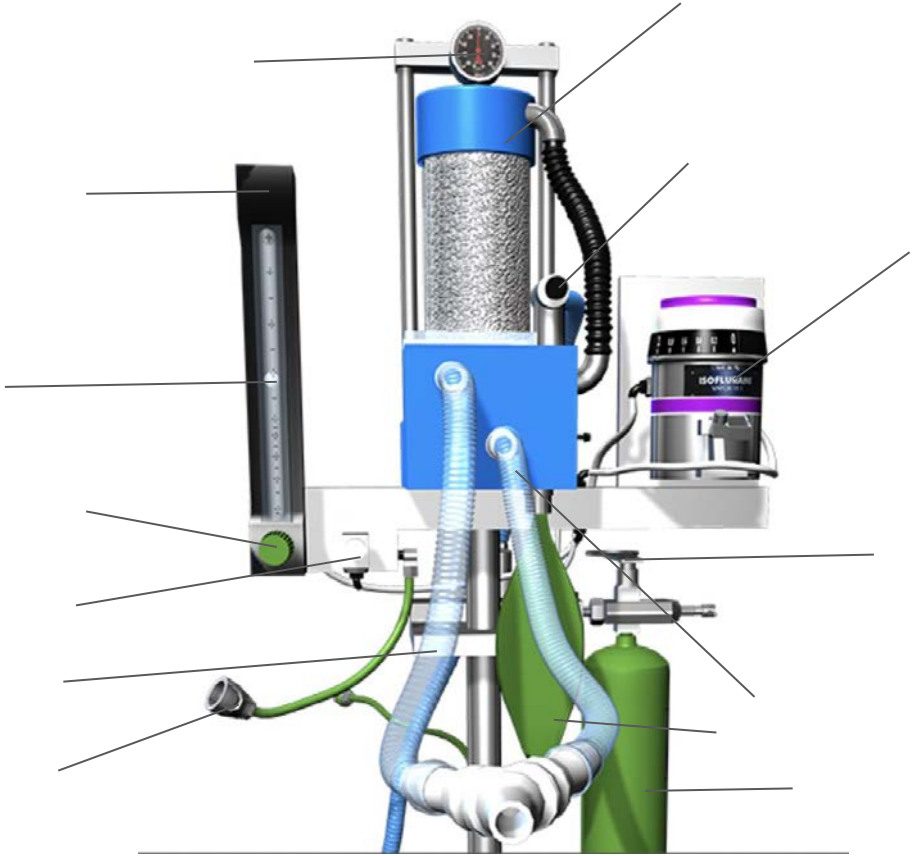
Anesthesia Machine Anatomy and Functions

A. Pressure Manometer - indicates the current operating pressure within the breathing system
B. Absorber Canister (Soda Lime) - holds CO_2 absorbent which removes CO_2 from expired gasses
C. Oxygen Flowmeter - regulates the volume of oxygen going into the machine
D. Oxygen Tank - holds the oxygen for use in the machine
E. Float - shows what the volume of oxygen is set to in the flowmeter
F. Flow Control knob - controls the flow of oxygen
G. Rebreathing bag - reservoir for additional gases
H. Inspiratory limb - sends gases to the patient
I. Oxygen flush valve - sends extra oxygen into the system, can be used to prime the rebreathing bag before attaching the system to the patient
J. Pop off valve - if closed, stops air from exiting the system (this can be deadly if left closed!!)
K. Vaporizer - turns the liquid anesthetic drug into a vapor to be inhaled
L. Expiratory Limb - takes expired gases away from the patient and back into the absorber
M. Oxygen Supply Line - supplies oxygen from the tank into the machine
N. Cylinder Valve key - turns on the oxygen tank to allow oxygen into the machine

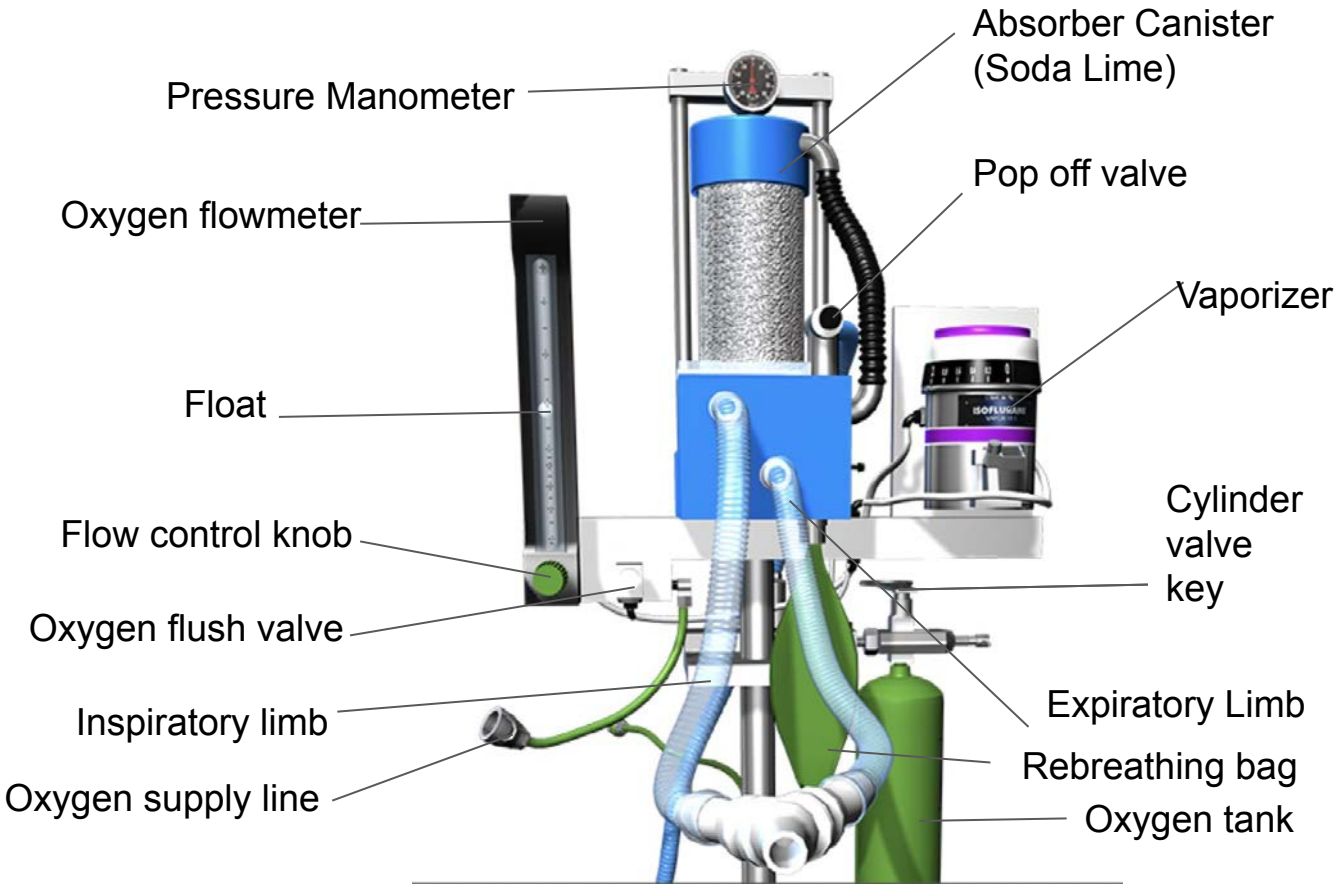
Anesthesia Machine Anatomy Matching

Match the parts of the anesthesia machine to their proper names!

A. Pressure Manometer
B. Absorber Canister (Soda Lime)
C. Oxygen Flowmeter
D. Oxygen Tank
E. Float
F. Flow Control knob
G. Rebreathing bag
H. Inspiratory limb
I. Oxygen flush valve
J. Pop off valve
K. Vaporizer
L. Expiratory Limb
M. Oxygen Supply Line
N. Cylinder Valve key



ANSWER KEY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Expiratory Limb
Inspiratory limb
Rebreathing bag
Oxygen supply line
Oxygen tank

A Common Equine Surgery: Colic

What is colic?

- Colic describes a long range of types of abdominal pain in horses
    - Can be from too much gas, an obstruction, inflammation, and more
- Can be mild with some medical intervention or severe with surgical intervention
- A thorough exam by a veterinarian is needed to figure out where the problem is and what level of treatment is required

Photo by Raphael Wicker on Unsplash

Types of colic

- Colic can be caused by numerous things!
- Gas colic
  - Excessive gas production in the intestines
- Obstructive lesions
  - Impaction - Digestive material is stuck and blocking the path through the gastrointestinal tract
  - Twists in the intestines
- Functional obstructions
  - Something is wrong with the intestines so the GI tract isn't moving ingesta as it should
  - Enteritis, inflammation of the intestine, can cause this

How do I know if my horse has colic?

There are a lot of different clinical signs to look for:

- Pawing at the ground
- Laying down, rolling
- Bothering the abdomen area (kicking, nudging, etc.)
- Problems defecating or urinating
- Abdomen distention
- Lack of appetite/overall depressed state
- Increased heart rate
- Pale and/or dry mucous membranes

Photo by Joshua Koblin on Unsplash

Think about when you have a bad stomach ache: it’s super uncomfortable!

How serious can colic be?

- Unlike people, horses can’t vomit
- This means that when they have an issue in their GI system, it can be a big deal!
- Many cases of colic can be treated medically with drugs
- Other times horses need to have surgery to fix the colic
    - In these cases it is a medical emergency! If the case is serious enough, the horse may not survive without the surgery.
    - Horses tend to need surgery when there is something obstructing the GI tract, particularly when the intestines are twisted or have moved into a wrong location.

Where does colic happen in a horse?

- The horse's GI tract is like a very long tube that turns on itself all within the abdomen
- Sometimes this tube makes sharp turns or becomes very narrow at specific spots; these are areas where we see impactions that can be fixed surgically
- Common impaction sites include:
    - Pelvic flexure - A 180º turn in the large intestine where the intestine also becomes much more narrow
    - Cecum - A blind pouch with a small opening where ingesta both enters and exits
    - Small colon - Another spot where the GI tract narrows, making it more likely for ingesta to become stuck

What can we do to treat colic?

Photo by Julia Zyablova on Unsplash

Depends highly on the severity of the colic

- Managing pain
  - Used when mild discomfort is the main issue
  - Most common sedative: Xylazine
  - Most common narcotic: Butorphanol
- Giving fluids
  - Helps with dehydration
  - Keeps blood pressure up (we don't want blood to stop going to vital organs!)
  - Can be given IV or via a tube from the nose to the stomach
- Laxatives
  - Used when the issue is a simple obstruction
  - Helps obstruction pass easier
  - Not to be used with impactions (can make it worse!)

What can we do to treat colic?

- Deworming
  - The migration of worms may cause inflammatory tissue that increase coagulation of the blood, which makes it harder for blood to get to the intestine
  - Common dewormers: ivermectin and moxidectin
- Protection from bacteria
  - The GI tract has a protective lining against the harmful products of certain bacteria
  - When lining is compromised, toxins from bacteria can do a lot of damage
  - Patient may be given flunixin, polymyxin B, or serum with antibodies in it
- Surgery
  - Needed when medical intervention will not help obstruction or if the blood supply of the intestine is affected
  - Often an emergency procedure
  - The sooner surgery is decided on, the better the prognosis (usually)
  - May have to put the intestine back where it needs to be, take out part of the intestine, or take out the obstruction

Mythbusters Horse Edition

Myth:

Horses only sleep standing up.

Busted!

While horses can sleep standing up due to their amazing stay apparatus and their uniquely designed knee caps that lock in place so that their knees and elbows do not bend.

Horses can and will lie down to sleep.

Myth

Horses hooves are solid and that is why we can nail horseshoes on them.

Busted!

Horse’s hooves are similar to your finger. The hard surface called the hoof capsule is similar to your fingernail attached to skin, muscle, bones, ligaments, nerves and vessels. Horseshoes are nailed onto the hoof through an small ring that contains none of these structures.

Myth

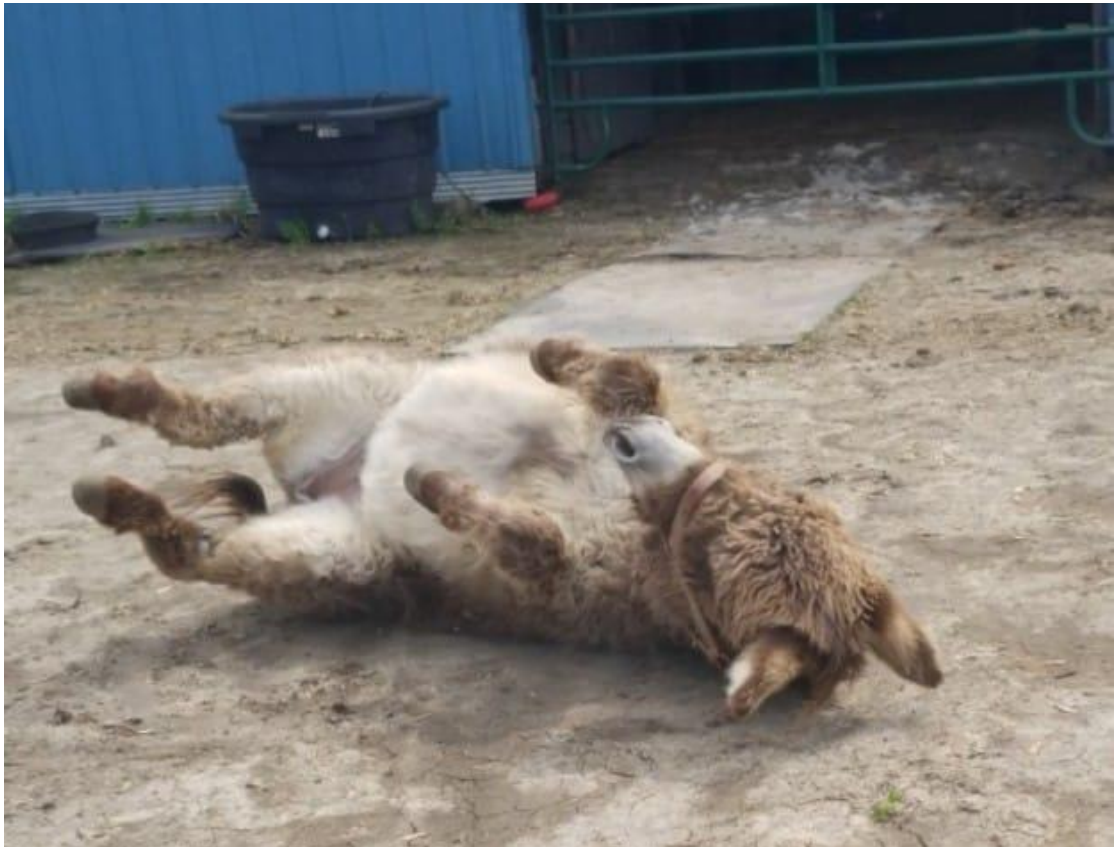
Horses have different body temperatures, that's why they're called
hot blooded and
cold blooded breeds.

Busted!

Horses have a body temperature ranging from 98.5 -100.5 ℉.

Myth

Horses only roll when They are colicky.



Busted!

A horse rolling on the ground can be a sign of colic, especially when paired with stomach kicking and flank biting. But horses do like to roll when playing, removing flies and getting themself dusty to prevent flies from biting them.

Myth

Horses are colorblind.

Busted!

Just like the belief that dogs can only see black and white, this assumption is incorrect. Just like a dog's vision, horses can see only certain colors, for the horse the colors are blue and yellow.

Sources for Mythbusters

Moore, J., 2013. *Overview of Colic in Horses*. [online] Merck Veterinary Manual. Available at: <https://www.merckvetmanual.com/digestive-system/colic-in-horses/overview-of-colic-in-horses> [Accessed 12 September 2021].

All photographs used in the mythbuster quiz were taken by Larissa Bokan