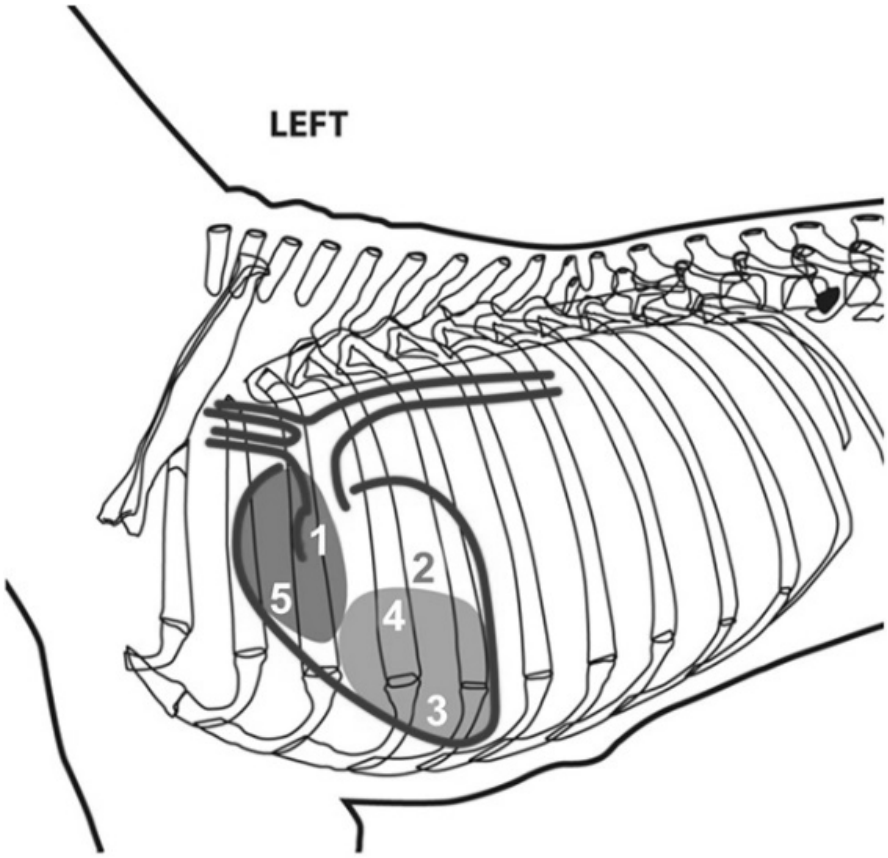
Arkansas 4-H Veterinary Science

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

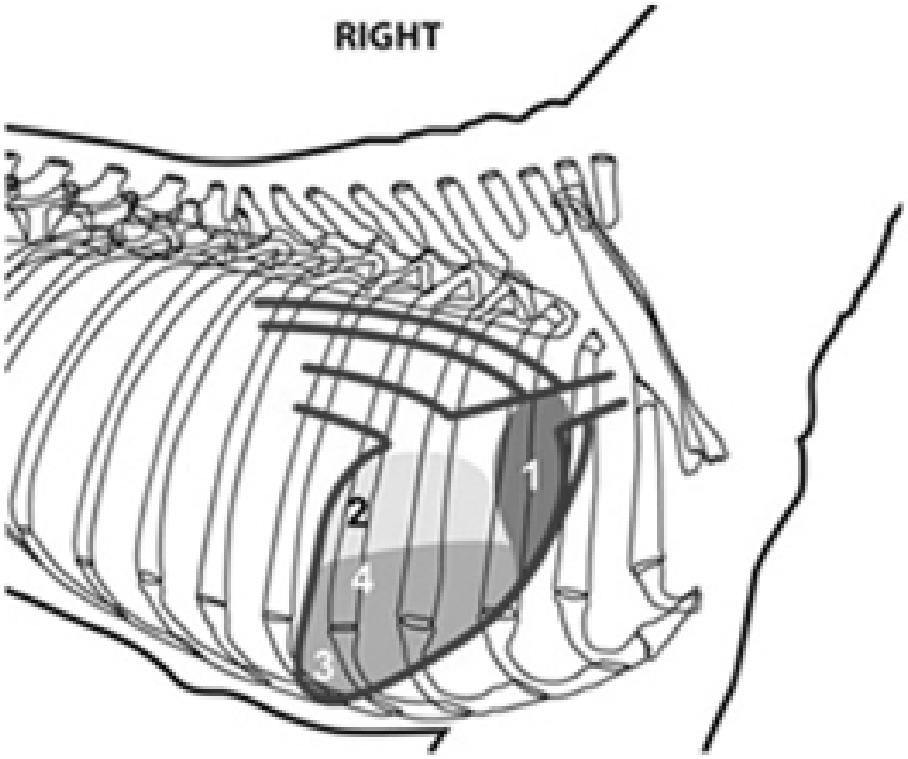
Cardiopulmonary Auscultation

Where to listen on left side?



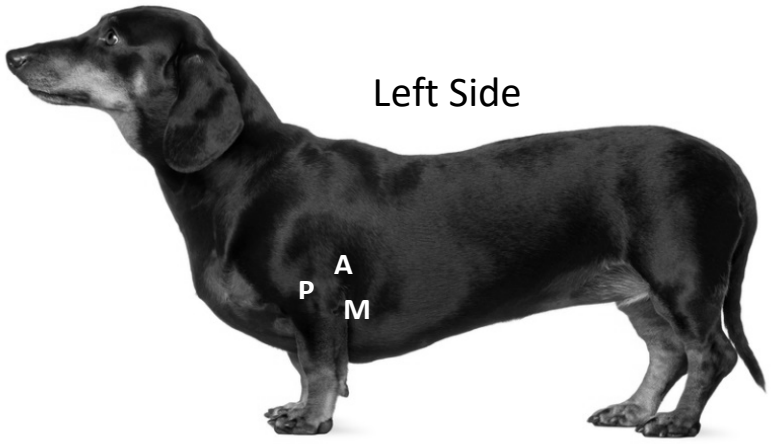
1=Aortic Valve
2=Left Atrium
3=Left Ventricle
4=Mitral Valve
5=Pulmonic Valve

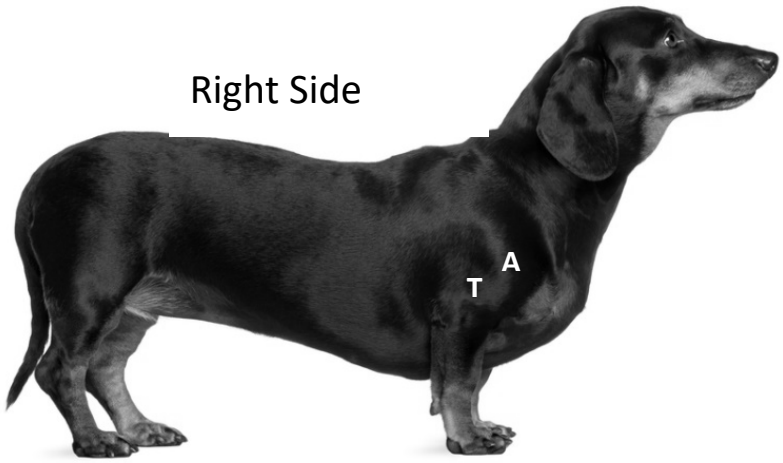
Where to listen on right side?



1=Aortic Valve
2=Right Atrium
3=Right Ventricle
4=Tricuspid Valve

Where to listen?





How do you listen to lungs?

- Examine the respiratory movements to ensure that there are no abnormalities.
- Measure the respiratory rate of the dog (number of breaths over 15 seconds X 4). Normal respiration rate for a dog is 10-30 respirations/minute.
- Auscultate the tracheal bifurcation at the level of the mid-thorax (8th intercostal space). Ensure the mouth is closed to prevent panting sounds.
- Auscultate sounds of the thorax dorsally, ventrally, cranioventral, craniodorsal and caudodorsally, as well as the trachea and larynx.
- By auscultating the upper and lower respiratory tract, the abnormal breath sounds can be localised.

Resting Heart and Breathing Rates

Species	Beats/min	Breaths/min
Human	60-100	12-20
Dog	70–120	10-30
Cat	120–140	16-40
Horse	28–40	10–14
Dairy Cow	48–84	26-50
Sheep	70–80	16–34
Pig	70–120	32–58
Ferret	180-250	33-36
Rabbit	120-150	30-60
Guinea Pig	200–300	42-105
Mouse	450–750	80-230

*Always evaluate by rate, character and position for both cardio and respiratory auscultation!

Heart Abnormalities

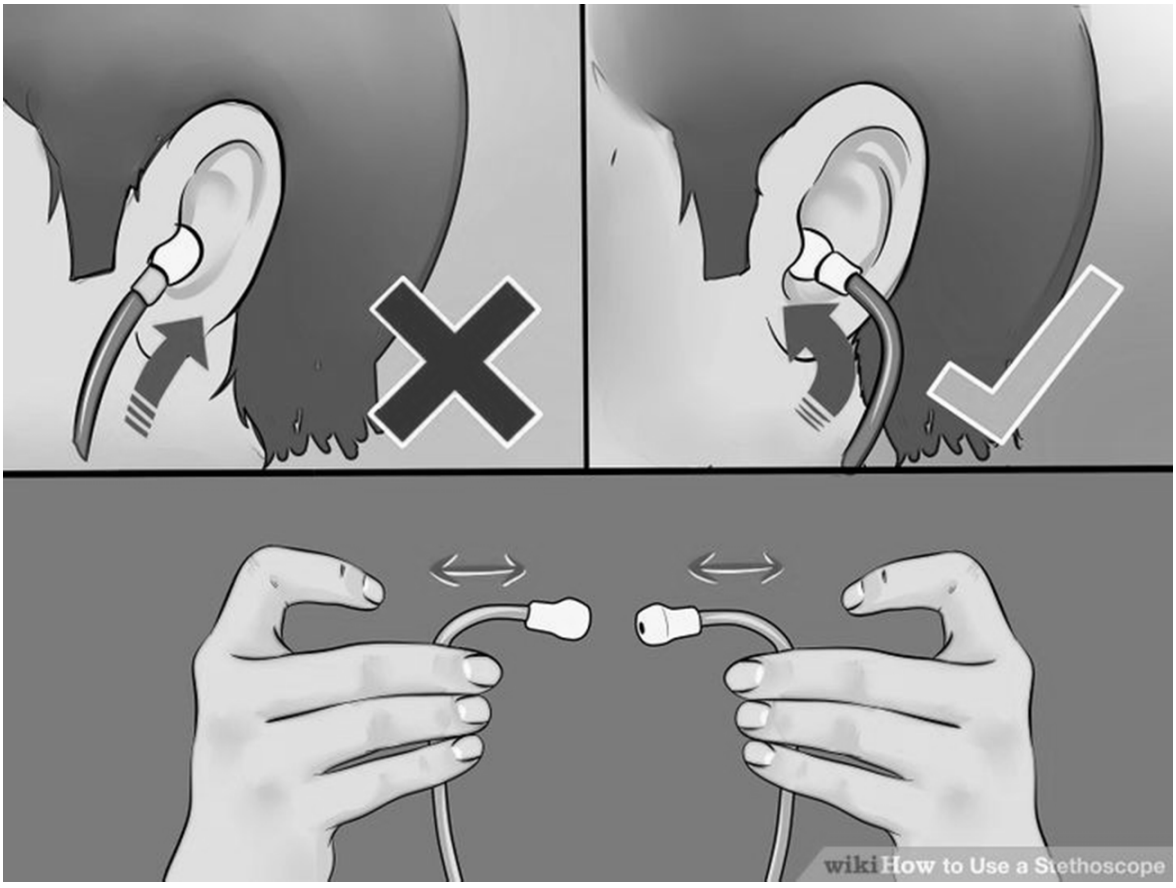
- Atrial fibrillation - rapid and irregular beat
- Mitral regurgitation - whoosh sound caused by backward flow of blood through faulty mitral valve
- Mitral valve click - sharp whoosh sound caused by a prolapsed mitral valve being pulled back suddenly by the chordae tendineae
- Patent Ductus Arteriosus (PDA) – constant whoosh sound caused by blood from a persistent fetal blood vessel moving blood from the aorta to pulmonary artery
- Pulmonic stenosis - extra sound caused by obstruction of flow from the right ventricle of the heart to the pulmonary artery
- Subaortic stenosis (SAS) - whoosh sound caused by the flow of blood from the left ventricle being restricted under the aortic valve
- Ventricular Septal Defect (VSD) – whoosh on second heart sound caused by turbulent flow into the left ventricle from the left atrium

Respiratory Abnormalities

- Wheeze – coarse whistling sound that varies in pitch and caused by narrowing of airway anywhere from the trachea to lungs.
- Monophonic wheeze – same as above, but the sound has the same pitch when breathing in and out
- Pleural friction rub - clicking sound caused by layers of the inflamed pleural membrane rubbing against each other
- Stridor - a high pitched vibrating noise caused by obstruction of the trachea or larynx
- Stertor - heavy snoring or gasping heard on inspiration
- Crackles – popping or crackling sounds heard on inspiration caused by a buildup of fluid, mucus or pus in the small airways
- Pulmonary edema – gurgling or crackling sound heard at the end of inspiration caused by fluid accumulation in the tissue and air spaces of the lungs

The Stethoscope

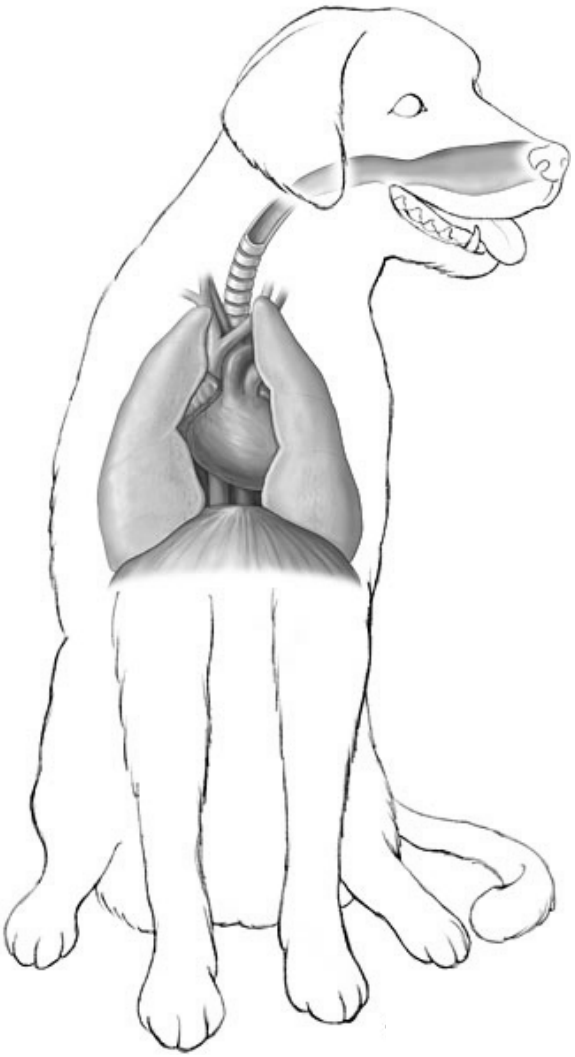
Earpiece Placement



Ventilation

What is ventilation?

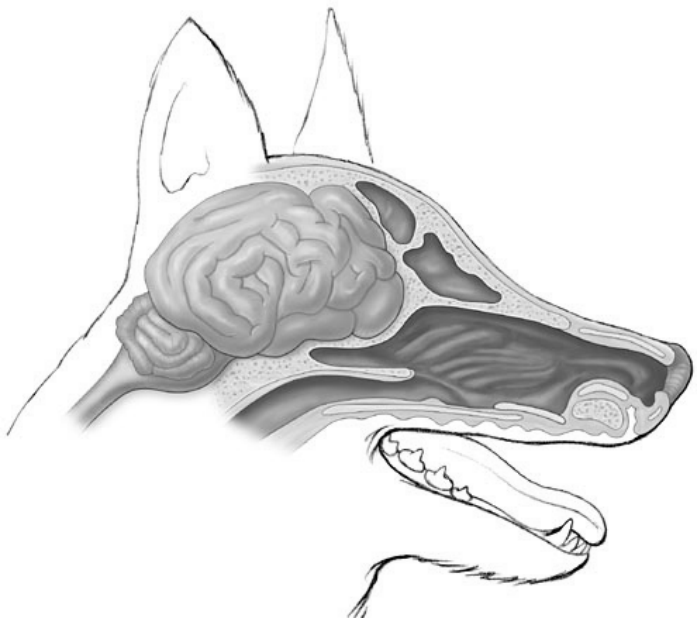
The passage of air into the lungs to supply the body with oxygen is known as inhalation, and the passage of air out of the lungs to expel carbon dioxide is known as exhalation: this process collectively is called ventilation or breathing



Why is ventilation important?

Sometimes an animal will have trouble breathing on its own, so the veterinarian must intervene with mechanical or artificial ventilation.

If the patient stops breathing, the lack of oxygen and excess of carbon dioxide in the blood will cause almost immediate loss of consciousness. Brain cells start dying as little as 5 minutes after being deprived of oxygen. Though the heart continues to beat briefly, death will follow in a matter of minutes unless emergency measures are taken to get breathing started again.



How do we ventilate?

Positive pressure with mask and bag

Positive pressure with endotracheal tube and bag

Positive pressure with endotracheal tube and ventilation machine

What are the goals of ventilation?

- Maintain an arterial blood carbon dioxide level (PaCO2) of 35-60 mmHg ♦
- Maintain a blood oxygen level (PaO2) of 80-120 mmHg ♦
- Maintain an oxygen saturation of hemoglobin (spO2) of 95%-100%
- Avoid ventilation induced lung injury and other consequences of positive pressure ventilation

General Guidelines for Ventilation

- Peak inspiratory pressure (PIP) of 10-20 mmHg (the highest level of pressure applied to the lungs during inhalation)
- Peak end-expiratory pressure (PEEP) of 0-2 mmHg (the pressure in the lungs above atmospheric pressure)
- Ventilatory rate of 10-20 breaths per minute
- Tidal volume (VT) of 6-10 mL/kg (normal volume of air displaced between normal inhalation and exhalation when extra effort is not applied)

Venipuncture

Why do we need blood in vet med?

Blood can help us make a diagnosis or give direction for further diagnostic tests.

Blood cell count

- Too little of one cell type (anemia, autoimmune)
- Too much of once cell type (inflammation, neoplasia)

Blood smear or wet mount

- Evidence of infection (bacteria, fungus, parasites)

Blood chemistry

- Electrolyte imbalance
- Organ function indicators (kidneys, liver and pancreas)
- Indicator of disease (Diabetes, hypothyroidism, Addison's)

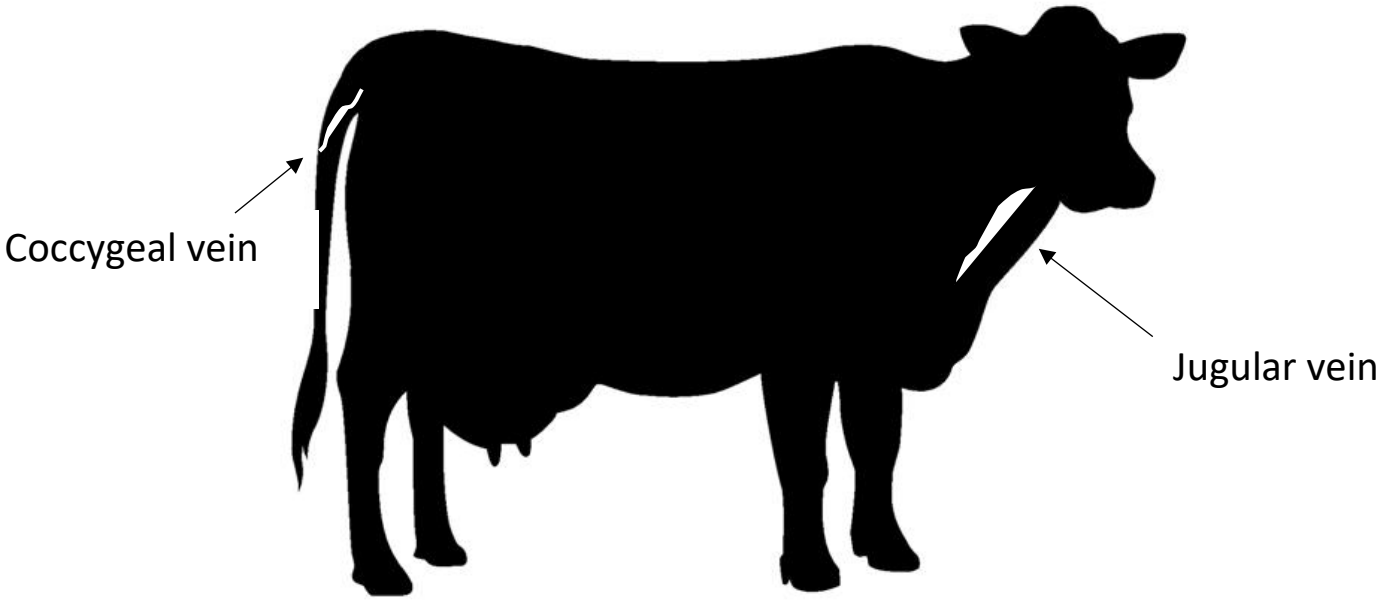
Blood typing

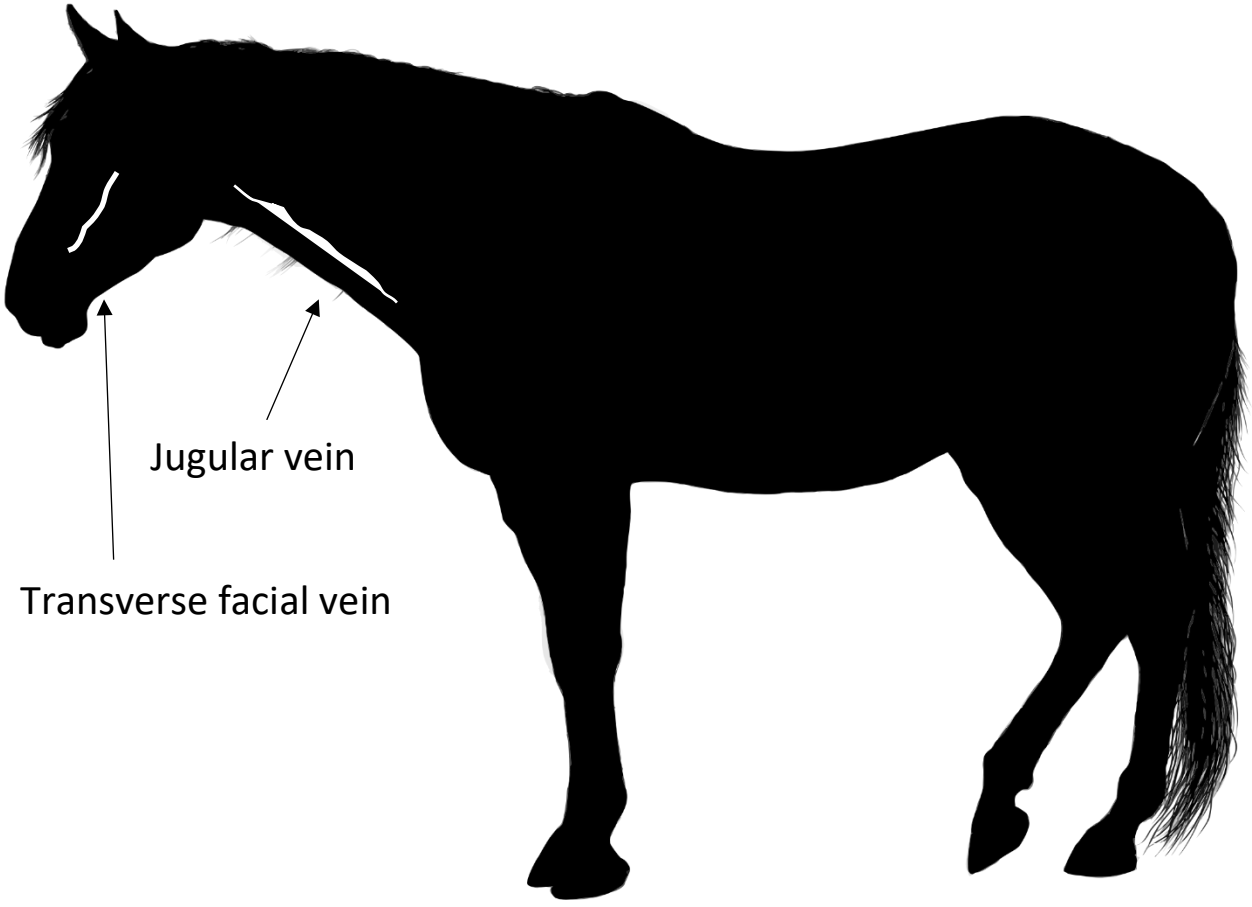
- Prior to blood transfusion

Blood clotting

- Partial thromboplastin time (PTT)
- Prothrombin time (PT)
- Activating clotting time (ACT)

Where do we get blood?





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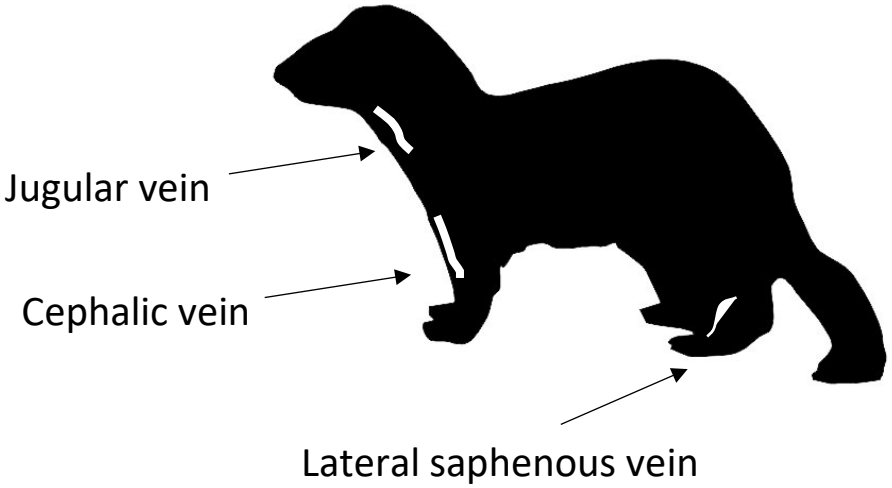

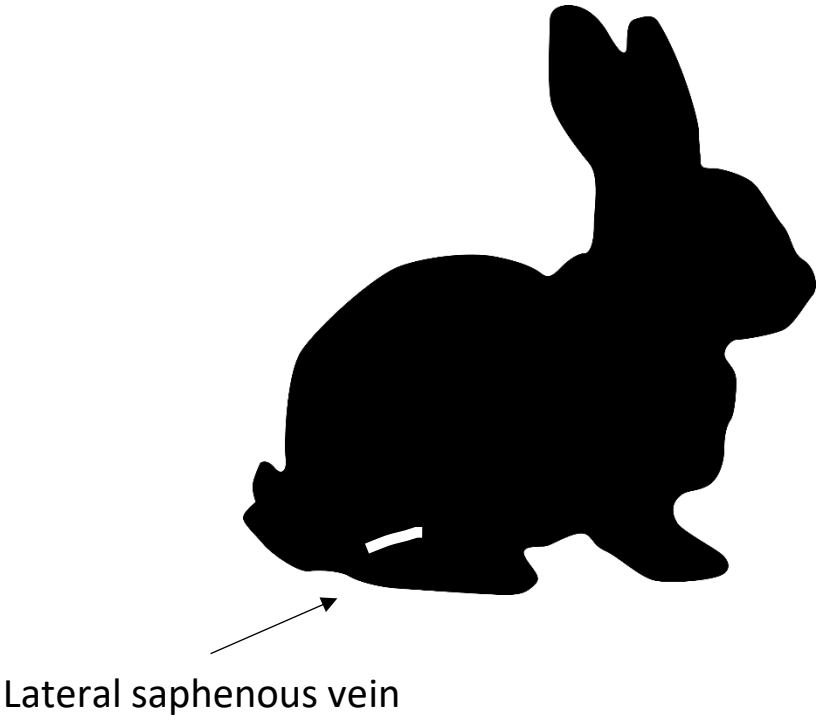

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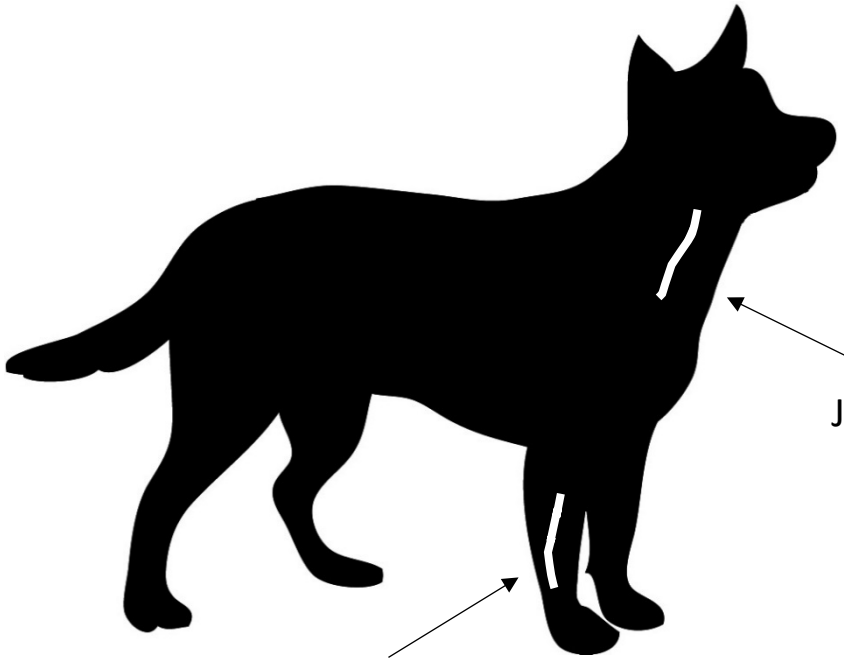
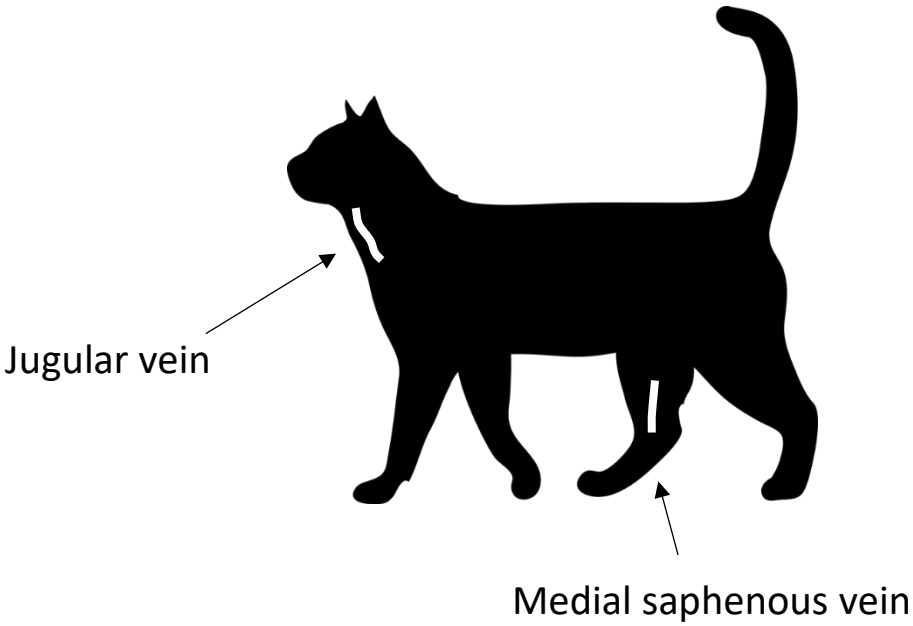




Blood Draw Tips

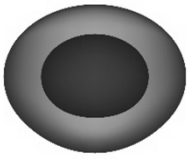
- Gather all supplies ahead of time including blood tubes
- Choose syringe and needle size
- If possible, clip fur from venipuncture site
- Clean venipuncture site with alcohol
- Move syringe plunger to make sure it won't stick
- Make sure plunger is pushed in before inserting
- Choose insertion site as distal as possible
- Insert needed with sharpest point downward
- Slowly pull on plunger to draw blood
- Redirect needle while still inserted to find vessel
- Stop pulling on plunger when ready to remove needle
- Place pressure on the venipuncture site for 15 seconds
- Check venipuncture site for bleeding

Blood Cytology

What is blood cytology?

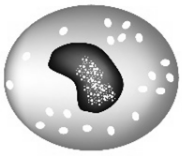
- The study of the microscopic appearance of cells, especially for the diagnosis of abnormalities and malignancies
- Each cell type has unique characteristics
- Veterinarians are trained to know these special characteristics
- Abnormalities of cells may indicate a disease process
- Too few cells may indicate anemia
- Too many cells may indicate inflammation or malignancy

What cells are normally in blood?



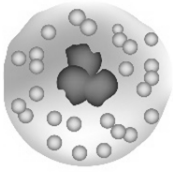
Erythrocyte

Platelets



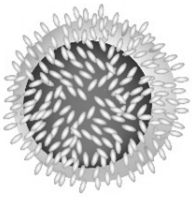
Monocyte

Eosinophil



Basophil

Neutrophil



Lymphocyte

What do these cells do?

- Erythrocytes (blood cells) carry oxygen to tissues
- Platelets are tiny cells that have a big job in stopping bleeding
- Monocytes fight infections and help other white blood cells remove dead or damaged tissues, destroy cancer cells, and regulate immunity against foreign substances
- Eosinophils are implicated in numerous inflammatory processes, especially allergic disorders
- Basophils contain anticoagulant heparin, which prevents blood from clotting too quickly. They also contain the vasodilator histamine, which promotes blood flow to tissues
- Neutrophils are the first cells to migrate to the site of infection to begin killing the invading microbes
- Lymphocytes eliminate pathogens by releasing antibodies, releasing cytotoxic granules or signaling to other cells of the immune system

Blood cell abnormalities

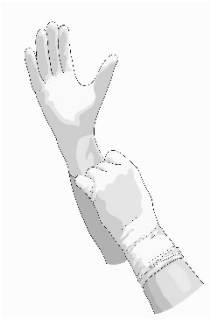
- Spherocytes form when parts of the cell membrane are damaged (auto-immune disease)
- Target cells form due to an excess in cell membrane (liver disease)
- Acanthocytes have uneven thorny outer membranes caused by a defect in the lipid or protein composition of the membrane (liver disease and many others)
- Echinocytes look similar to acanthocytes but have uniform spikes covering the entire cell surface. They are usually an artifact due to chemical treatment of the slide
- Schistocytes are pieces of shredded red blood cells that signal active red blood cell destruction by the body (very bad!)

Other abnormalities

- Platelet clumps often occur in cats. Always check the feathered edge of the smear!
- Neutrophils with a sausage-looking nucleus are called "banded" and signal an active inflammatory process
- Neutrophils that look bubbly inside are called "toxic" and signal a blood infection
- Over-representation of any cell that is not a red blood cell or platelet signals a potential neoplasia, especially if they are in clusters
- White blood cells that vary drastically in size or have unusual nuclei signal a potential neoplasia
- Visual mitotic bodies are definitive of neoplasia

DiffQuik Stain Procedure

Put on gloves (or have blue/pink fingers)



Pick up slide with clothespin

Dip slide slowly 5 times in light blue fixative

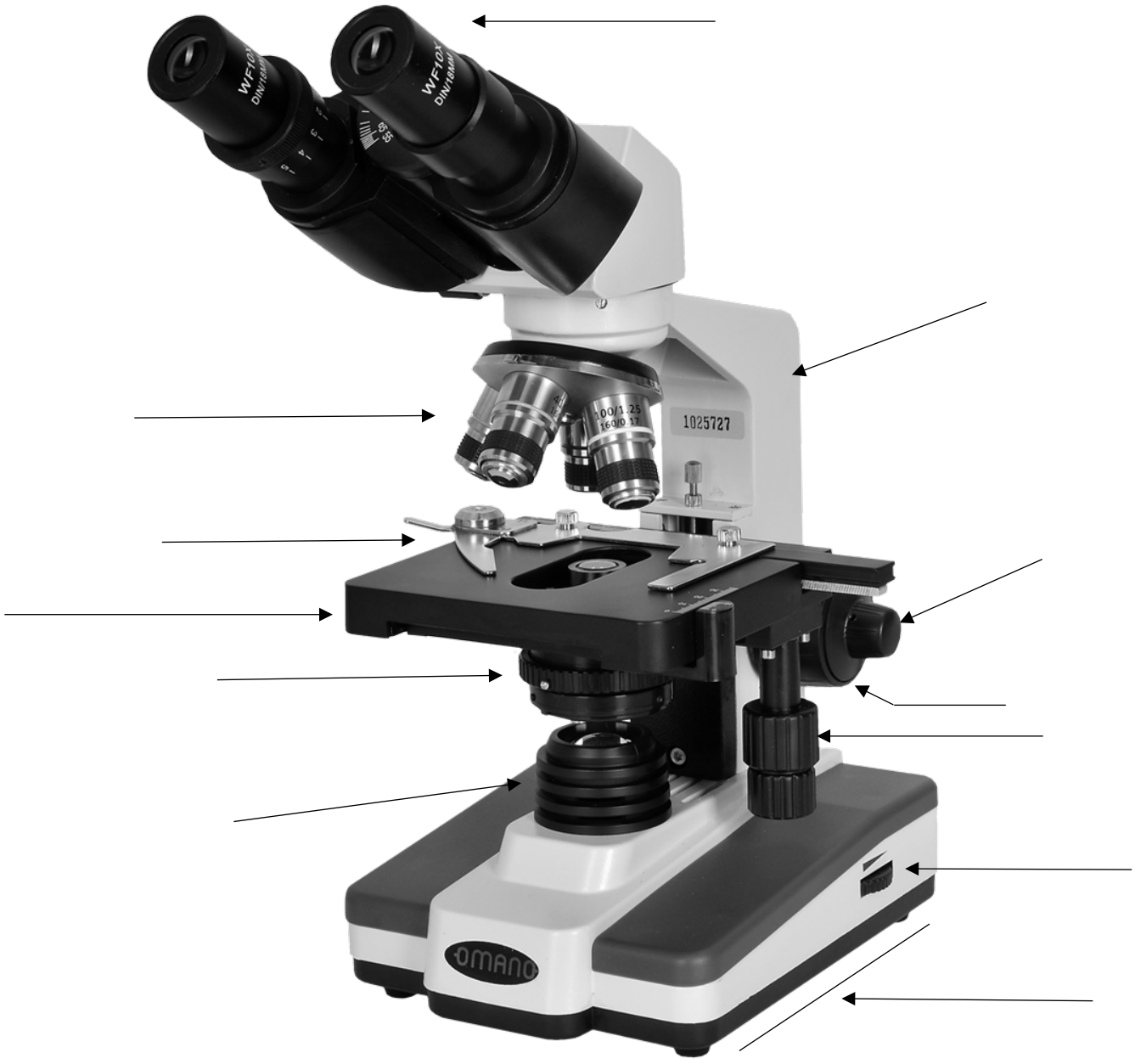
Dip slide slowly 5 times in dark pink stain

Dip slide slowly 5 times in purple counter stain

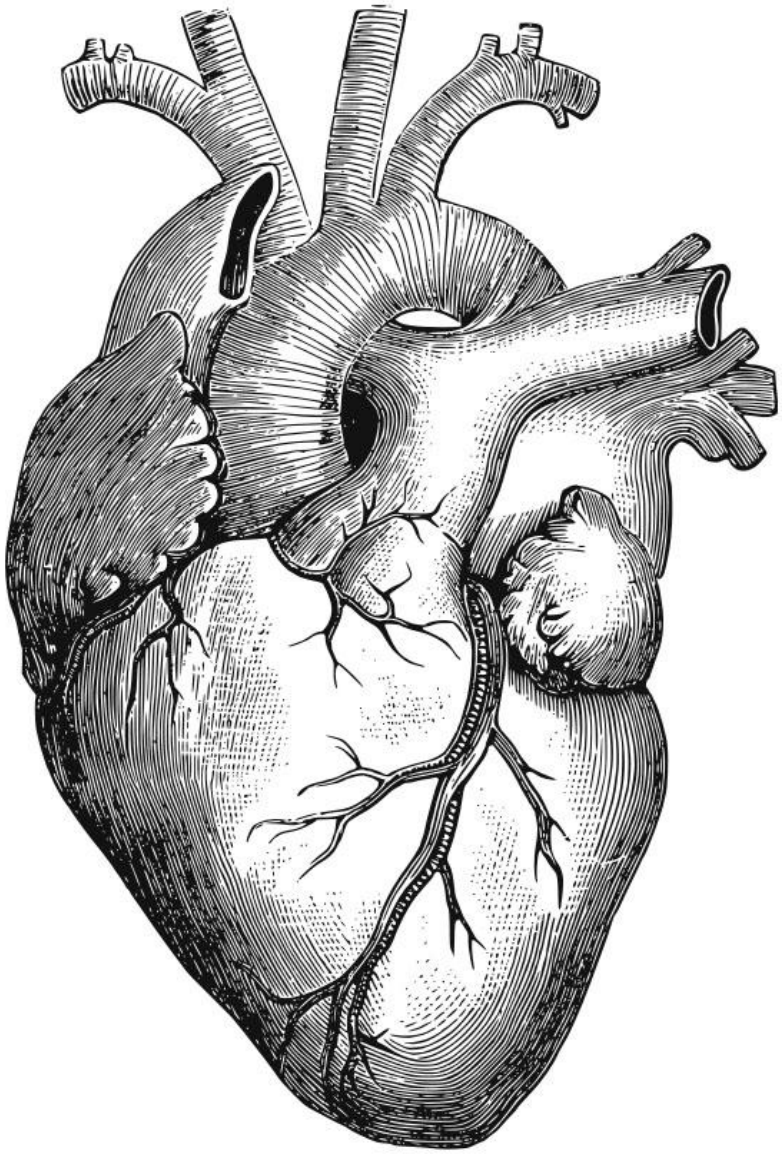
Gently rinse slide with distilled water

Allow to air dry before viewing

The Compound Microscope



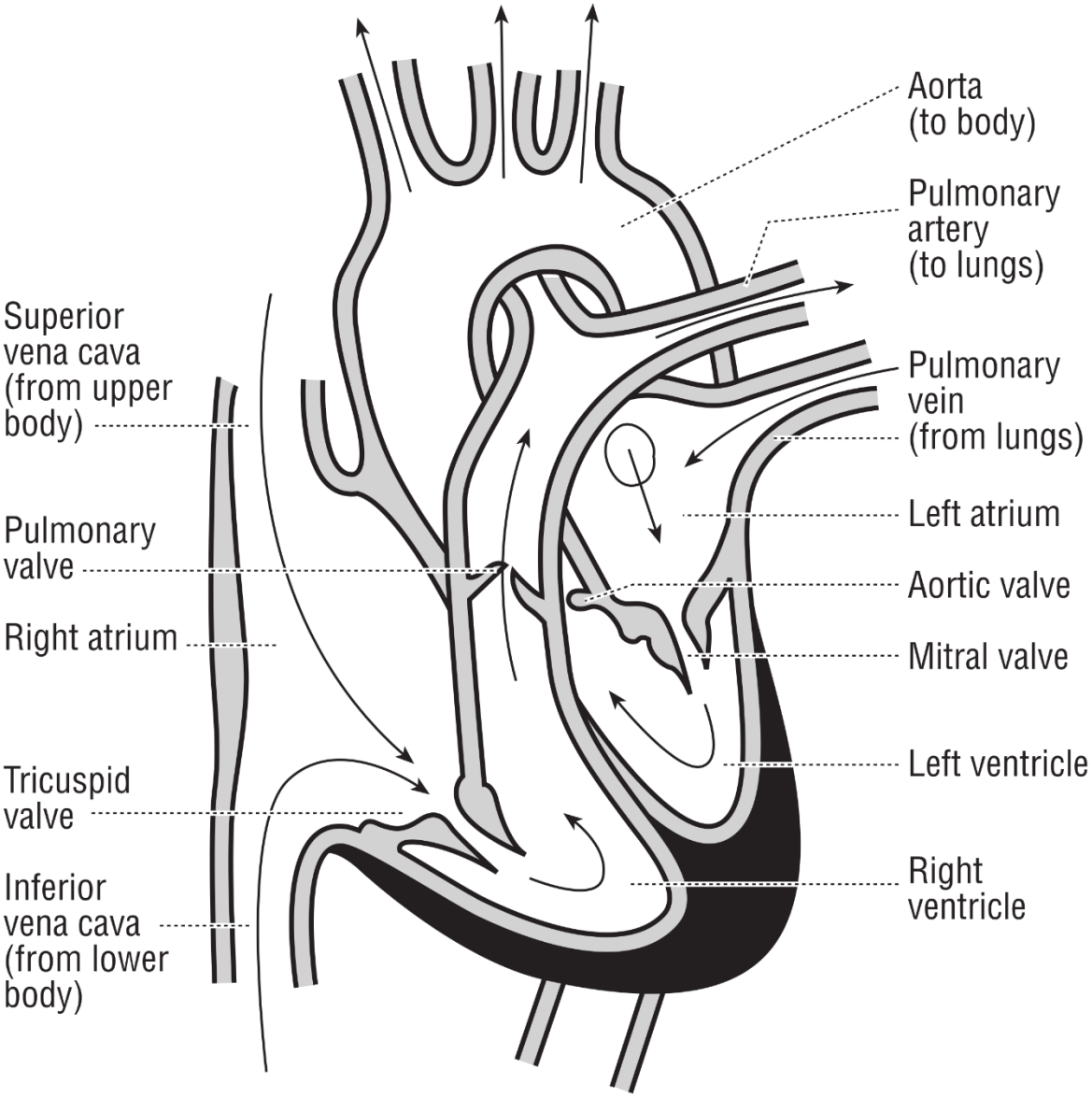
Heart Quiz Bowl



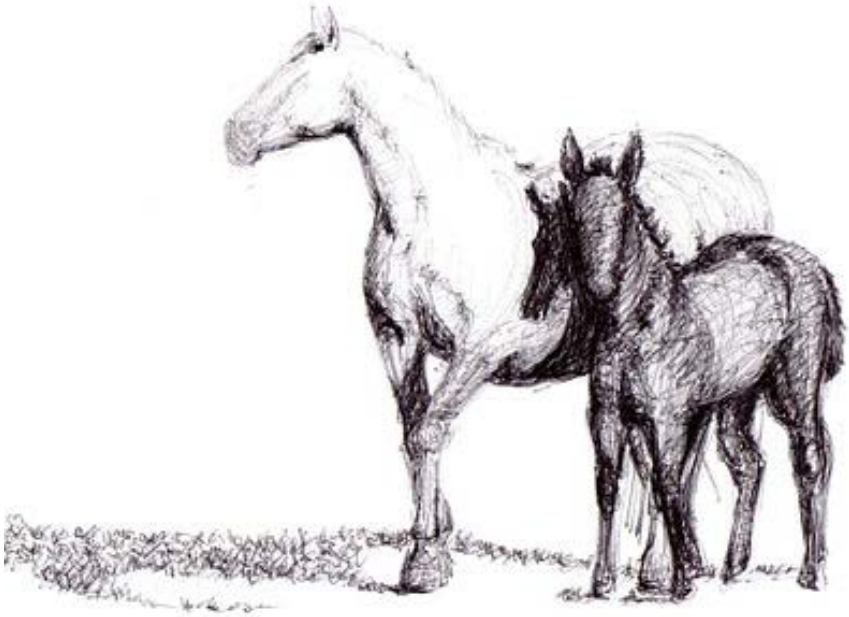
The goal of this exercise is to test what you know and don't know in a fun setting. Pay attention and note the correct answer as we will play team against team later for prizes! For now, when a team gets a correct answer, they get to move their game piece one space on the heart blood flow game board.

1. How does the vagus nerve affect the heart?
2. How does temperature affect heart rate?
3. What chambers of the heart does the tricuspid valve separate?
4. What chambers of the heart does the mitral valve separate?
5. What are chordae tendineae and where are the located?
6. What are the three layers of the heart wall and their anatomical relationship to each other?
7. How is the blood supplied to the heart itself, and where do these arteries originate?
8. What is the purpose of the papillary muscles?
9. What is located between the two layers of the pericardium, and what is its purpose?
10. Name the first group of cardiac cells where a normal electrical impulse is initiated, and its location.
11. What is considered the natural pacemaker of the heart?
12. How is cardiac electrical activity generated?
13. What is the purpose of the electrical impulse being delayed at the atrioventricular (AV) node?
14. Which enzyme is considered the more specific indicator for myocardial damage due to its limited distribution in other parts of the body?
15. What chamber of the heart does a pulmonary artery pressure reading provide information about?

16. What electrical activity of the heart is represented by the P wave of EKG?
17. What heart activity is occurring during a QRS complex of an EKG?
18. What cardiac activity is occurring during the T wave, and why is it so vital to cardiac function?
19. Of what diagnostic value is an EKG?
20. How are chest x-rays of importance in a cardiac dysfunction?
21. What information does a central venous pressure provide?
22. The normal blood urea nitrogen in dogs is 6-31 mg per 100 ml of blood. What is the significance of a blood urea nitrogen test?
23. What effect does a decreased serum protein level have on the cardiovascular system?
24. Why are blood cultures done on a cardiovascular patient?
25. During systole, which chambers of the heart are contracting, and what are the positions of the four valves?
26. The closing of which valves makes the first heart sound?
27. The closure of which valves makes the second heart sound?
28. When auscultating heart sounds, which heart sound is normally louder at the base of the heart?
29. Name three out of the six things that should be noted when ausculting a heart murmur.
30. What three important aspects should be evaluated when taking a pulse?


Aorta
(to body)
Pulmonary
artery
(to lungs)
Superior
vena cava
(from upper
body)
Pulmonary
vein
(from lungs)
Left atrium
Pulmonary
valve
Aortic valve
Right atrium
Mitral valve
Left ventricle
Tricuspid
valve
Right
ventricle
Inferior
vena cava
(from lower
body)

Horse Handling



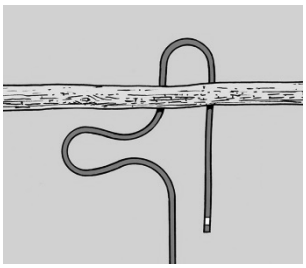
Restraint for Examination

- Observe horse from a distance as part of exam
- Get a respiratory rate prior to handling
- Minimum restraint is a halter and lead rope
- Lead rope can be held by an assistant
- Lead rope can be tied to stationary object
- Refrain from using twitches

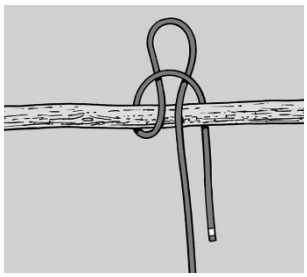
Tying Up a Horse

- Always use a quick release knot
- Never wrap rope around your hand
- Only tie a rope that is connected to a well-fitted halter
- Choose the best place to tie up the horse
- Place the knot at eye level of the horse
- Allow approximately 2-3 feet of slack
- Stand out of kicking range if walking behind horse
- Keep hand on horse as you move along side

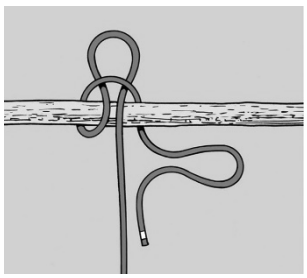
The Highwayman's Hitch



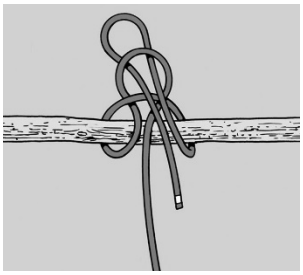
Place a loop under the fixed post, pole, branch, or railing, then form another loop in the standing line.



Pull the second loop over the post and under the first loop.

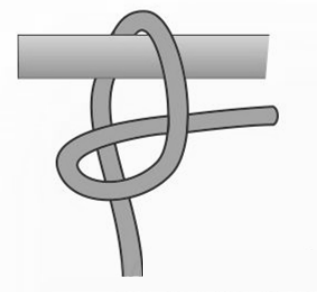


Make a loop in the end of the line...

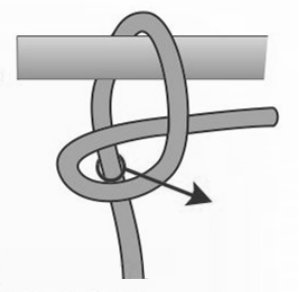


...and thread it through the loop formed at the top of the knot. Pull the standing line to set the knot. To release, pull the end of the free line.

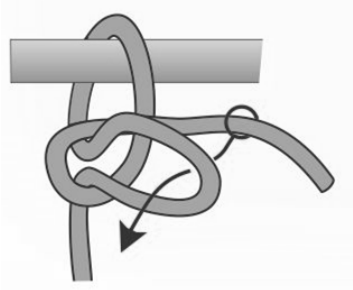
The Mooring Hitch



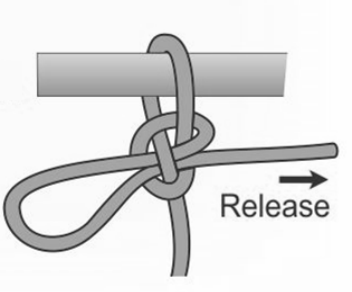
Make a turn around a post and then form a loop with the free end exiting the loop on the inside.



Grasp the standing line and pull a section through your loop.

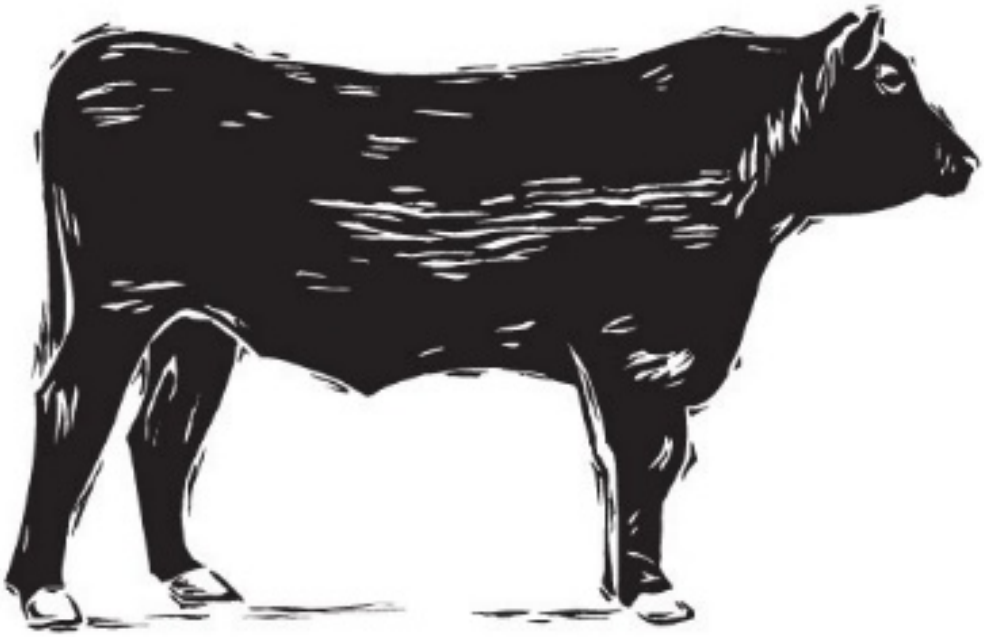


Grasp a section of the free end (but not the very end) and pull part way through the new loop.



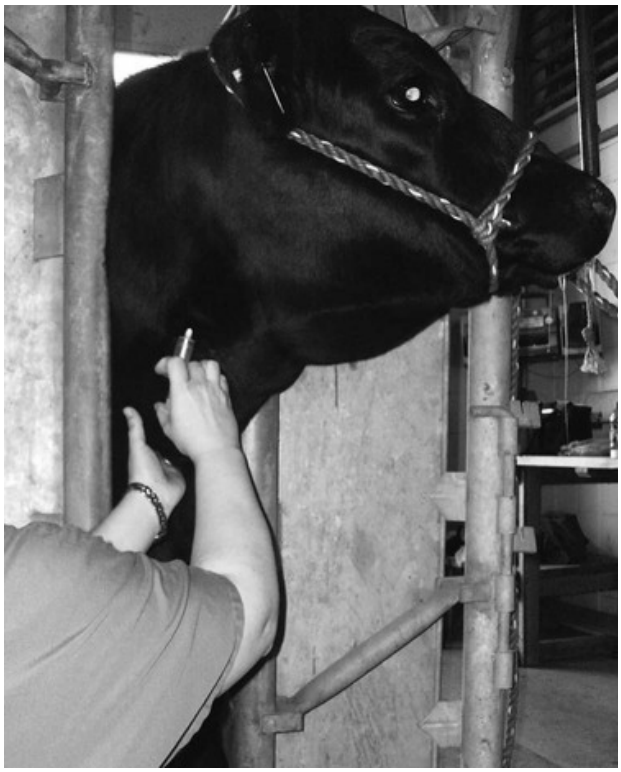
Tighten the knot by pulling down on the standing line. Release the knot by pulling the free end.

Cattle Handling



Where to get blood from cattle?

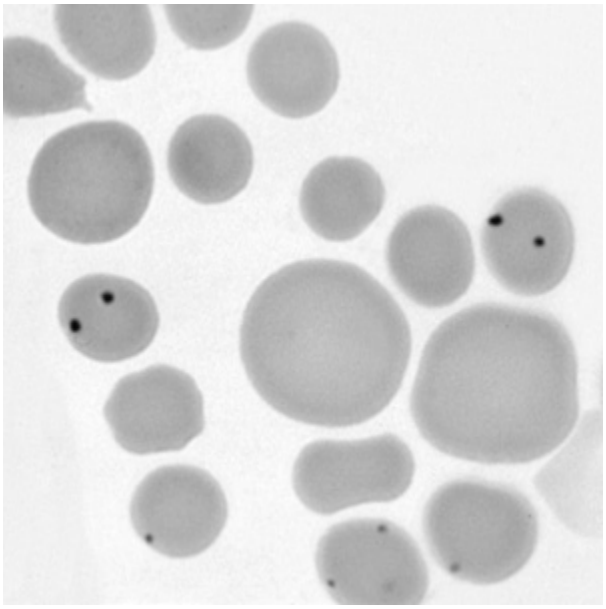
Jugular vein



Tail vein

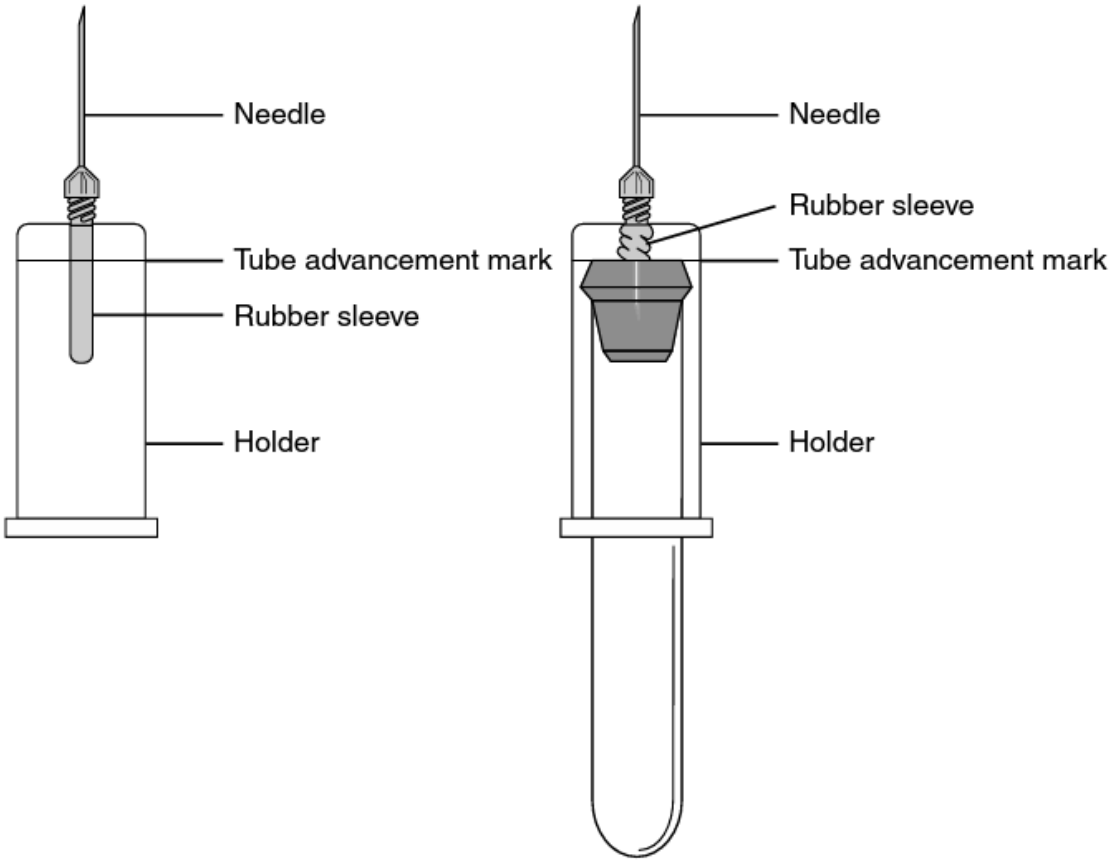
What are common cattle blood tests?

- Blood Cell Count
- Blood smear
- Blood Chemistry
- Genetic testing (for breeding)
- Pregnancy testing
- Bovine Viral Diarrhea Virus testing
- Johne's disease testing



Tips for cattle venipuncture

- Ensure that animal is restrained properly
- Determine blood draw site and clean with alcohol
- Palpate vein prior to inserting needle
- If multiple tubes, use vacutainer needle
- It takes force to get needle through cow skin
- Bigger animal = more blood = more mess



Ferret 101

Ferret Characteristics

- 3rd most popular pet in America
- Domesticated from the European Polecat
- Member of the weasel family
- Considered an obligate carnivore
- Possesses a distinct musk odor
- Famous for their "war dance"
- Notorious thieves and hoarders

Ferret Basics

- Lifespan 5 to 8 years
- Weight 1.5 lb to 6 lb (depending on gender)
- Body temperature 100°F to 103°F
- Heart rate 180-250 beats per minute
- Respiratory rate 33-36 breaths per minute
- Sexually mature at 5 to 6 months of age
- Gestation period of 42 days
- Adult teeth appear at 47 days
- Choppers are full size at 70 days!

More Ferret Facts

- Intact females are "jills" and intact males are "hobs"
- Spayed females are called "sprites"
- Neutered males are called "gibs"
- Baby ferrets are called "kits"
- Female ferrets are induced ovulators
- Non-mated females in heat may die from estrogen-induced anemia
- Heat intolerant
- Very high metabolism- sleep up to 18 hours a day
- Naturally very itchy
- Very intelligent and explore constantly
- Like to defecate in corners (latrine users)

Common Ferret Diseases

- Adrenal disease (adrenal gland tumor)
  - Fur loss
  - Weight loss
  - Increased thirst
  - Can treat with surgery or chemotherapy

- Insulinoma (cancer of the pancreas)
  - Sudden loss of energy
  - May appear intoxicated
  - Blood glucose is suddenly low
  - No cure, but can treat with steroids
  - Steroids help release stored sugars

- Lymphoma (cancer of the white blood cells)
  - Often no symptoms
  - Lack of appetite and weight loss
  - General lack of energy
  - Treat with surgery or chemotherapy

Other Ferret Diseases

Epizootic Catarrhal Enteritis (ECE)

- Caused by a coronavirus shed in feces of carriers
- Destroys intestinal cells much like canine parvovirus
- Ferrets die of dehydration and malnutrition

Aleutian Disease (ferret parvovirus)

- Chronic wasting disease spread in body fluids
- Test blood of new ferrets and isolate

Canine Distemper

- Very contagious airborne virus
- Causes mucoid eye discharge, fever and death
- Vaccinate kits at 8, 11 and 14 weeks
- Vaccinate adults annually

Rabies

- Contagious zoonotic virus spread through saliva
- Vaccinate kits at 12 weeks, then annually as adults

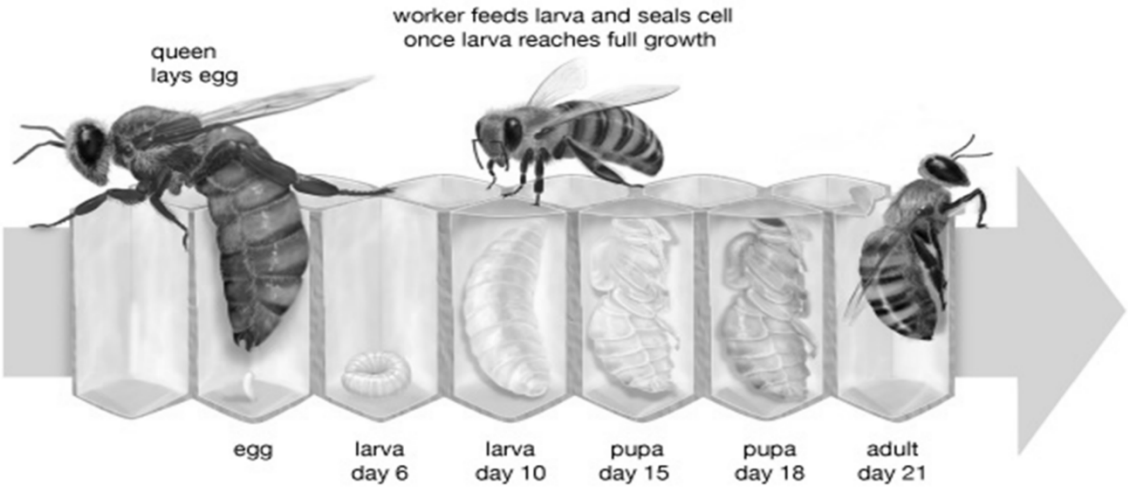
Handling Ferrets

- Grasp by scruff initially to avoid bite
- Position one hand under the shoulders with a thumb under the jaw
- If neck is too thick, then holding by scruff is ok
- Position other hand to support the hindquarters

Honey Bees

Honey Bee Characteristics

- The queen is the only fertile female
- Drones are males who fertilize the queen
- Workers are sterile females who do everything else!
- The entire colony lives by the queen's pheromone
- A colony can have up to 40,000 bees
- Bees construct perennial, colonial nests from wax
- Honey and pollen are stored in the nest
- Immature bees are called the brood
- Bees develop from eggs to adults in 28 days
- Brood are reared in hexagonal wax cells
- Bees cap the cells with wax to help larvae pupate



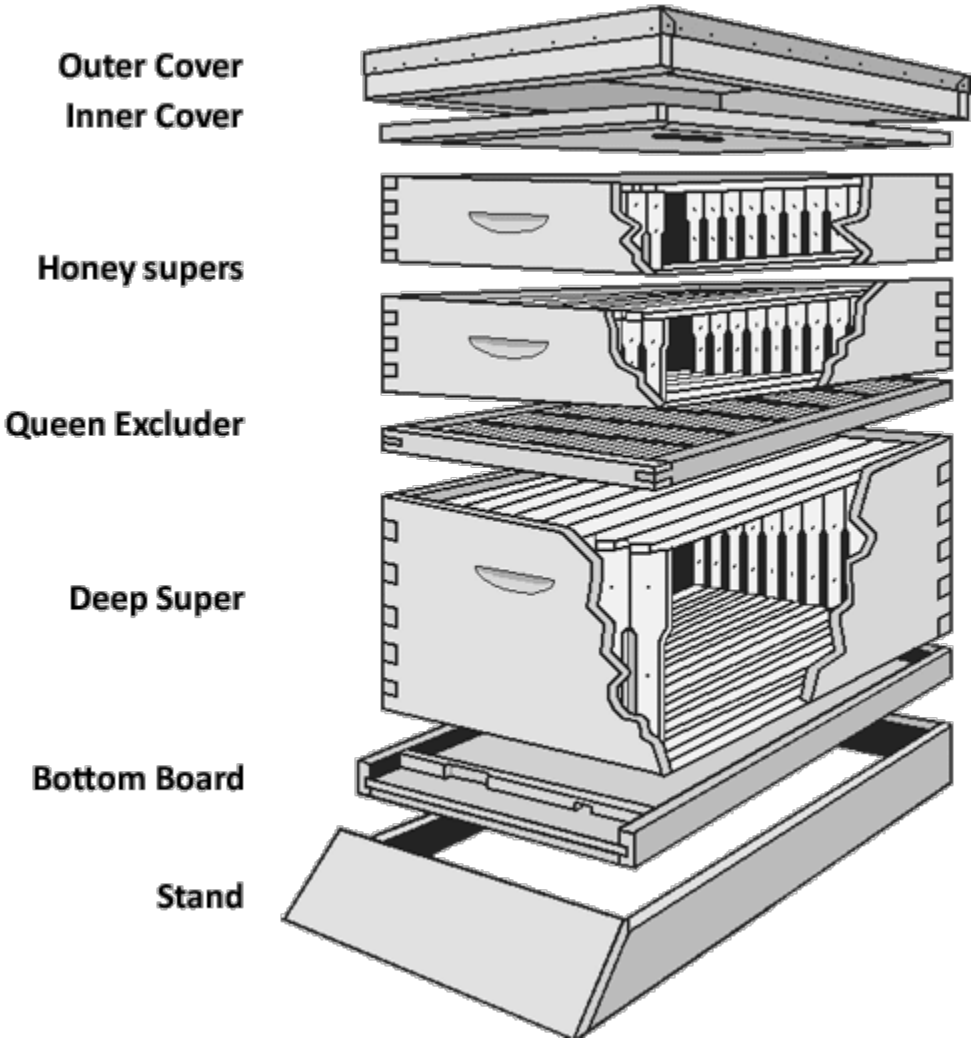
Examining a Colony

- Wear personal protective equipment (PPE)
- Use a smoker to calm bees before working
- Lift hive frames gently so as to not injure bees
- Observe the bees
  - Observe general number and activity of bees
  - Observe bees for abnormal behavior
  - Note ratio of drones to worker bees
  - Try to find the queen
- Observe honeycomb for evidence of disease
  - Mixed Brood (too many drones)
  - American Foulbrood (*Paenibacillus larvae*)
  - European Foulbrood (*Melissococcus plutonius*)
  - Chalkbrood (*Ascosphaera apis*)
  - Hive beetle larvae or adults (*Aethina tumida*)

PPE

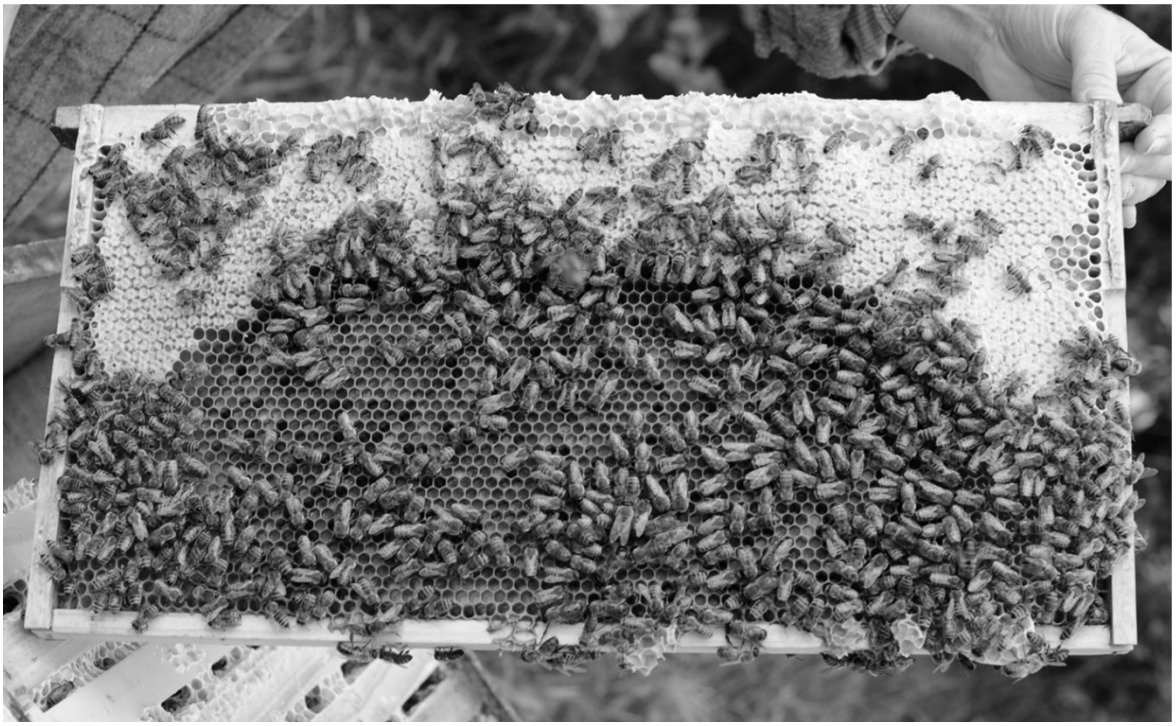
- Bee suit, bee jacket or bee hood
- Gloves
- Jeans or thick canvas pants
- Closed toe shoe and socks
- You may still get a sting or two!

The Honey Bee Hive

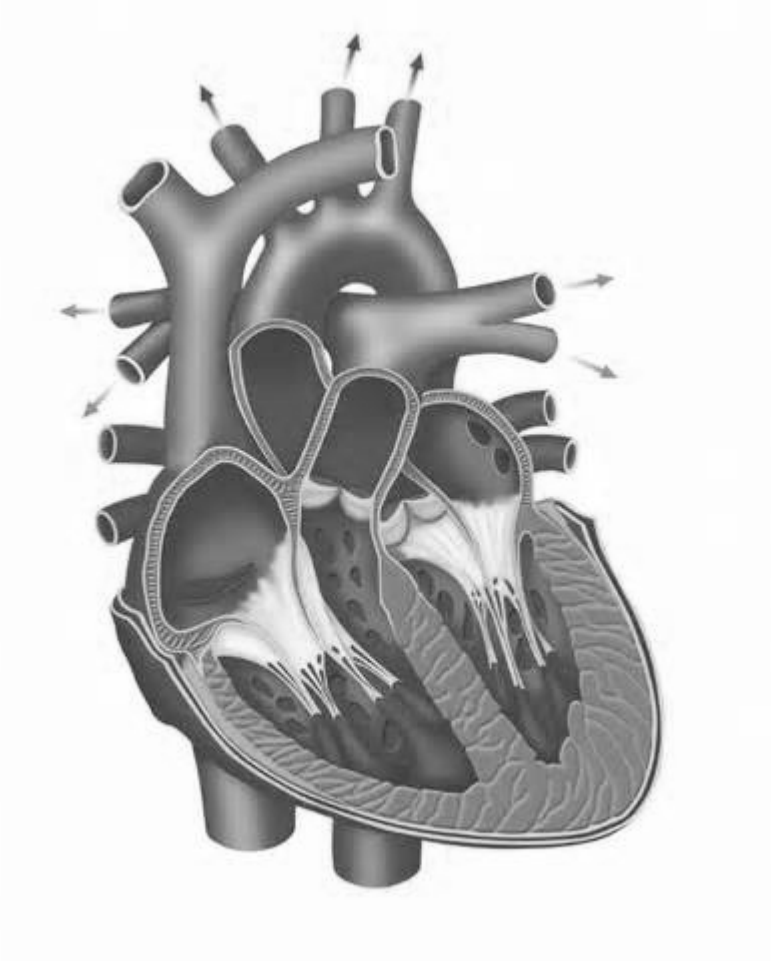


Honey Bee Frames

- Lots of bees
- Nice golden color (not gray!)
- Rainbow of honey on top surrounded by pollen
- Drone brood at the bottom
- Even distribution of capped cells



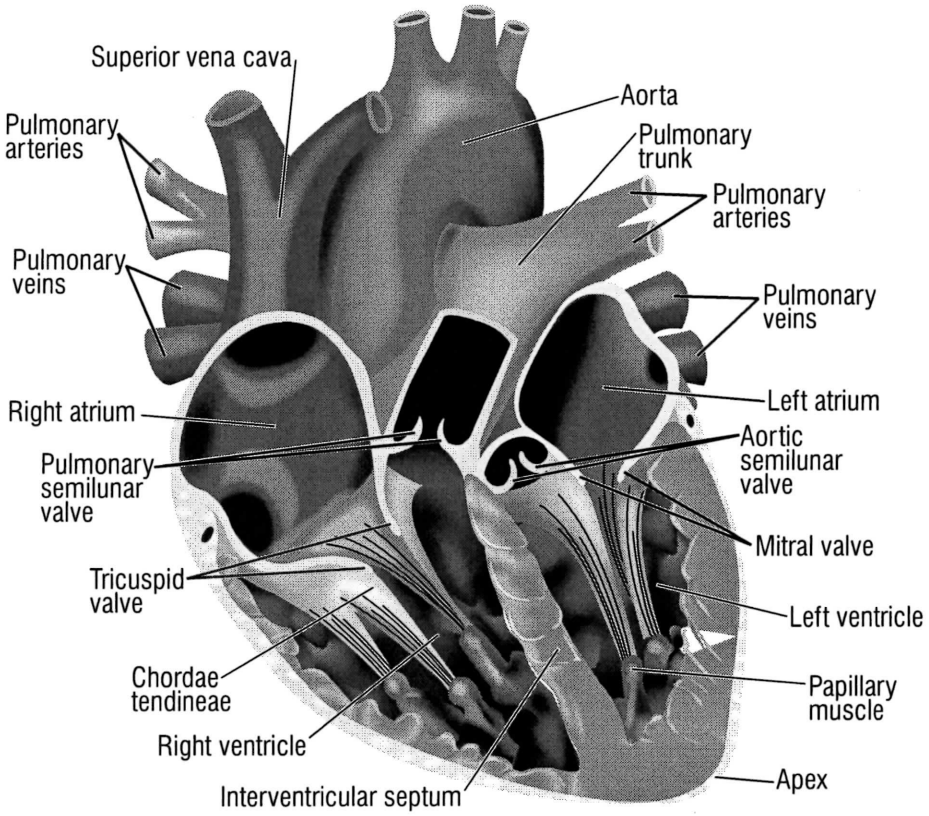
Heart Anatomy



The mutual interrelationships between form and function can nowhere be seen better than in the heart. The mammalian heart, which is approximately the size of the human heart, will be used for the study of heart anatomy. (The cow heart is slightly larger than a human heart.)

The heart lies in a tough membranous sac, the **pericardium**, the inner surface of which is a serous membrane that faces the outer surface, or **epicardium**, of the heart. The pericardial space, between these facing membranes, contains a serous pericardial fluid. In removing the pericardium, it will be observed that it attaches only around the base of the heart, where the large vessels emerge. The cavities of the heart are lined with a membrane called the **endocardium**. The same type of tissue lining all of the blood vessels is called **endothelium**. Between the epicardium and endocardium is the bulk of the heart tissue, the **myocardium** or heart musculature.

Figure 1 – Anatomy of the Mammalian Heart



The right and left sides of the heart can be identified in two ways: (1) the pointed end, or **apex**, is entirely a part of the left ventricle, and the right and left divisions are indicated superficially by a diagonal furrow followed by coronary vessels; (2) when feeling the ventricular musculature, the left side appears firm and muscular, while the right ventricle feels soft and flabby. The auricles are earlike projections at the base of the heart. The cavity within each auricle is referred to as the **atrium**, and receives incoming blood from the body or lungs.

Make a long incision through the **right atrium** in line with the superior vena cava. Lift the edges of the flaps and observe the wide mouths of the great veins (**superior and inferior vena cava**) as they enter the atrium. With scissors, carry the incision downward toward the ventricle and determine the relationship between the two cavities. Note the irregular band of muscle lining the interior of the atrial wall. These are pectinate muscles. Find the **coronary sinus**, which receives venous blood directly from the heart musculature and which enters the atrium as a wide cavity. Note that the partition separating the atria is membranous rather than muscular. Locate the thinnest portion of the wall between the two atria. This area is the **fossa ovalis**, an oval depression marking the position in fetal circulation at which blood was carried directly from the left side of the heart and thus bypassed the pulmonary circuit. Why does this occur in the embryonic heart?

Carry the incision from the right atrium into a straight line through the lateral wall of the **right ventricle.** Note the three rounded flaps of membranous tissue suspended into the ventricle and held in place by tendinous cords. These flaps comprise the **tricuspid valve**. Study its position, structural character, and attachments. If necessary, wash out both cavities. Note that pointed columns of ventricular muscle (papillary muscles) are continuous with the wall of the ventricle and with the strong fibrous cords (**chordae tendineae**) that extend to the edges of the cusps or segments of the valve. What function would you ascribe to these structures with reference to the valve?

Observe the heavy muscular ridges within the ventricle, the **columnae carneae cordis**. Find the **pulmonary artery** though which blood leaves the right ventricle. Carry an incision upward through the wall of this artery and note that the mouth of the artery is surrounded by three membranous pockets (the **pulmonary semilunar valves**). Determine how these valves prevent blood from flowing back into the ventricle when the ventricle relaxes.

Open the **left atrium** in a similar manner as you did on the right side. Before cutting down through the ventricle, push your finger from the atrium into the ventricles and distend the atrioventricular opening. Determine the number of openings draining into the atrium from the lungs. These openings are the mouths of the **pulmonary veins**. In what way does the wall of the left atrium differ from the right?

Make an incision in the left ventricle to expose the cavity. Study the details of the **mitral**, or bicuspid (two-parted) valve between this atrium and ventricle. Explore the **septum** between the two ventricles as to its thickness. With your finger, find the outlet of the ventricle into the **aorta**. In what respect is this outlet similar to the pulmonary artery.

Open the aorta to expose its **semilunar valve**. Find the openings of the two coronary arteries just above the valve – that is, within the pockets. Trace these to the walls of the heart. Observe the tough ligamentous connection, which usually is covered with a conspicuous pad of fat, between the pulmonary artery and aorta. This is the remains of a vessel that connected the pulmonary artery and aorta in the embryo. If the vessel remains open after birth, a mixing of oxygenated and unoxygenated blood occurs. Why is this dangerous?

In studying the heart, emphasis should be placed on the structural arrangement of the parts and their functional continuity. The mammalian heart is essentially a double pump equipped with specially designed valves. It serves as the propelling force for two circuits of blood that do not mix in the heart. The circuit from the heart to the lungs and back is the **pulmonary circuit**, and the circuit from the heart to all the body tissues and back is the **systemic circuit**. These circuits act concurrently and interdependently, since no more blood can be sent through the pulmonary circuit than is delivered to it by the systemic circuit.

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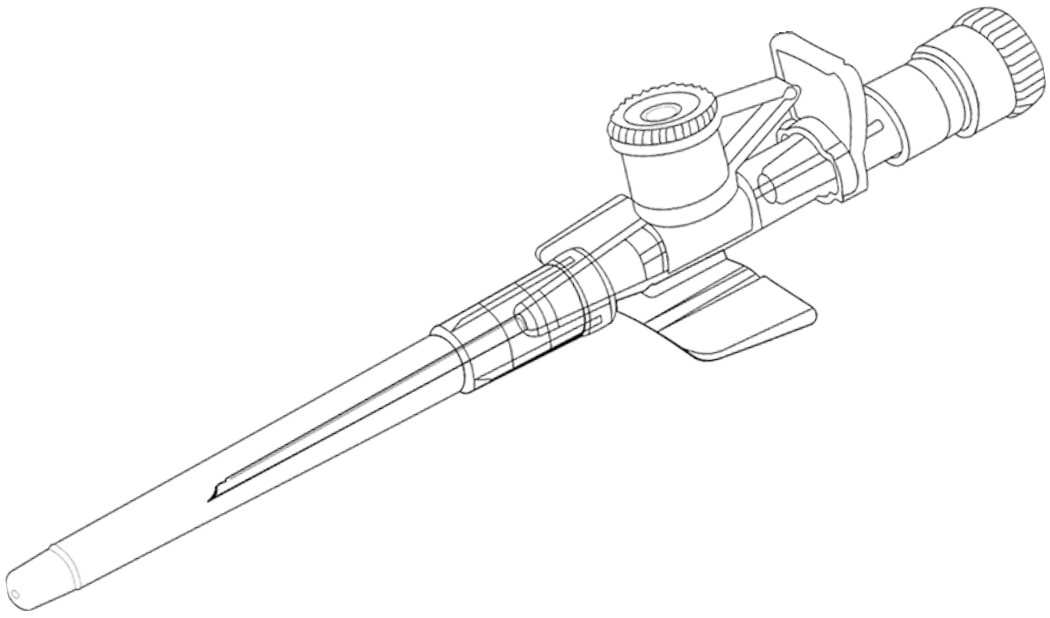
IV Catheters



Why do we use intravenous catheters?

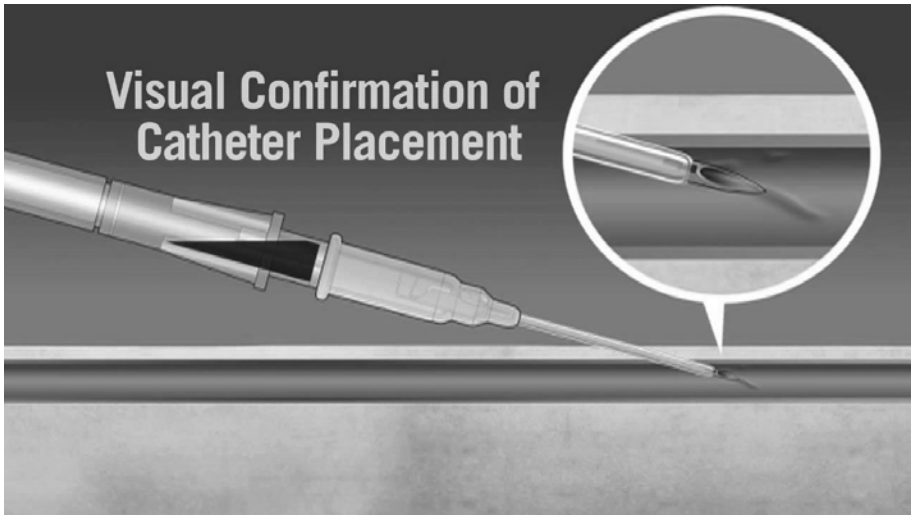
- Sampling of blood
- Fluids
- Medications
- Parenteral nutrition
- Chemotherapy
- Blood products

Catheter Basics

- Select the smallest gauge of catheter that can effectively deliver the prescribed therapy
  - 24-ga for puppies and kittens
  - 22-ga for cats and small dogs
  - 20-ga for medium-sized dogs
  - 18-ga large dogs and small ruminants
  - 14-ga horses
- If patient needs large volumes infused over a short period of time, then select the largest gauge that is likely to fit the chosen vein

Placing a Catheter

- Clip fur from catheter site around limb
- Scrub skin 3 times with surgical scrub
- Wipe away scrub with alcohol and air dry
- Have assistant hold off vein or use tourniquet
- Insert catheter at 15° to 20° angle
- Look for flash of blood in cannula
- Feed cannula over stylet
- Quickly place cap and tape into place
- Flush catheter with sterile saline
- Replace cap or connect to t-port or fluid line

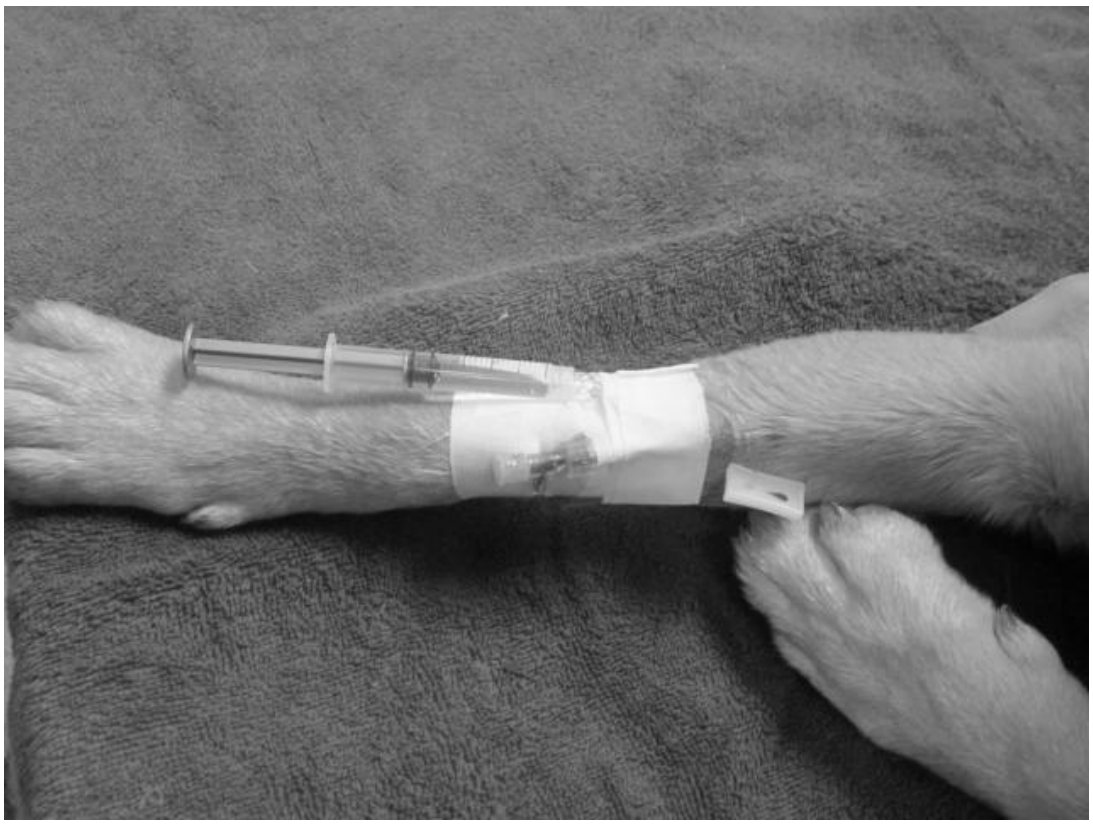


Equipment for catheterization

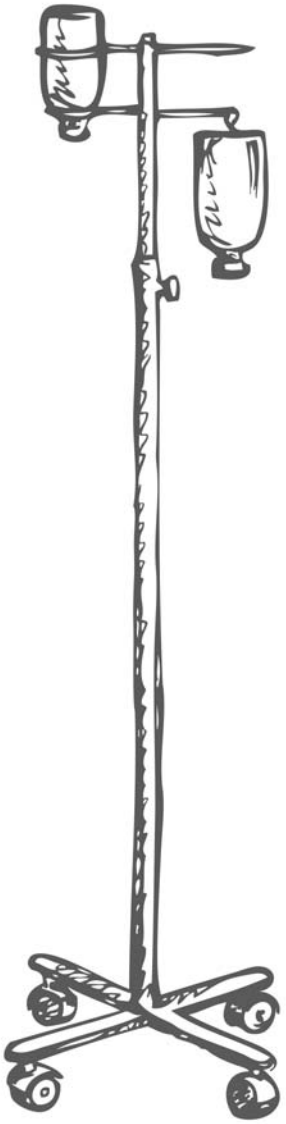
- Tape – two skinny and one thick with a notch
- Vet wrap (usually red)
- Clean clippers with sharp blade
- Chlorhexidine soaked gauze
- Alcohol soaked gauze
- 2 catheters (one for back up)
- Cap or t-port
- 3 ml syringe with saline flush
- A good assistant!

The Perfect Catheter

- Flushes easily
- Fluid can be felt in vein when pushed
- Catheter is not positional
- Catheter is secured
- Does not bother patient



Fluid Therapy



Your Pet and Fluid Therapy

What is fluid therapy?

Fluid therapy is administration of specially formulated liquids for treatment of disease or prevention of problems. More than half of body weight is water, so all animals need to take in fluids every day.

Why is fluid therapy given?

Pets normally take in enough fluids by drinking. There are many reasons a pet might not get enough fluids.

A healthy pet that is undergoing anesthesia may need to receive fluids to help maintain normal blood pressure during the procedure to replace fluids lost in surgery. In addition, the catheter serves as an access point should the need for emergency drugs arise.

A sick pet that is not drinking, or is vomiting or experiencing diarrhea also needs fluids to make up for what is not being taken in or is being lost.

Some pets have problems with organs, such as the kidneys, which prevent their bodies from utilizing the fluids they drink.

Other sick pets have problems with their electrolytes, such as sodium or potassium. Fluids are given to these pets to help bring them back to a normal electrolyte balance.

What is in the fluids?

There are several kinds of fluids and electrolytes that we can use, and our veterinarians choose the specific ones that will best help your pet. Fluids have water, of course, and they may contain sodium, potassium and/or glucose, plus other electrolytes. For the safety of your pet, all of the fluids are sterile, which requires special packaging and handling.

How are fluids given?

Fluids are generally administered through a catheter placed in your pet's vein. This is called intravenous fluid (IV) therapy. It gets the fluids into the body fairly quickly, and it allows us to measure and control the amount and rate of fluids that are administered.

Sometimes veterinarians work with pet owners so owners can give fluids to their pet at home. This type of administration is referred to as subcutaneous because the sterile fluids are placed just under your pet's skin.

This usually occurs when a pet has an ongoing condition, where the pet has received initial treatment in the hospital and then is being maintained on a regular schedule of subcutaneous fluids at home. If this is necessary for your pet, we will teach you how.

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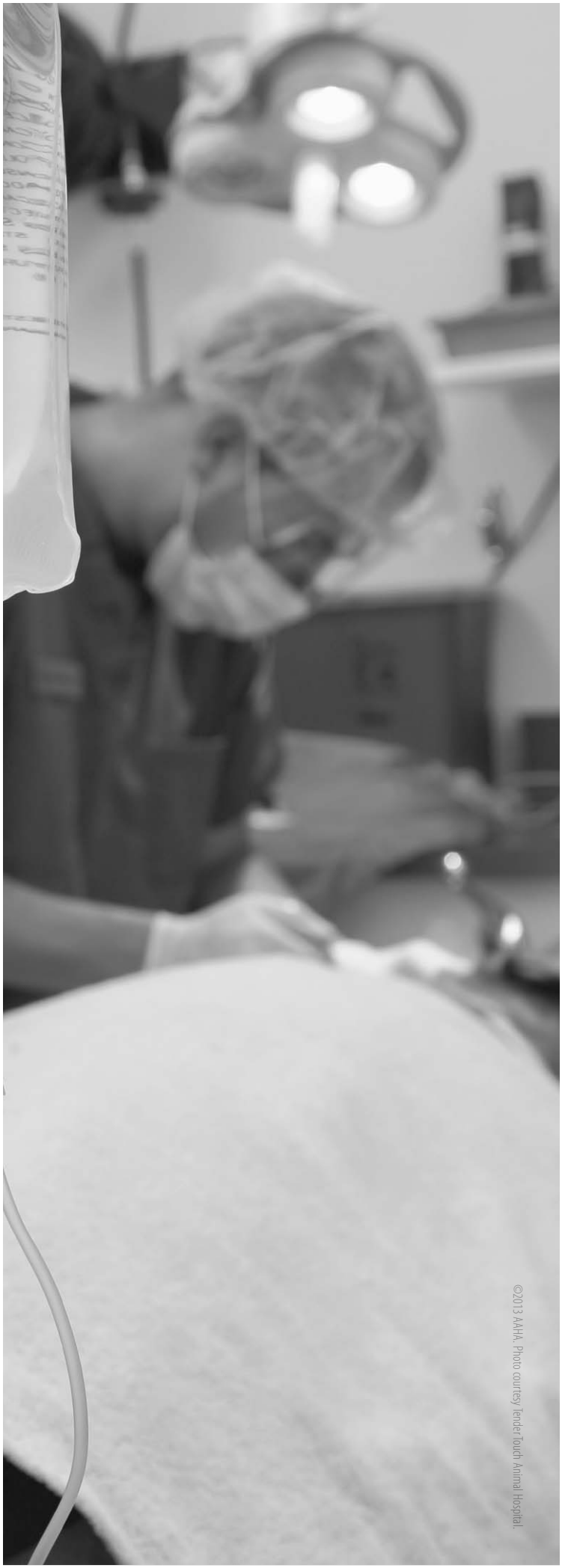
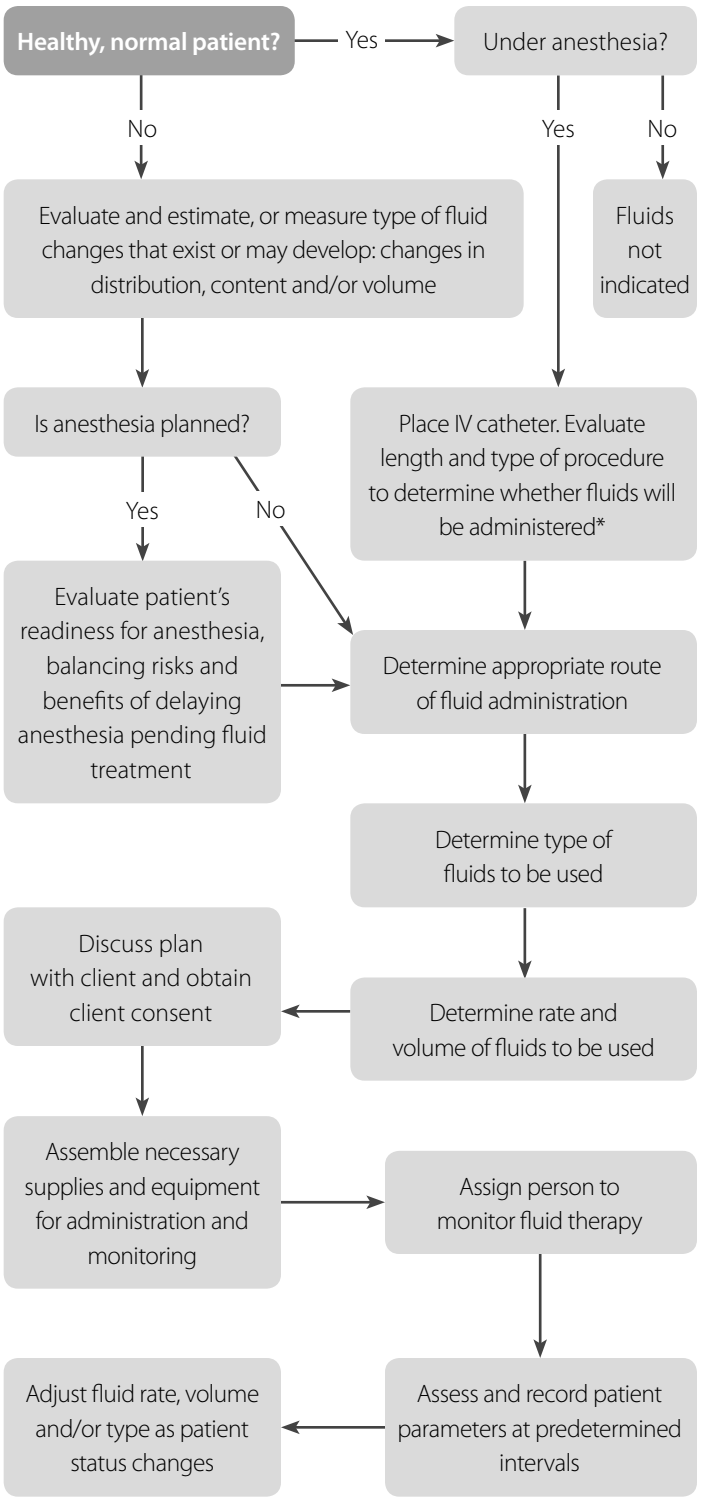
4-H VETERINARY SCIENCE



Model Algorithm

AAHA/AAFP Fluid Therapy Guidelines for Dogs and Cats



*For factors to consider, please see the *2013 AAHA/AAFP Fluid Therapy Guidelines for Dogs and Cats*.

Verify Key Tasks as You Perform Them

Use this checklist to remind yourself to perform key tasks in administering fluid therapy. Make multiple copies and laminate them so you can use them repeatedly in the surgical suite. This checklist is available as a download at aahanet.org/library/FluidTherapy.aspx.

Catheter placement, maintenance and monitoring

- ☐ Shave the area and perform a sterile preparation.
- ☐ Maintain strict aseptic placement and maintenance protocols to extend catheter life.
- ☐ Place the largest-size catheter that can be safely and comfortably used (very small catheters greatly reduce flow).
- ☐ If a catheter is placed in an emergency situation, prepare a new site and place a new catheter once the emergency is resolved.
- ☐ Flush the catheter every 4 hours unless fluids are being continuously administered. Normal saline is as effective for flushing as heparin solution.
- ☐ Unwrap and evaluate daily. Follow the steps below:
  - ☐ Aspirate and flush to check for patency.
  - ☐ Replace the catheter if the dressing becomes loose, soiled or damp.
  - ☐ Inspect for signs of phlebitis, thrombosis, perivascular fluid administration, infection or constriction of blood flow due to too-tight bandaging.

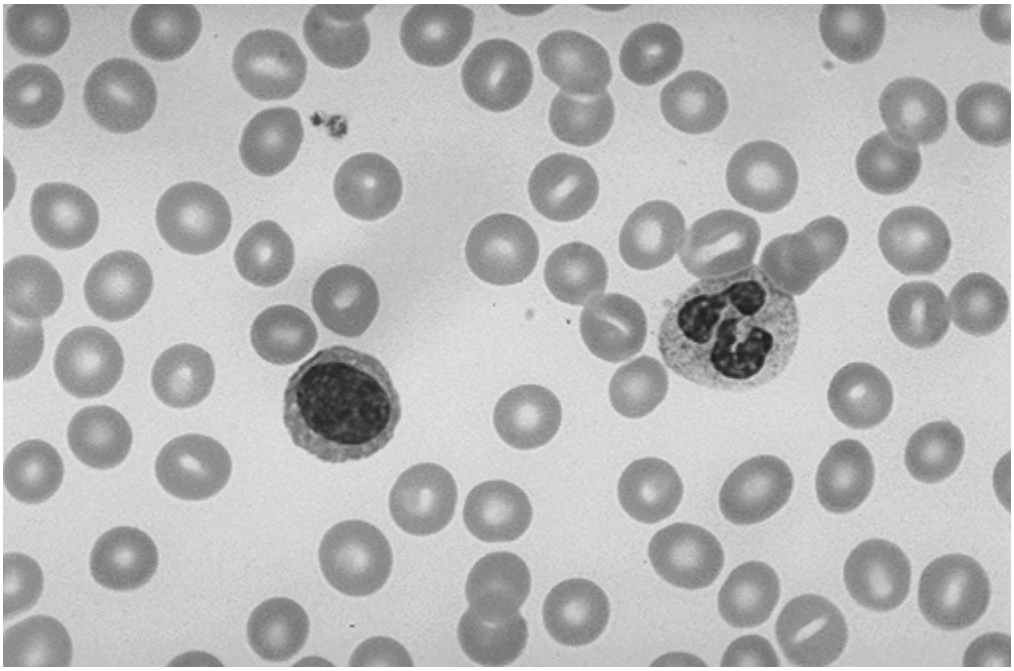
Intravenous fluid administration

- ☐ Prepare a new bag of fluids with a new administration set for each patient regardless of route of administration.
- ☐ Ensure lines are primed to avoid air embolism.
- ☐ Use Luer-lock connections when possible to prevent inadvertent disconnection.
- ☐ Select the appropriate size/volume bag according to patient size if using gravity flow to minimize the risk of volume overload if the entire volume were to be inadvertently delivered to the patient.
- ☐ Use a buretrol if frequent fluid composition changes are anticipated.
- ☐ Consider using t-ports to easily medicate a patient receiving IV fluids if the medication is compatible with the fluid type.
- ☐ Consider using a y-port in patients receiving more than one compatible infusion.
- ☐ Consider a syringe pump for small-volume infusions or for constant-rate infusions (CRIs). Place small-volume CRIs close to the patient's IV catheter so that the infusion will reach the patient in a timely manner.
- ☐ Consider a pressure bag for bolus delivery in an emergency situation.
- ☐ Follow CDC recommendations for changing fluid administration lines no more than every 4 days to reduce the chance of nosocomial infection.

Monitoring fluid therapy

- ☐ Use fluid pumps whenever possible and monitor the pump frequently.
- ☐ Monitor the patient for over-administration. Symptoms include the following:
  - ☐ Increased respiratory rate and effort
  - ☐ Peripheral and/or pulmonary edema
  - ☐ Weight gain
  - ☐ Pulmonary crackles (a late indicator)
- ☐ Monitor the patient for under-administration. Symptoms include the following:
  - ☐ Persistent increased heart rate
  - ☐ Poor pulse quality
  - ☐ Hypotension
  - ☐ Decreased urine output
- ☐ Monitor during anesthesia. Follow the steps below:
  - ☐ Assign a staff member to monitor fluid administration and patient status.
  - ☐ Consider current recommendations of an anesthetic rate less than 10 mL/kg/hr to avoid hypervolemia, especially in cats (rule of thumb start at 3 mL/kg/hr in cats and 5 mL/kg/hr in dogs).
  - ☐ Consider reducing the anesthetic rate in procedures lasting longer than 60 minutes by 25% each hour, if beginning at higher-than-maintenance rate, until the maintenance rate is reached.

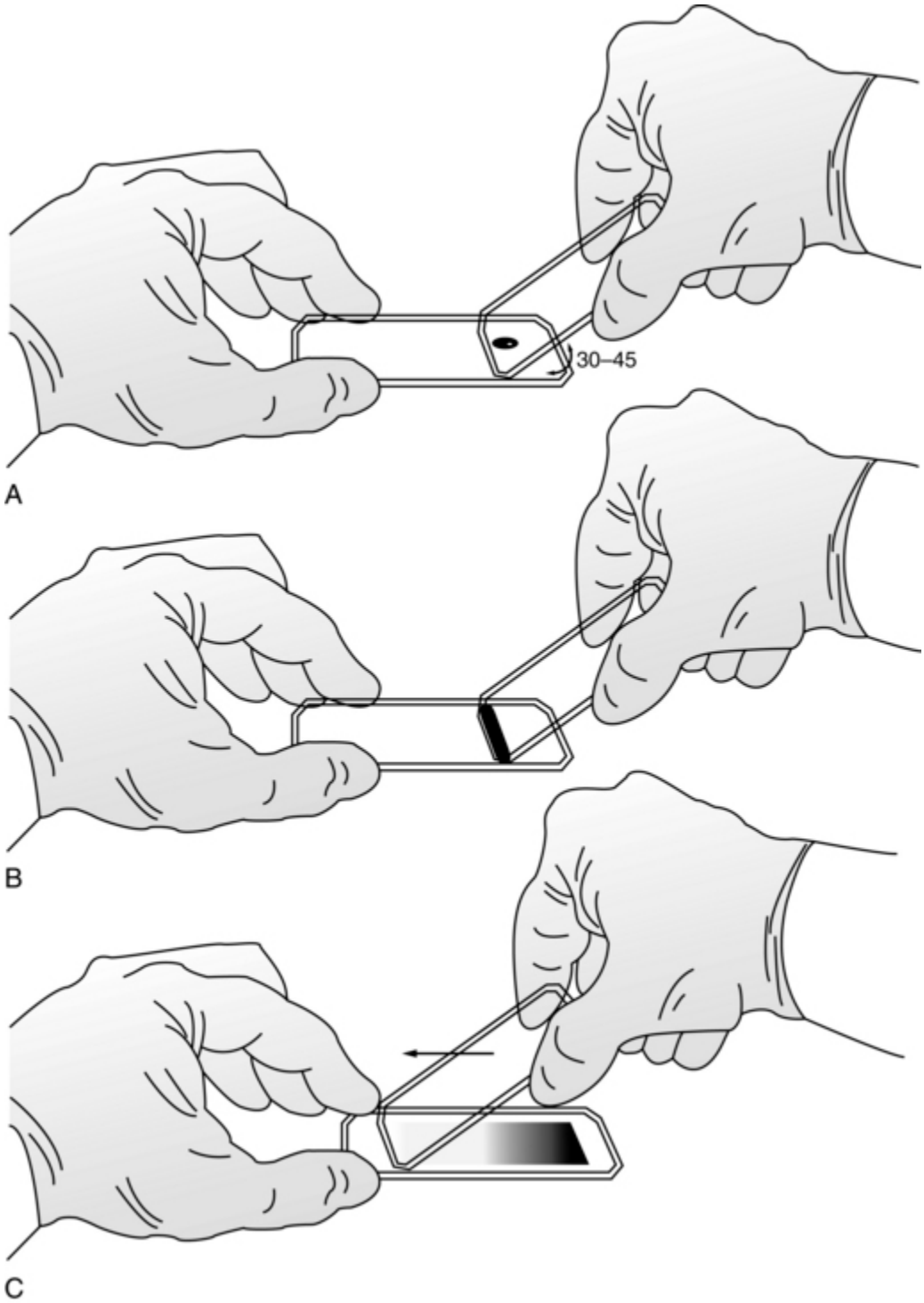
Blood Smear



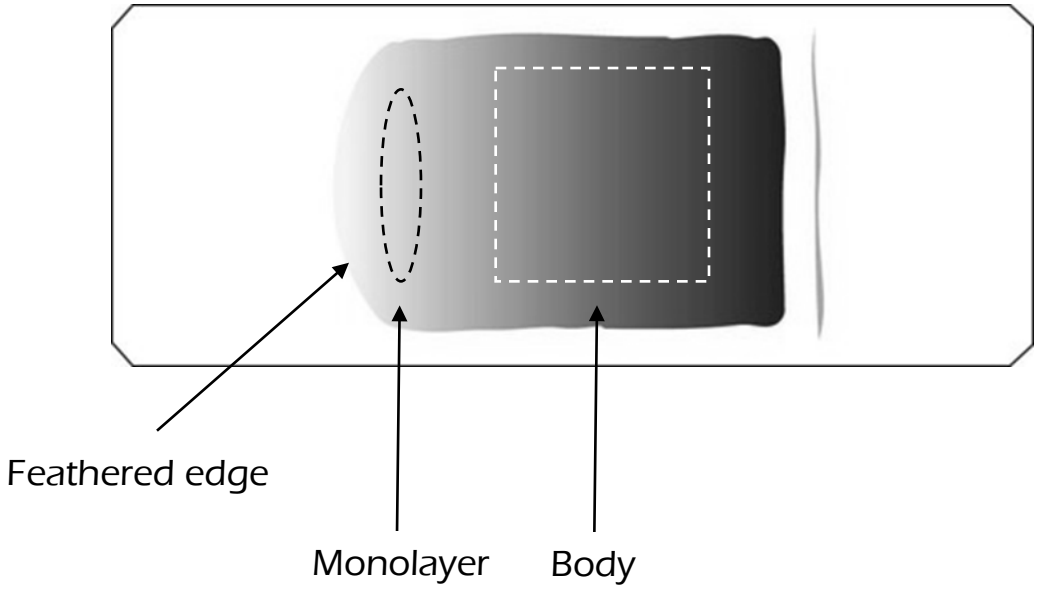
What is a blood smear?

- A blood smear is a blood test used to look for abnormalities in blood cells
- The three main blood cells that the test focuses on are red cells, which carry oxygen throughout the body, white cells, which help the body fight infections and platelets, which are important for blood clotting
- An ideal blood smear has an even distribution with a feathered edge and a thin monolayer (zone of morphology)
- The feathered edge will contain larger white blood cells and platelet clump

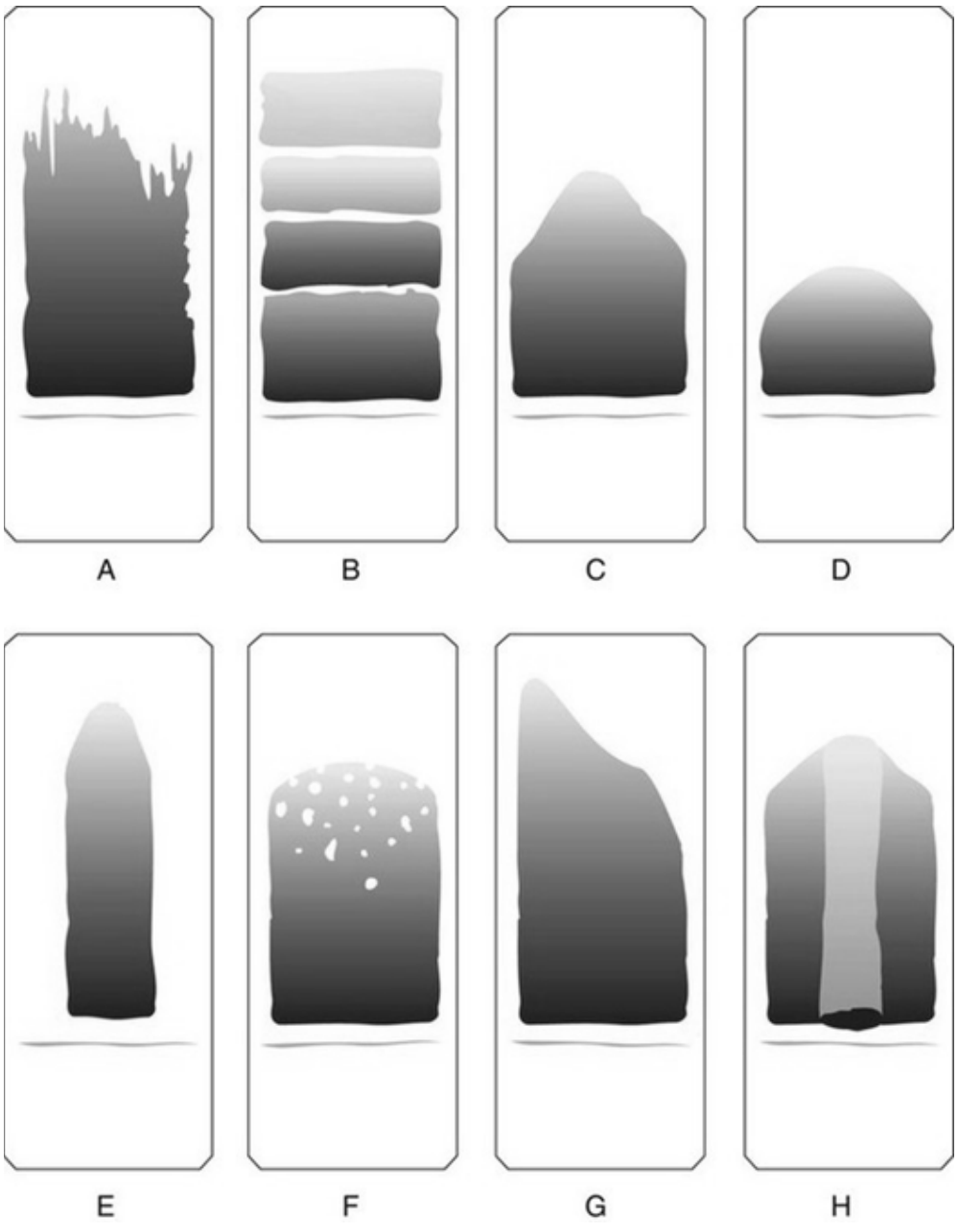
How do you make a blood smear?



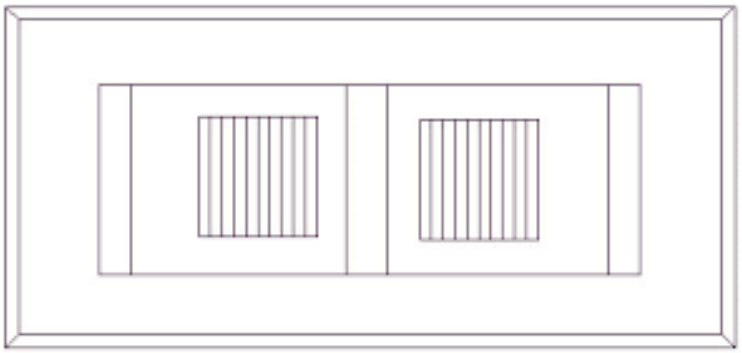
What does a good slide look like?



What does a bad slide look like?

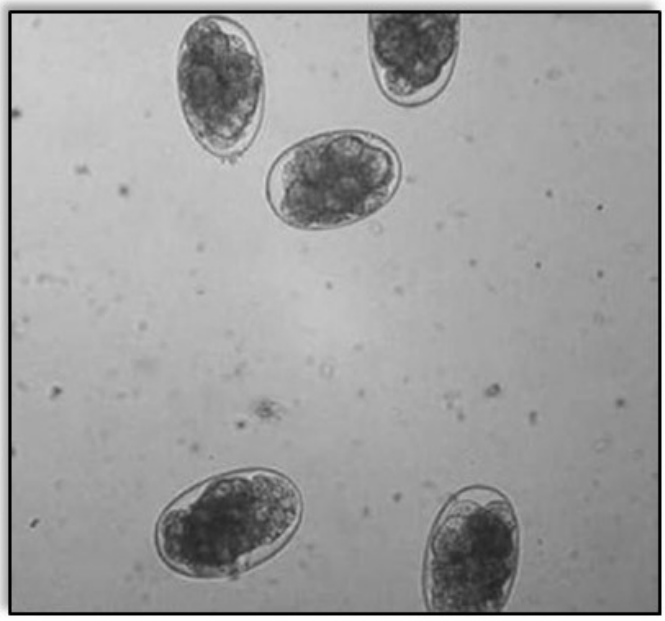


Fecal Egg Count



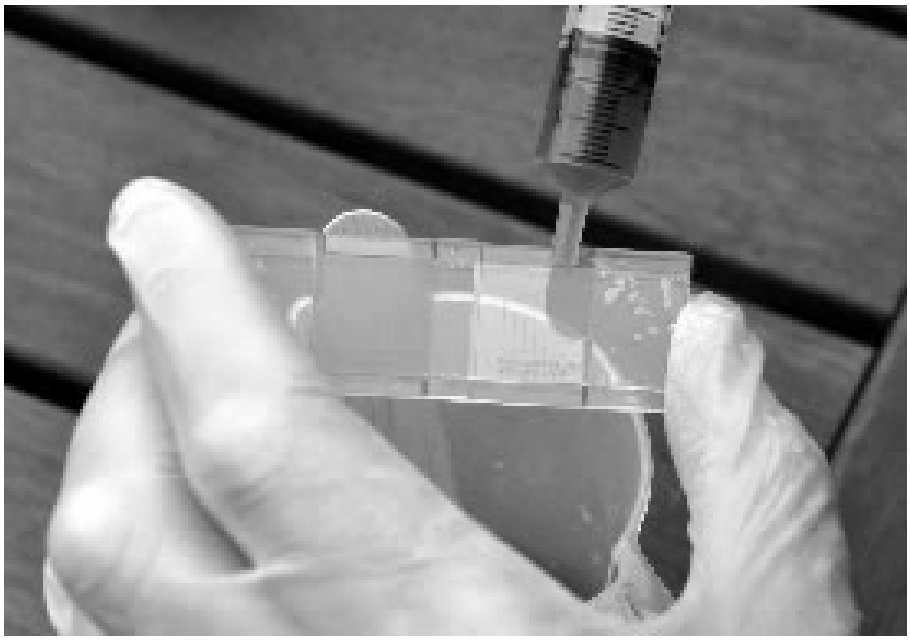
Why do we do fecal egg counts?

- Determine the worm burden of a given animal
- Determine the type of parasites present
- Determine if dewormer is working (efficacy)
- This lesson is for the Modified McMaster's FEC



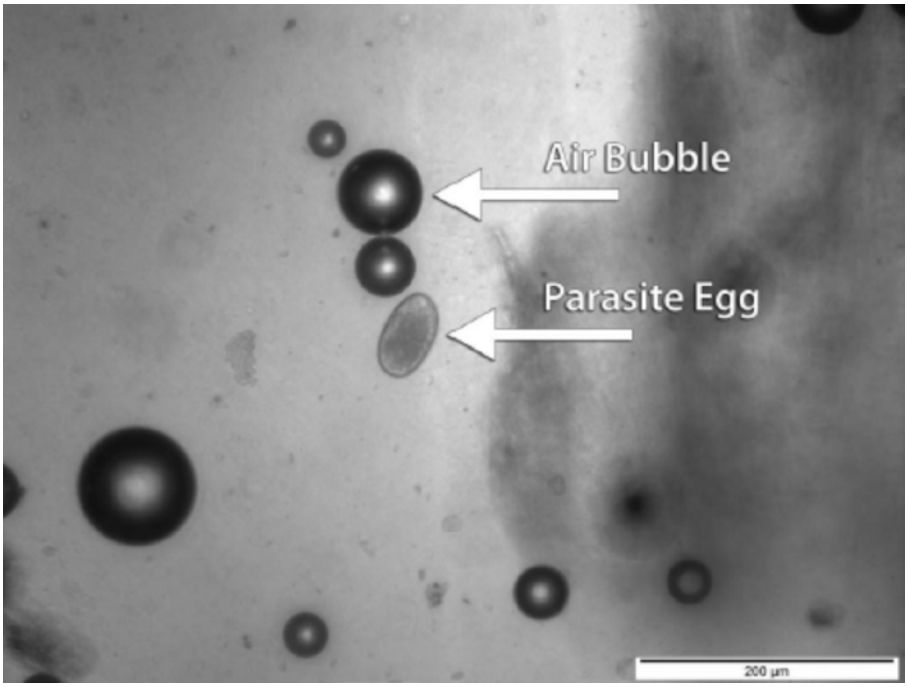
How do we prepare feces?

- Place cup on scale and measure 2 grams of feces
- Add 28 ml of sugar solution to feces and stir with stick
- Meanwhile, place cheesecloth over another cup
- Pour contents of first cup into the second cup
- Use stick to aid in moving liquid through cheesecloth
- Remove cheesecloth and discard
- Use plastic pipette to stir strained solution
- Draw up 1 ml of solution into pipette
- Tilt McMaster's slide and use tip of pipette to add solution
- Fill both squares of McMaster's slide
- Allow solution to sit in slide for 5 minutes before viewing



How do we count eggs in feces?

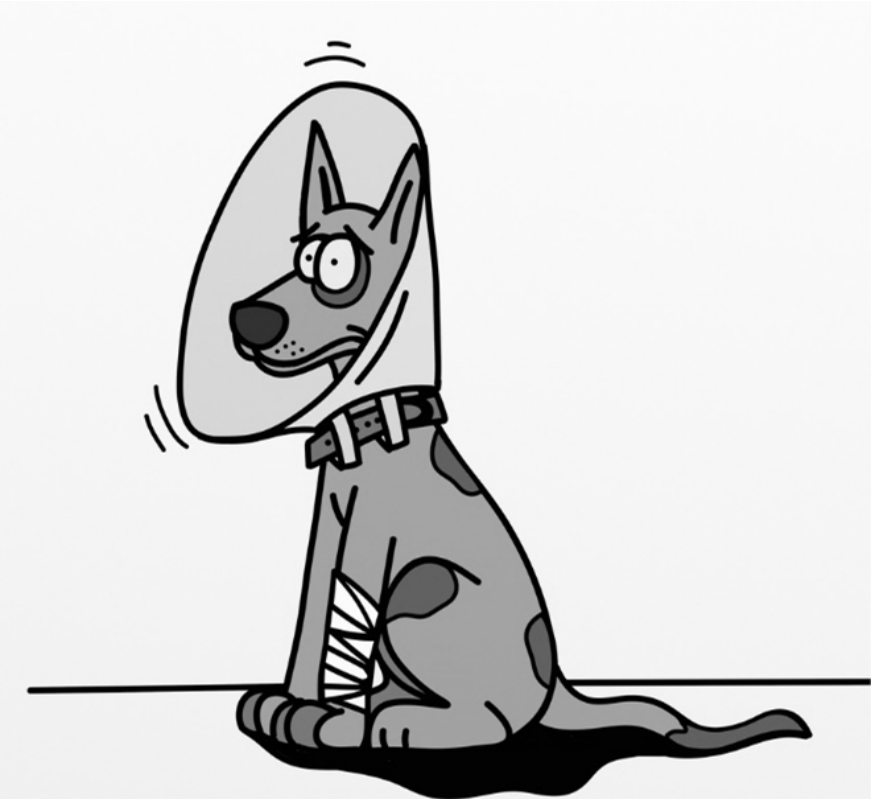
- Lower stage of microscope to place McMaster's slide
- Turn on microscope and adjust 100x objective
- Use coarse adjust to bring slide into focus
- Use fine adjust to specifically focus on bubbles
- *Haemonchus* eggs are on same plane as bubbles!
- Count each parasite egg in each column
- Count eggs on the grid line if > ½ of egg is inside grid
- Write down total # from all columns in both squares
- Multiply the total number of eggs by 50
- This number is the # of eggs per gram of feces



Bandaging

Why do we bandage wounds?

- Ease pain
- Prevent contamination
- Keep pet from licking



Do all wounds need a bandage?

Do bandage if:

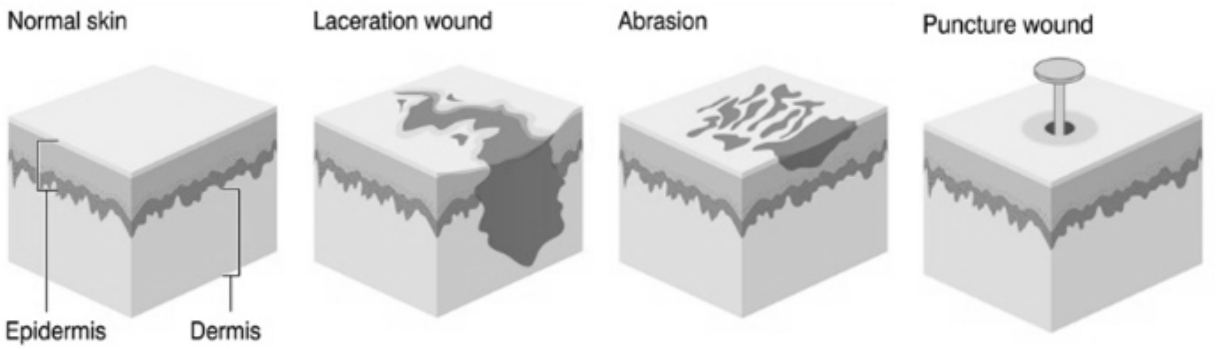
- Much skin is missing
- Wound is deep

Do <u>not</u> bandage if:

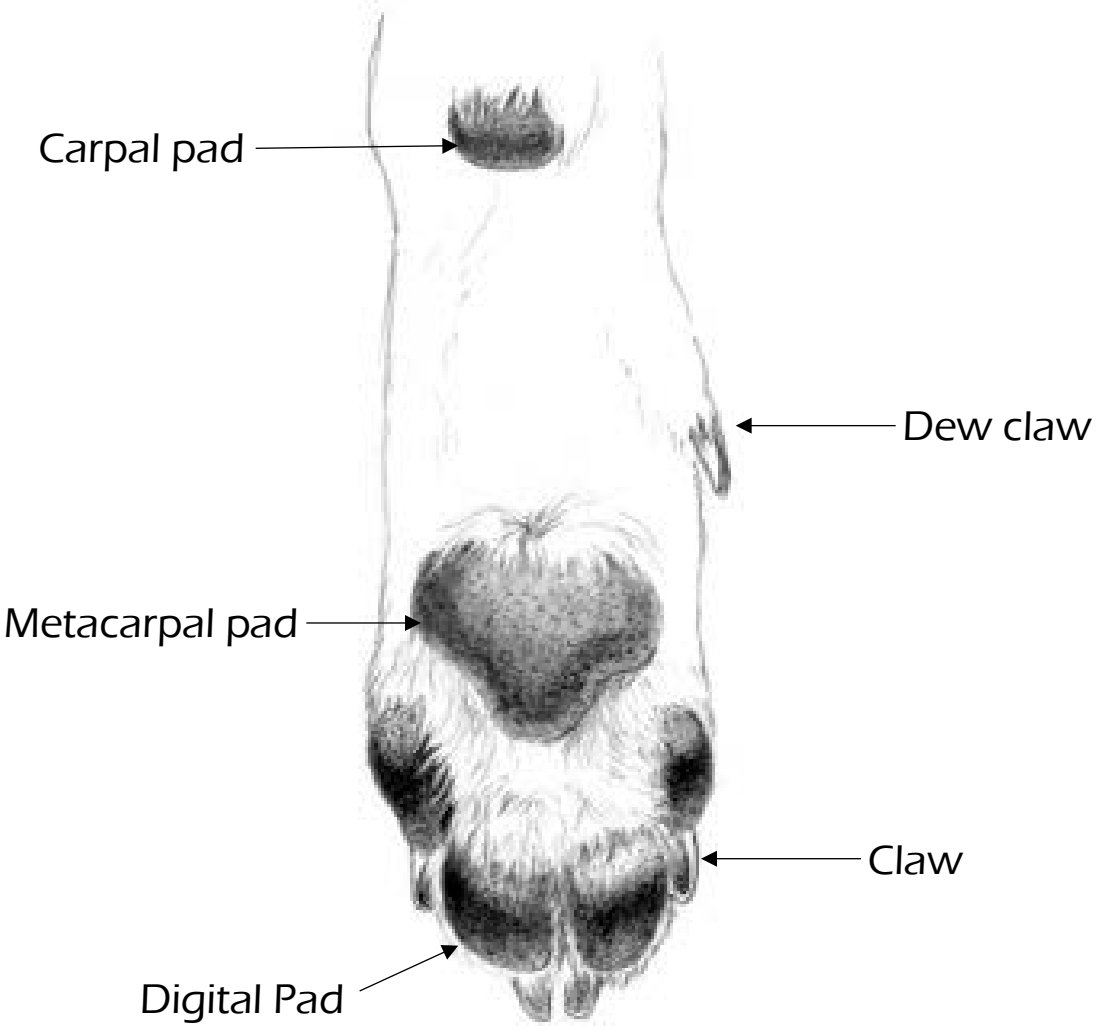
- Abrasion
- Puncture wound

Most common wounds for dogs are:

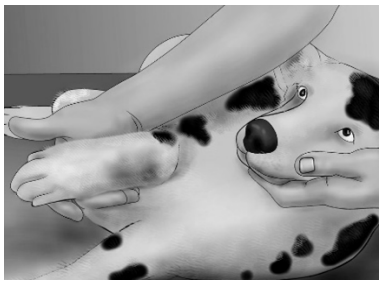
- Broken claws
- Paw pad wounds

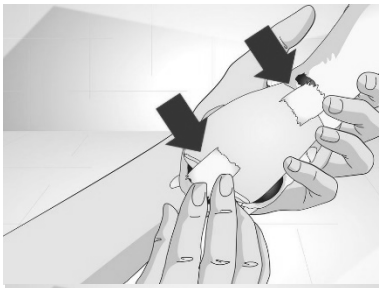


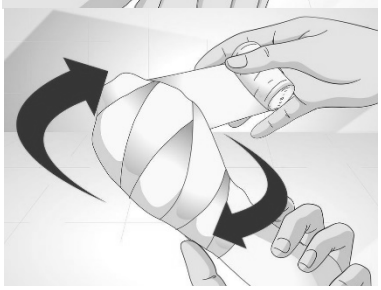
Parts of the Dog Paw



How do we bandage a paw wound?







1. Apply muzzle
2. Lay pet on side
3. Apply sterile jelly to wound
4. Clip fur around wound
5. Clean wound with antiseptic
5. Flush wound with sterile saline
6. Dry wound with sterile gauze
7. Place non-stick pad on wound
8. Wrap cotton around wound
9. Apply gauze over cotton
10. Apply vet wrap over gauze
11. Place tape to secure bandage
12. Place a collar on neck

Notes

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