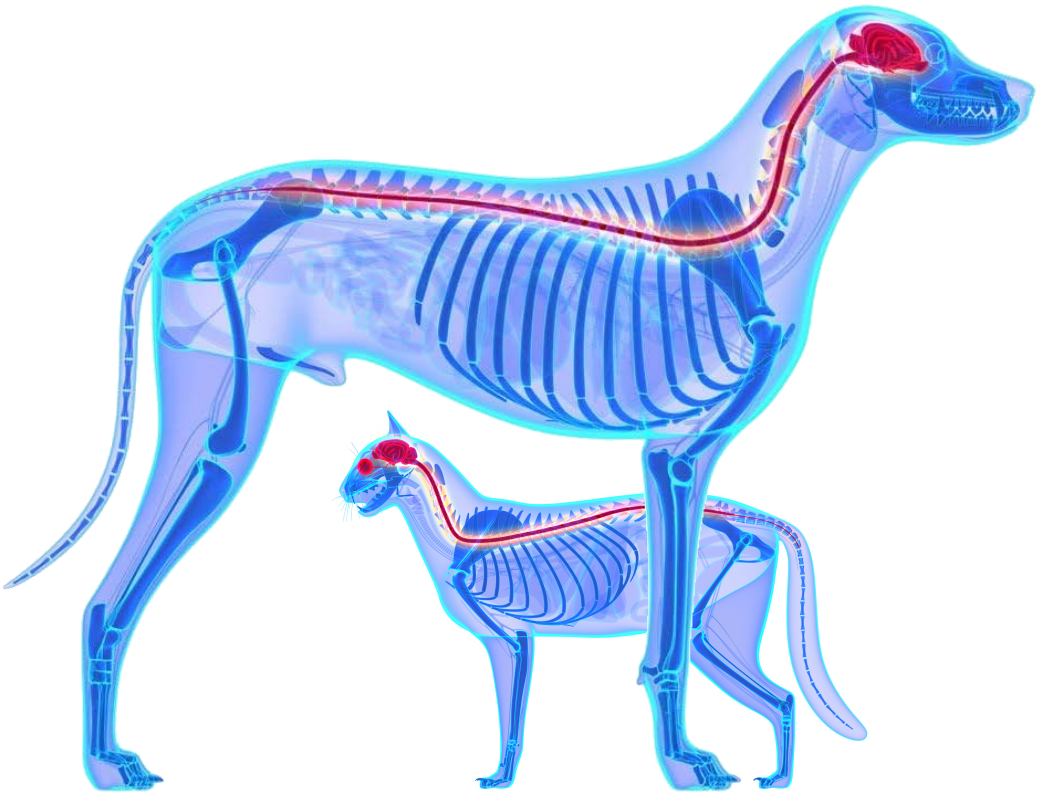
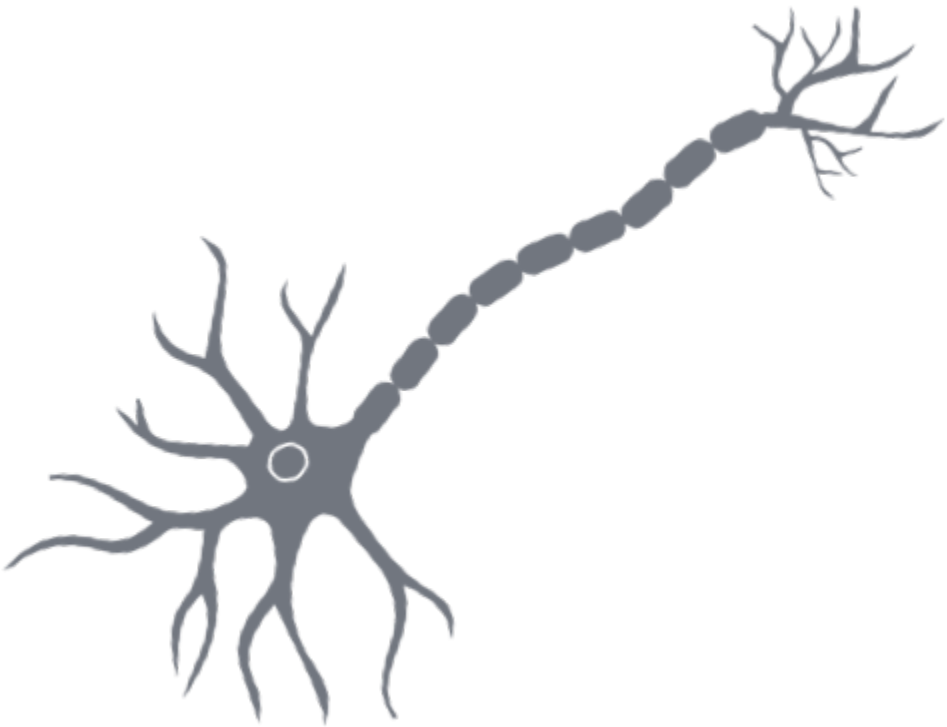
ARKANSAS 4-H VETERINARY SCIENCE



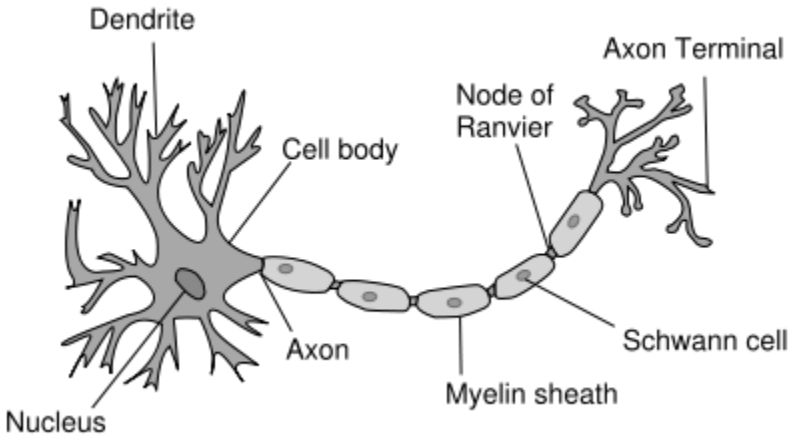
DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Neural Microscopy

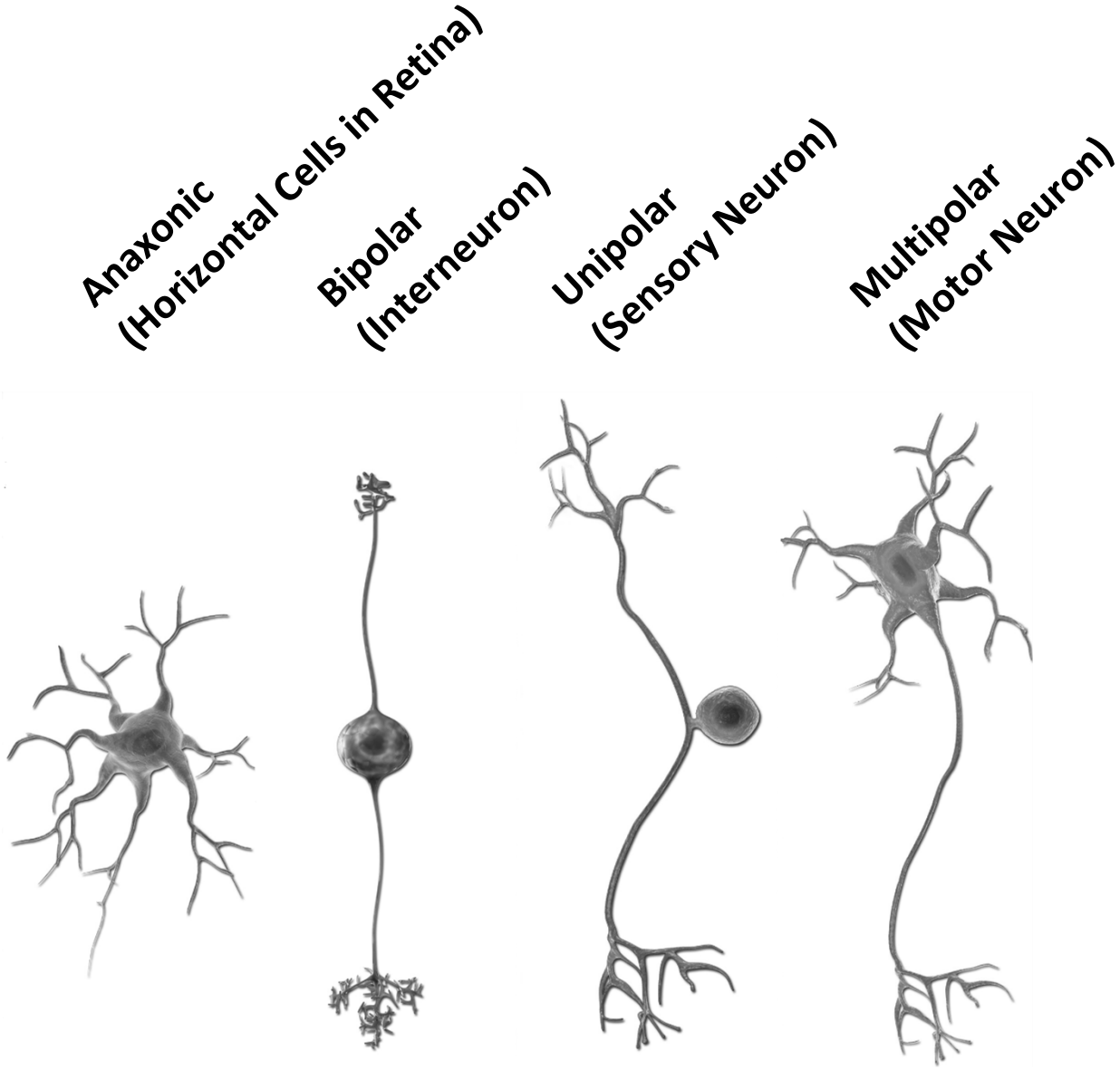


Basic Definitions

- A neuron is a cell that transmits nerve impulses (electrochemical signals)
- The body of the neuron contains the nucleus
- The axon is a long projection of a neuron that conducts electricity
- Dendrites are branched projections of a neuron that receives impulses
- The myelin sheath is an insulator that allows electricity to pass efficiently
- The Nodes of Ranvier are gaps that allow rapid conduction of impulses
- Schwann cells wrap around the axon to form the myelin sheath
- A synapse is the small gap between neurons where signals are exchanged
- Neurotransmitters are chemicals that pass from one neuron to another
- Neurotransmitters are released in response to an electrical pulse
- The major neurotransmitters are:
  - Glutamate and aspartate are excitatory neurotransmitters
  - Gamma-aminobutyric acid (GABA) is the major inhibitory neurotransmitter
  - 5-HT (serotonin) relays messages concerning mood, appetite, sleep and memory
  - Acetylcholine is the major neurotransmitter of the motor neurons
  - Dopamine plays a major role in reward-motivated behavior
  - Norepinephrine (adrenalin) mobilizes the brain and body for action
  - Endorphins activate the body's opiate receptors (relieves pain)

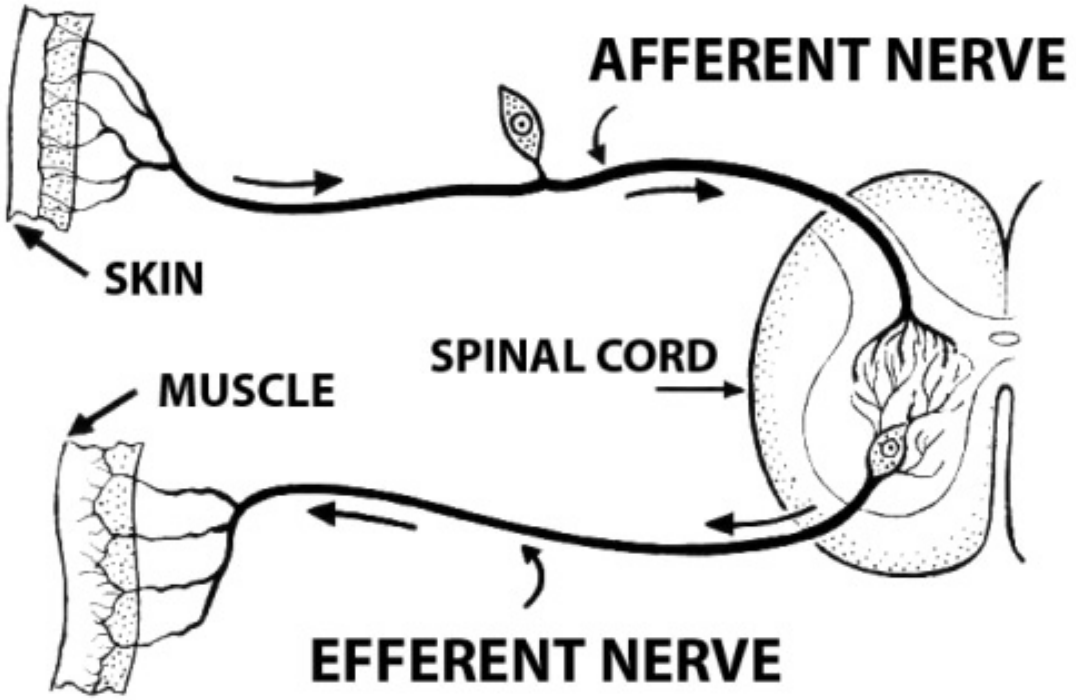


Classes of Neurons



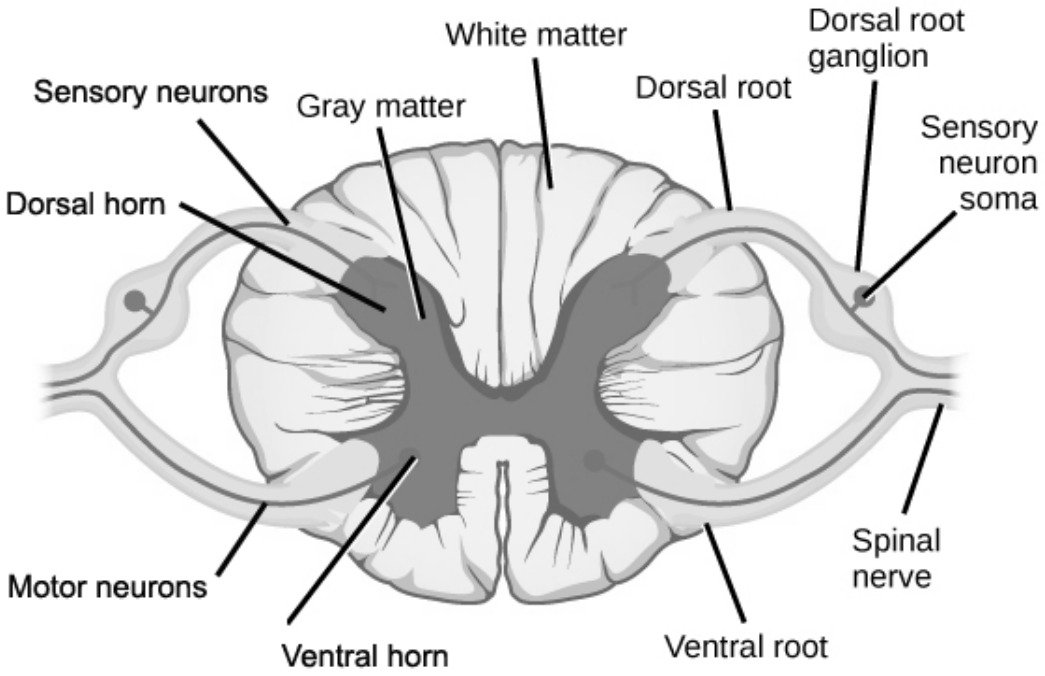
What do neurons do?

- Sensory neurons are activated by sensory input from the environment
- Motor neurons of the spinal cord connect to muscles, glands and organs
- Interneurons connect spinal motor and sensory neurons
- Sensory, motor and interneurons communicate in the spinal cord
- Anaxonic neurons act as interneurons in the brain
- Glial cells provide support to neurons in brain, retina and spinal cord



The Spinal Cord

- White matter contains all of the axons of the neurons (white from myelin)
- Gray matter contains all of the neuron cell bodies
- Gray matter has dorsal horns and ventral horns (horn describes shape)
- Sensory nerves travel through the dorsal root
- Motor nerves travel through the ventral root
- Communications between cells happens in the gray matter



Cross Section of Spinal Cord

Notes

Is it Rabid?

What is rabies?

- Rabies is an infectious viral disease that is almost always fatal
- Rabies is present on all continents, except Antarctica
- Caused by a bullet-shaped rhabdovirus (RNA virus)
- It enters the peripheral nervous system and migrates to the brain
- Transmission is almost always through a bite from an infected animal
- Once in the nervous system, the virus produces inflammation of the brain
- The “furious” type causes hyperactivity and hydrophobia
- The “dumb” type causes paralysis
- Humans get rabies in countries that have lots of stray dogs (Africa or Asia)
- Humans rarely get the disease in the United States
- Reservoirs for the virus in the U.S. are bats, skunks, raccoons and foxes
- In Arkansas, skunks and bats are the main reservoir animals
- The Arkansas Department of Health (ADH) monitors rabies in Arkansas
- Dogs and cats are required by law to be vaccinated (ferrets in some states)
- Humans who work with animals should be vaccinated

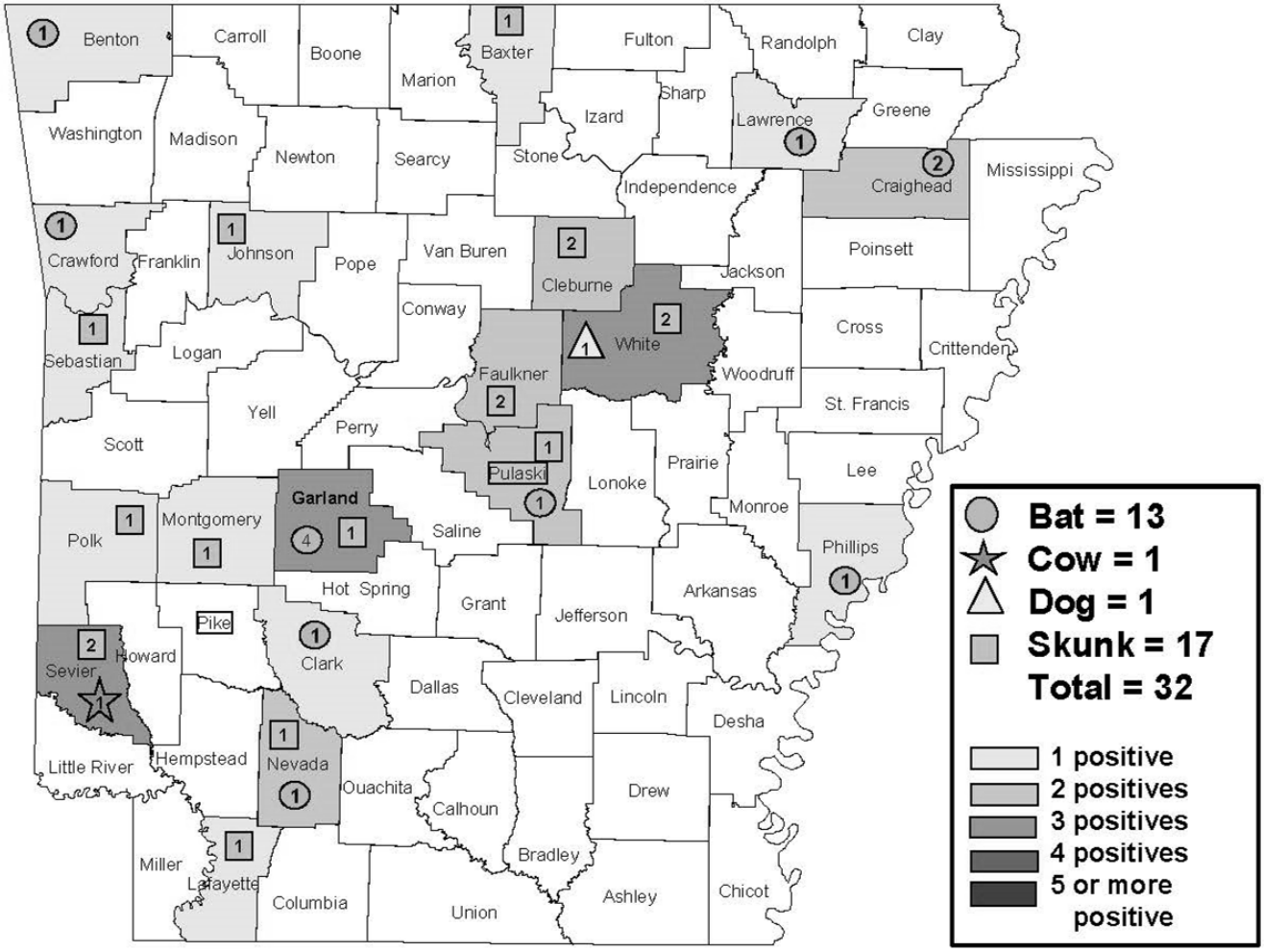
How is rabies spread?

- Dogs are the main source of human rabies deaths (99%)
- Bats are the cause of most of the human rabies deaths in the U.S.
- Infection causes tens of thousands of deaths every year (Asia and Africa)
- 40% of people bitten by suspect rabid animals are children under 15 years
- Virus can also be transmitted through infected saliva on skin wounds
- People who are bitten should receive post-exposure prophylaxis (PEP)
- PEP consists of
  - Extensive wound washing
  - A course of effective rabies vaccine that meets ADH standards
  - Administration of rabies immunoglobulin (RIG), if indicated
- Each state has their own rules regarding rabies vaccinations/procedures
- All suspect rabies cases are sent to the Arkansas Health Department
- Public health officials take over from there

Arkansas Rules for Animal Bites

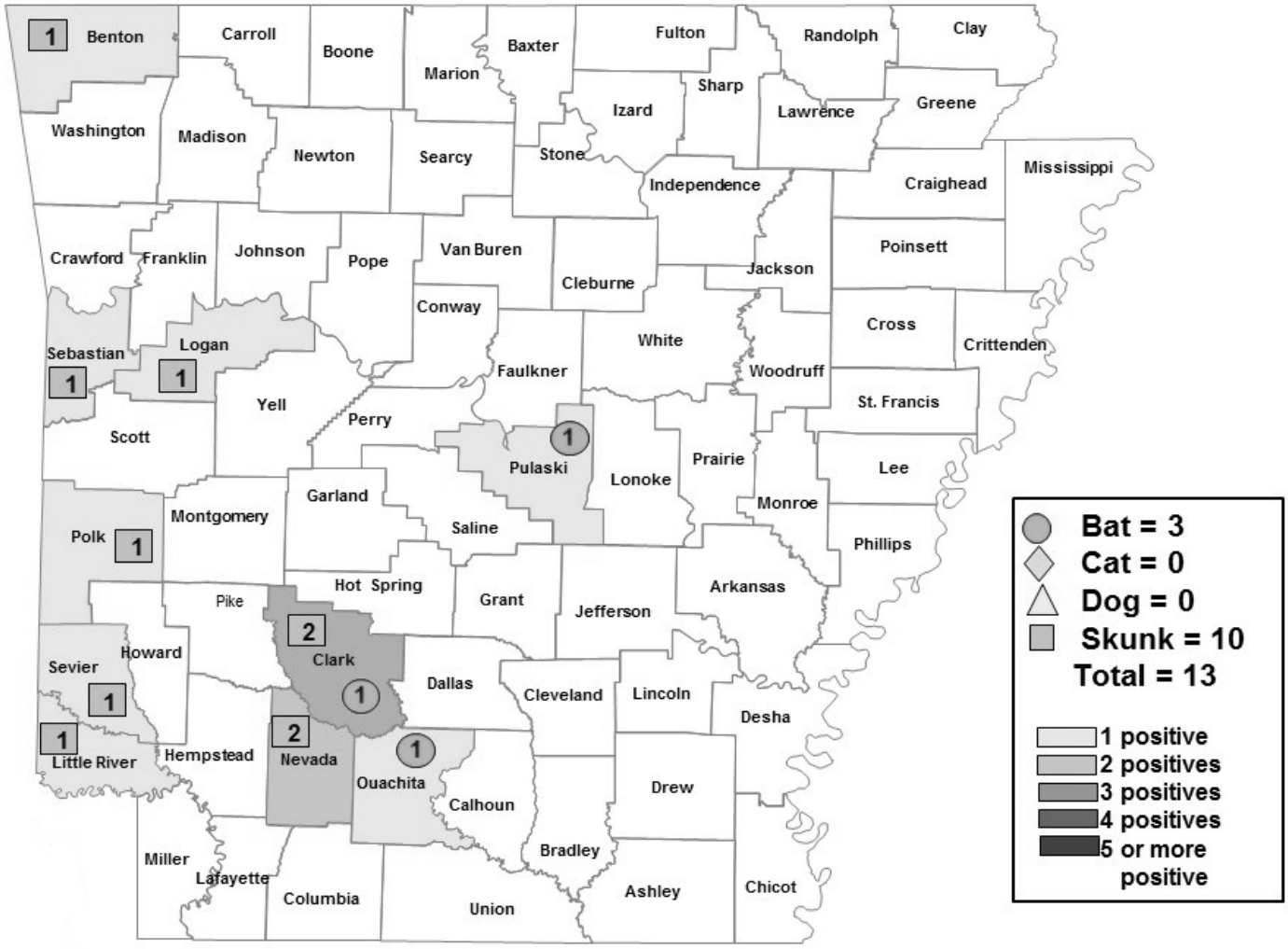
- All dog and cat bites shall be reported to state board of health
- Cats and dogs require rabies vaccination by a veterinarian (OTC not recognized legally)
- Owner of animal responsible for bite must comply with health authorities
- A vaccinated animal that bites a person must be quarantined for 10 days
- An unvaccinated animal that bites a person is euthanized for testing
- Vaccinated pets bitten by a wild/feral animal get a booster shot and are monitored for 45 days
- Unvaccinated pets bitten by a wild/feral animal get a rabies vaccine and are monitored for 4 months
- Vaccinated pets bitten by a known positive animal get a booster shot and are monitored for 45 days
- Unvaccinated pets bitten by a known positive animal should be euthanized*
- *If allowed, pet will get a rabies vaccine followed by a booster shot and then monitored for 4 months

Rabies Cases in 2018



Rabies Cases in 2019

(As of May 19th)

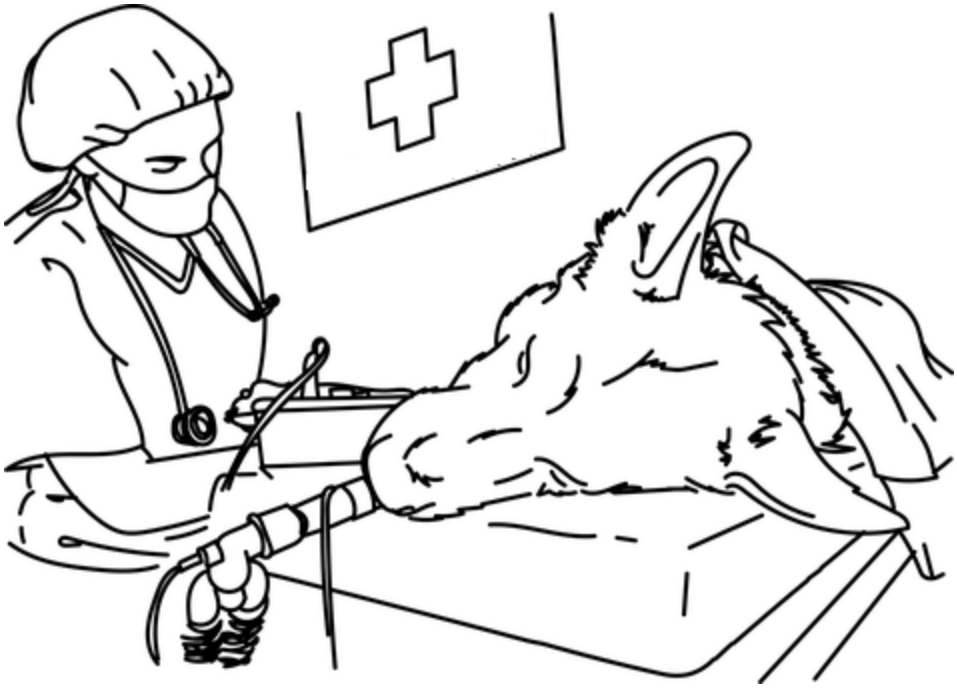


I Wanna Be Sedated

Sedation vs Anesthesia

- Sedation is the reduction of irritability or agitation by sedating drugs
  - Used to facilitate a medical procedure or diagnostic procedure
  - Patient is awake and can feel pain
  - Common sedatives in vet med are acepromazine and midazolam

- Anesthesia is the administration of drug to allow medical procedures to be done without pain while patient is unconscious
  - Can cause side effects like low blood pressure and trouble breathing
  - Patient can die from the side effects of anesthetic drugs
  - Some patients react unpredictably to anesthetic drugs
  - Common anesthetics in vet med are isoflurane and dexmedetomidine



Monitoring the Patient

Due to side effects from anesthesia, the patient should be monitored and records taken every two minutes.

Temperature

Heart rate (stethoscope and pulse)

Respiratory Rate

Palpebral response

Eye Position

Pedal Withdrawal Response

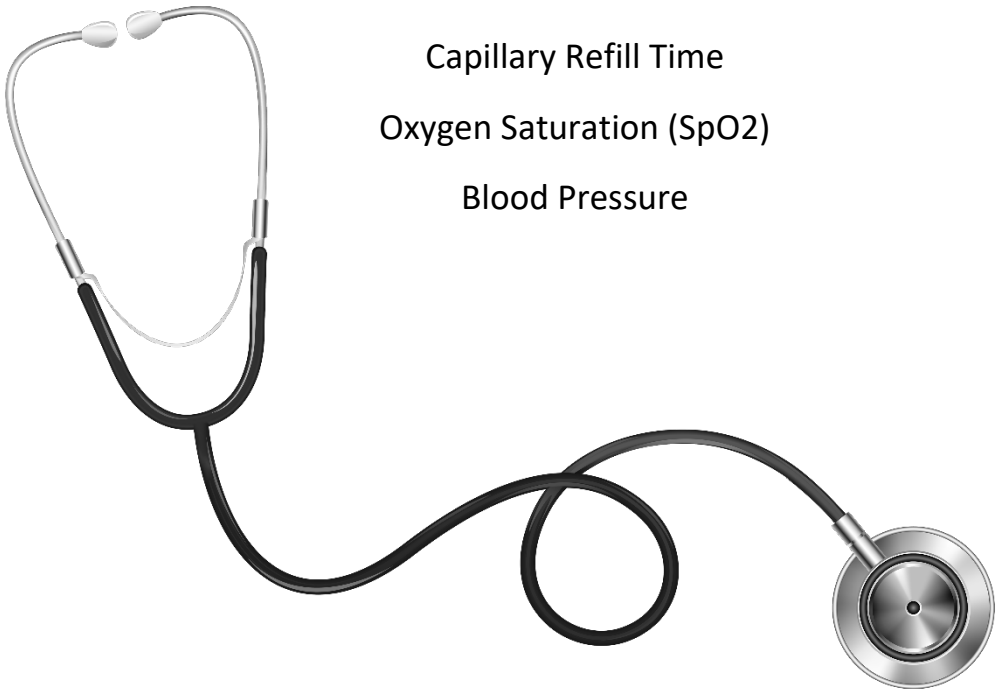
Jaw Tone

Mucous Membrane Color

Capillary Refill Time

Oxygen Saturation (SpO2)

Blood Pressure



ANESTHETIC RECORD

PAGE of

DATE:	SURGEON:	ANESTHETIST:	CLIENT #:
PROCEDURE:	POSITION:	ASA STATUS	PATIENT NAME:

BODY WT:	TEMP:	PULSE:	RESP:	PCV:	TPP:	MM/CRT:	SPECIES:	BREED:

OTHER PE or LAB:

FACILITY:

PRE-ANESTHETIC AGENT(s)				INDUCTION AGENT(s)			
AGENT	DOSE(MG)	ROUTE	TIME	AGENT	DOSE(MG)	ROUTE	TIME

TIME:	:15	:30	:45	:15	:30	:45	:15	:30	:45	:15	:30	:45	TOTALS
IV 1:TYPE: RATE:													
IV 2:TYPE: RATE:													
Bair Hugger ☐ Circ. Water Blanket ☐													TEMP
OXYGEN L/min													

VAPORIZER SETTING

8 7 6 5 4 3 2 1 0.5 0

AGENT:
- ☐ DESFLURANE
- ☐ ISOFLURANE
- ☐ SEVOFLURANE
- ☐ HALOTHANE

SYMBOLS
- PULSE ● RESP O
- ET CO2 ▲ SP O2 ■
- BLOOD PRESSURE
  - SYSTOLIC V
  - MEAN †
  - DIASTOLIC ^
- DIRECT ☐
- INDIRECT ☐
- DOPPLER ☐

180 160 140 120 110 100 90 80 70 60 50 40 30 20 10

TIMES:
- TOTAL ANES:
- PROCEDURE:
- EXTUBATION:
- STERNAL:
- STANDING:

AIRWAY MAINTENANCE
☐ ET TUBE ☐ MASK
SIZE:

SYSTEM:
- ☐ CIRCLE
- ☐ NON-REBREATHING
- ☐ MECH VENT

CATHETER:
- SIZE:
- TYPE:
- LOCATION:
- SIZE:
- TYPE:
- LOCATION:

POST-OP AGENTS:

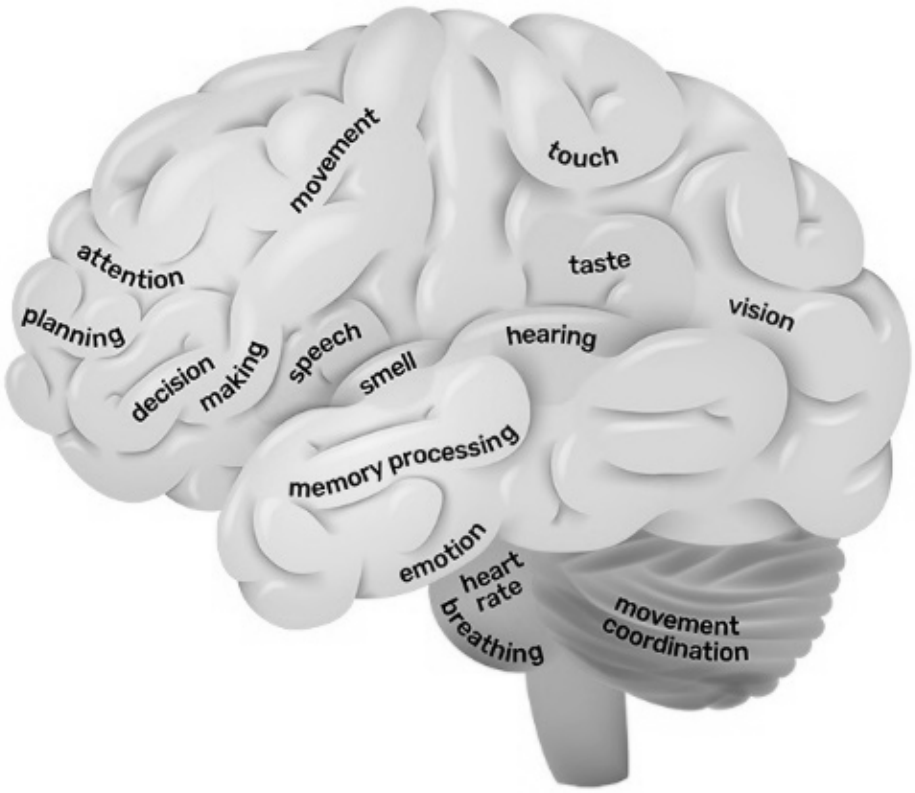
Post-Op
TPR TIME

REMARKS

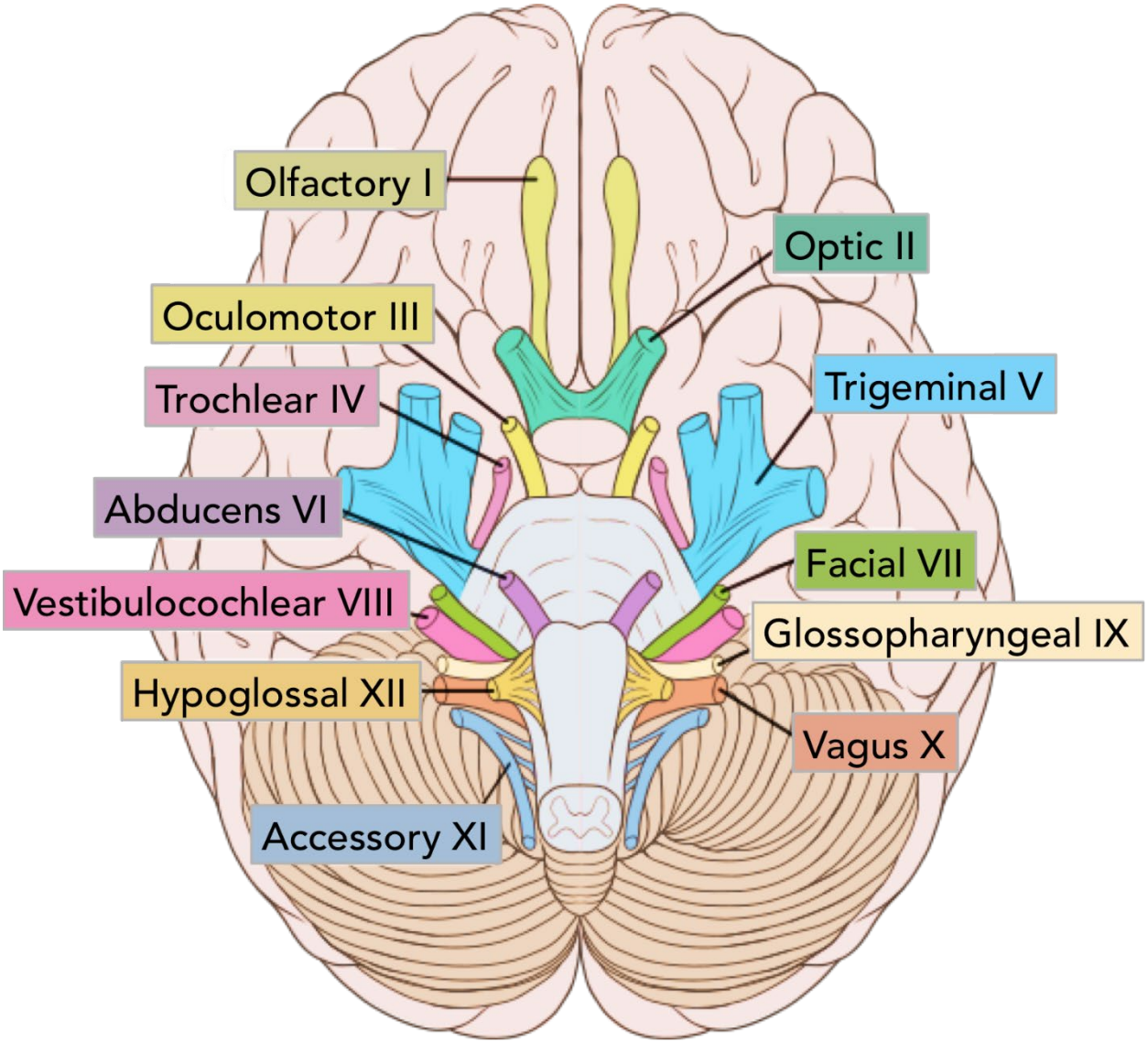
What Am I Seeing?

Sensing the Environment

- Everything we experience is processed by the brain
- Raw information travels to the brain by nerves (input)
- The twelve cranial nerves send info to the brain for the senses
- Different parts of the brain process sensory information
- Senses allow the body to respond to the environment



The Cranial Nerves

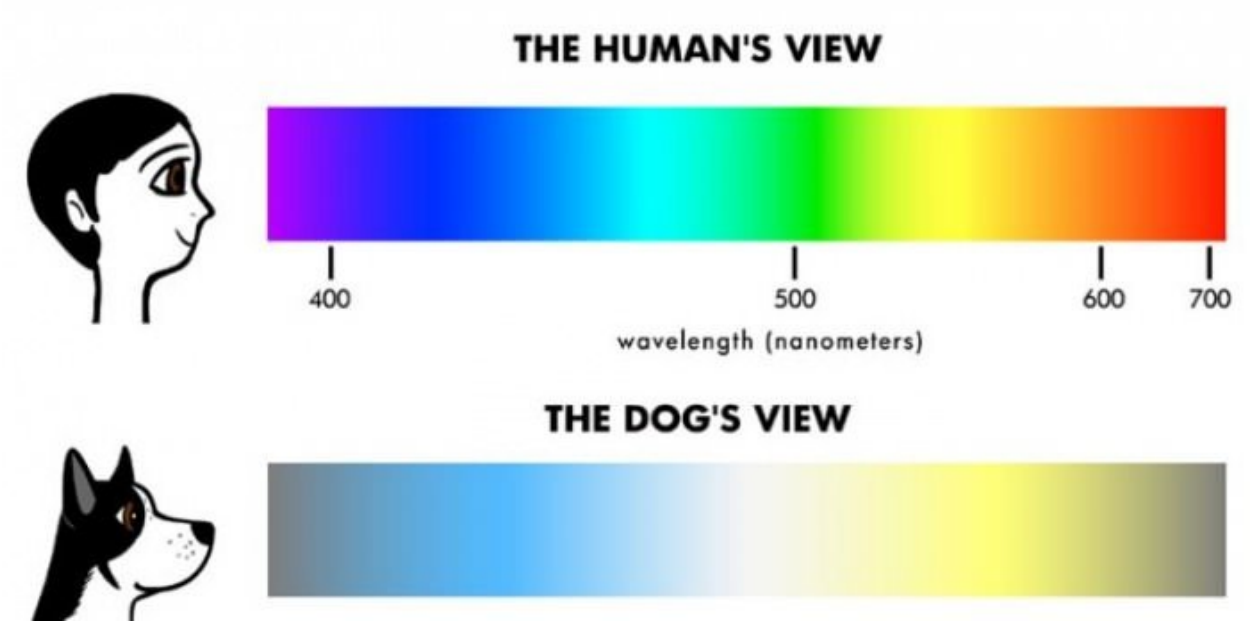


Olfactory Nerve

- Transmits info to the brain from the smell (olfactory) receptors in the nose
- Olfactory receptor cells are bipolar nerve cells
- The cells have cilia at the end that face the naval cavity to process odors
- Chemoreceptors are located on the cilia
- Mammals have a special part of their brain called an olfactory bulb
- The olfactory bulb is the part of the brain that processes odors
- Dogs have over 300 million olfactory receptors in their noses
- Humans only have around 6 million
- Bears have the best sense of smell with a large olfactory bulb in their brain
- The sense of smell of a bear is 2,100 times better than humans

Optic Nerve

- Transmits info from the retina to the brain
- Info includes color and focus
- Damage to the optic nerve causes blindness
- Dogs have poor color vision (only two types of cones)
- Birds have awesome color vision (four types of cones)
- Humans have good color vision (three types of cones)



Oculomotor Nerve

- Transmits info from eyes to brain concerning position and light exposure
- Controls eye movement, pupil dilation/constriction and eyelids
- Damage to nerve causes uneven pupils
- The third eyelid (nictitating membrane) is NOT controlled by this nerve



Ophthalmology	Right	Left
Eye Position		
Lids		
Sclera		
Conjunctiva		
Tears		
Lens		
Iris		
Pupil		
Retina		

Trochlear Nerve

- Transmits impulses to the superior oblique muscle of the eye
- Responsible for rotating eye inward
- You can't cross your eyes without it!
- Damage to the nerve will cause the eye to drift outward (exotropia)
- Some breeds have exotropia due to genetics (King Charles Cavalier)

Trigeminal Nerve

- The largest cranial nerve
- Transmit info about touch from the face to the brain
- Damage to nerve causes loss of feeling in face
- Transmits efferent messages for biting and chewing
- Very important for animals that chew all day
- Trigeminal neuritis occurs in dogs causing paralysis of jaw
- Trigeminal neuritis is thought to be immune-related

Abducens Nerve

- Sends efferent messages to the lateral rectus muscle of the eye
- Responsible for moving the eye outward
- If damaged, the eye will move inward by default
- Also controls muscle that pulls eyeball back
- Muscle is the musculus retractor bulbi
- Controls third eyelid movement
- Damage to nerve will cause the 3rd eyelid to move involuntarily

Facial Nerve

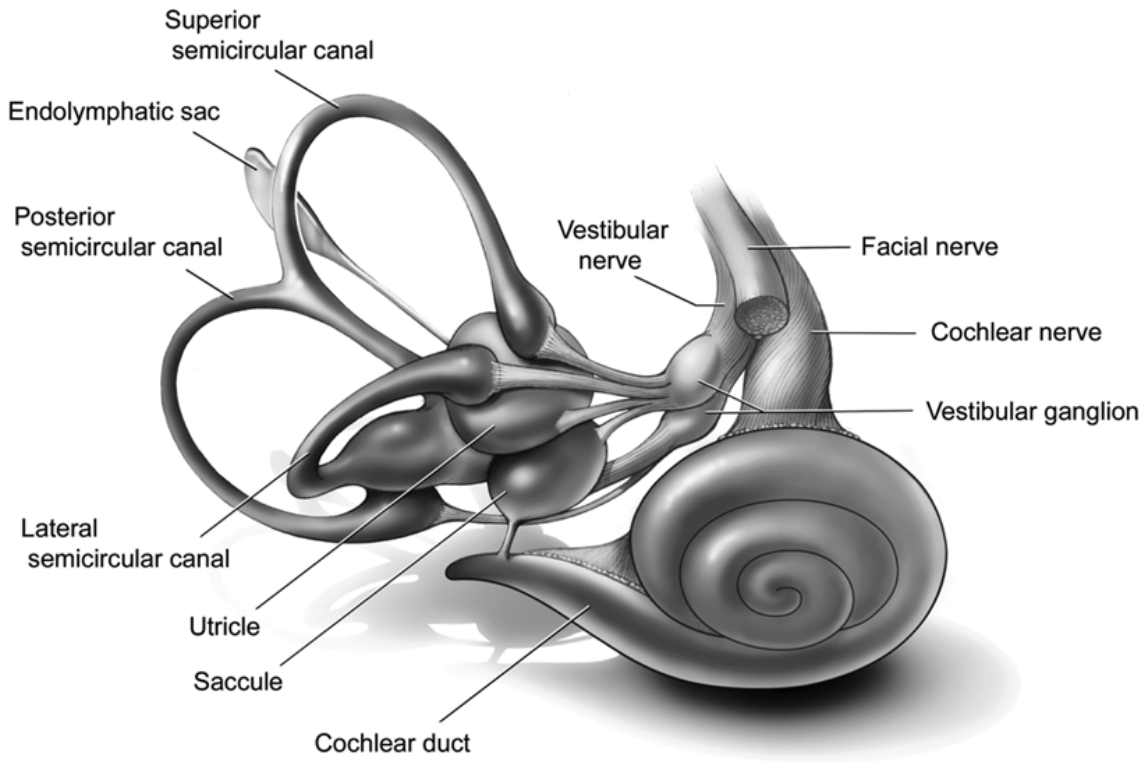
- Sends efferent messages to muscle controlling facial expression
- Sends afferent messages to the brain from front 1/3 of tongue (taste)
- Ear infections in dogs can damage the nerve
- Most common clinical sign is paralysis of one side of the face
- Humans can get a disease that temporarily affects the nerve (Bell's Palsy)

Vestibulocochlear Nerve

- Transmits sound and balance from the inner ear to the brain
- Can be divided into the cochlear nerve and vestibular nerve
- Cochlear nerve transmits info from sound waves to the brain
- Vestibular nerve transmits info from the vestibular apparatus in inner ear
- A tilted head is a clinical sign of damage to this nerve
- Old dog have a higher incidence of developing vestibular disease

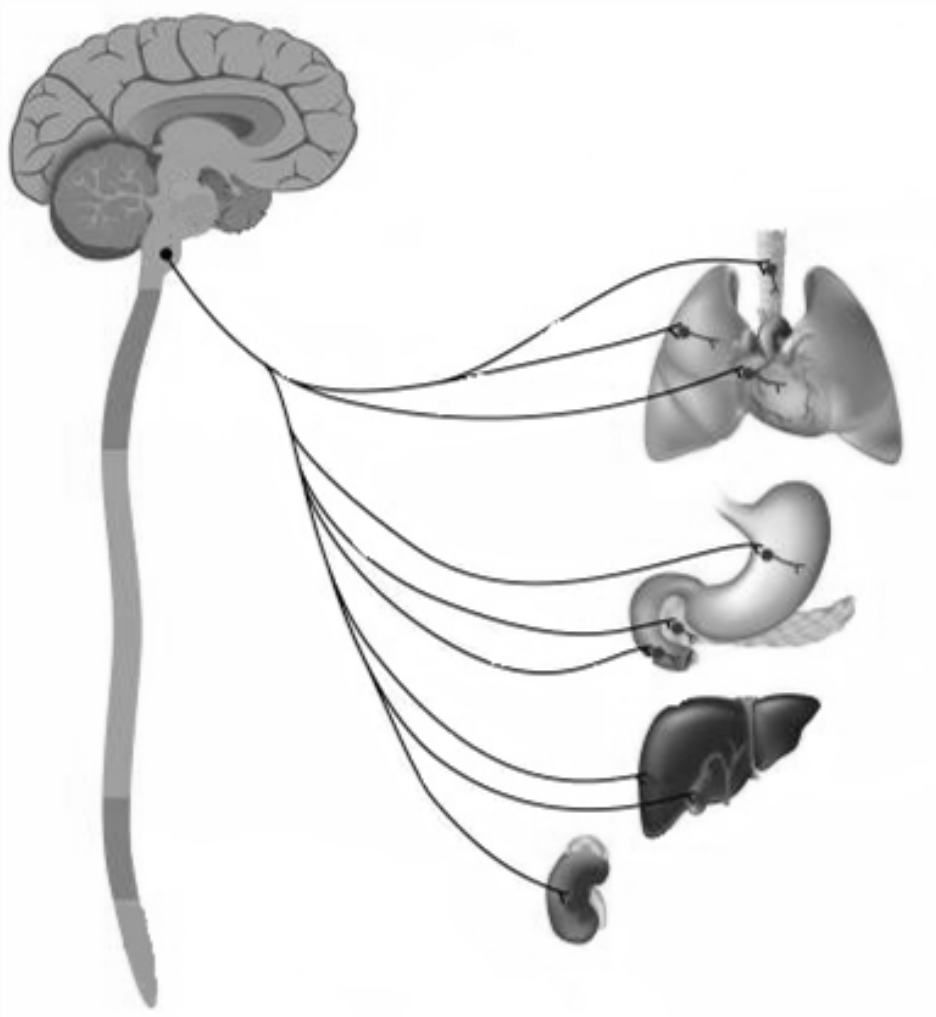
Vestibular Apparatus

- Three semicircular canals are positioned in different directions
- Canals are filled with fluid (endolymph)
- In response to movement the fluid moves
- Hair cells in the canals send info to the vestibular nerve
- The utricle and saccule are otolith organs
- The utricle is specialized to detect movement in the horizontal plane
- The saccule detects movement in the vertical plane



Vagus Nerve

- Also called the master nerve and is the longest cranial nerve
- Controls the heart, lungs and digestive tract
- Sends sensory info (afferent) from the organs to the brain
- Sends motor info (efferent) to muscles and organs
- Stimulation of the nerve slows down the heart rate
- Some drugs act to inhibit the nerve to increase heart rate
- Atropine is use in vet med to counteract vagal activity



Constricts Bronchi

Slows Heartbeat

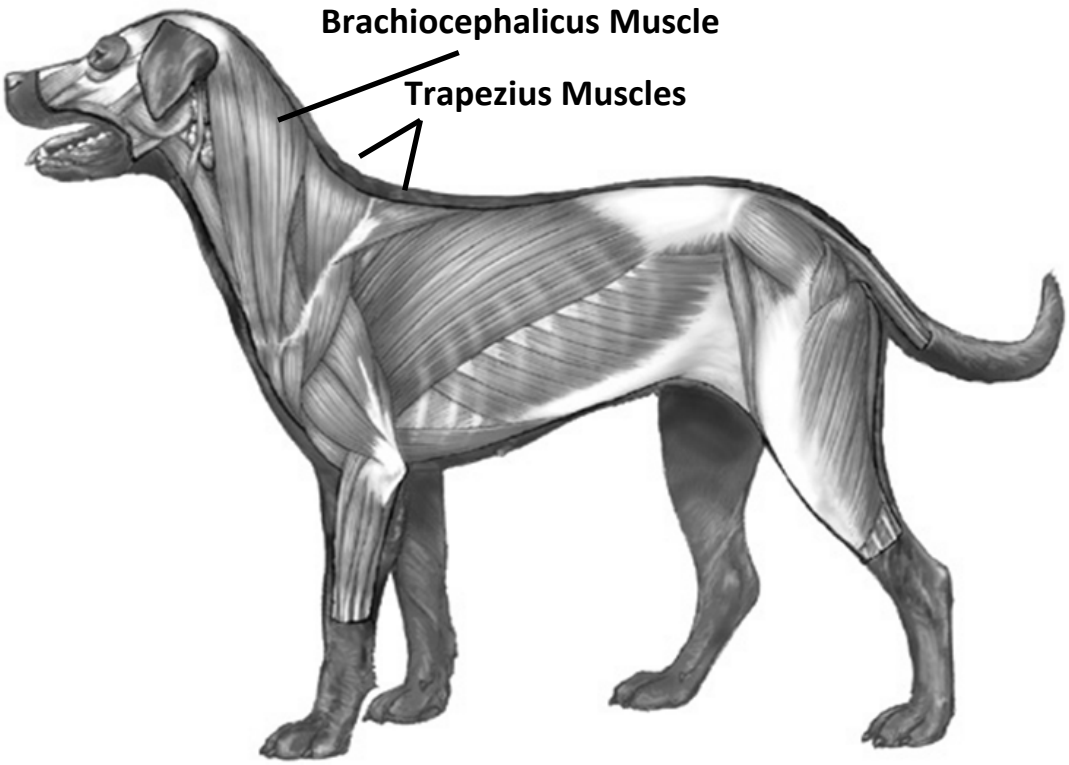
Stimulates Peristalsis and Secretion in Gut

Stimulates Bile Release

Stimulates kidney function

Accessory Nerve

- Considered a cranial nerve, but is actually a spinal nerve
- Originates in the area where the spinal cord meets the brainstem
- Sends efferent info to brachiocephalicus and trapezius muscles
- Isolated damage to this nerve is rare
- Damage would likely occur during surgery



Hypoglossal Nerve

- Provides motor stimulation to the tongue
- Damage to nerve will cause tongue paralysis
- Common clinical sign is a protruding tongue
- Test by pulling on tongue to see if animal can resist

Notes

Laser Therapy

What is Laser Therapy?

- Lasers therapy is in veterinary medicine is where we apply light to animals to deliver increased circulation, reduced inflammation, pain reduction and enhanced tissue healing.

- This process is called photobiomodulation. In other words, the body is modified by light.

- In veterinary medicine, we use laser therapy for several reasons
  - After surgery to reduce incision pain
  - Treatment of chronic wounds
  - Treatment of arthritis
  - Treatment of IVDD
  - Treatment of fractures to speed up the healing process
  - Treatment of bladder infection/inflammation in cats
  - Treatment of ear infection/inflammation in dogs

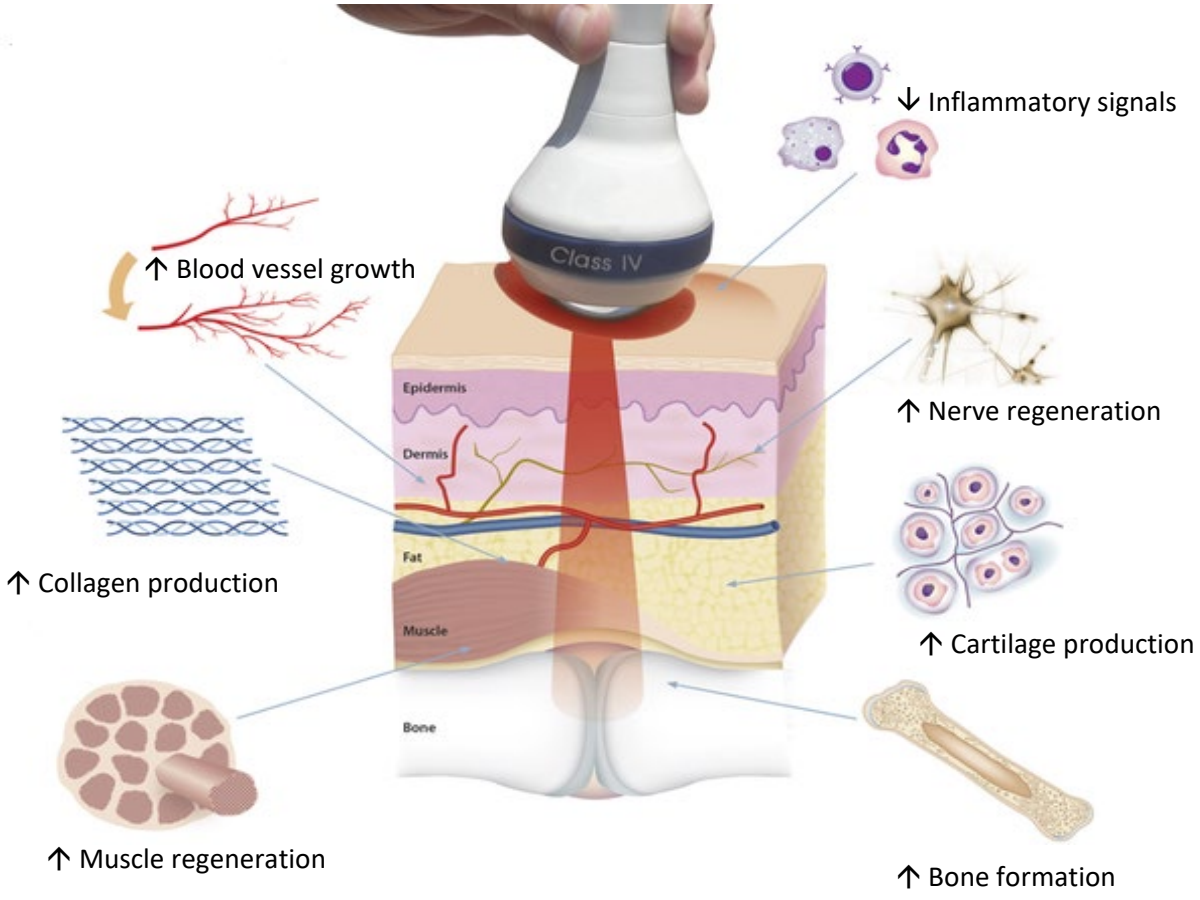
- We cannot use laser therapy on any condition that is a suspected neoplasia (cancer) because the increase circulation may stimulate growth.

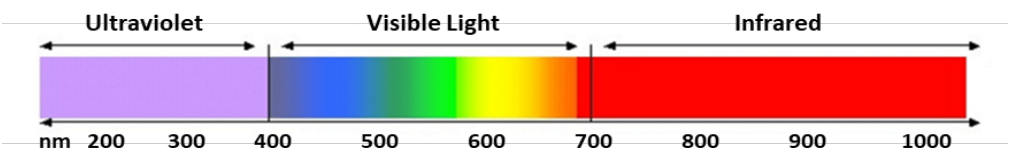
Class IV Lasers

- Class IV lasers are most commonly used in vet med
- Class IV lasers are very powerful
- Laser can cause permanent eye damage (direct, diffuse or indirect beam)
- Special goggles are required to protect eyes from the laser
- Laser wand must be moved constantly to prevent burning skin
- The darker the skin or fur, the warmer the light
- Fur does not have to be shaved for laser to be affective

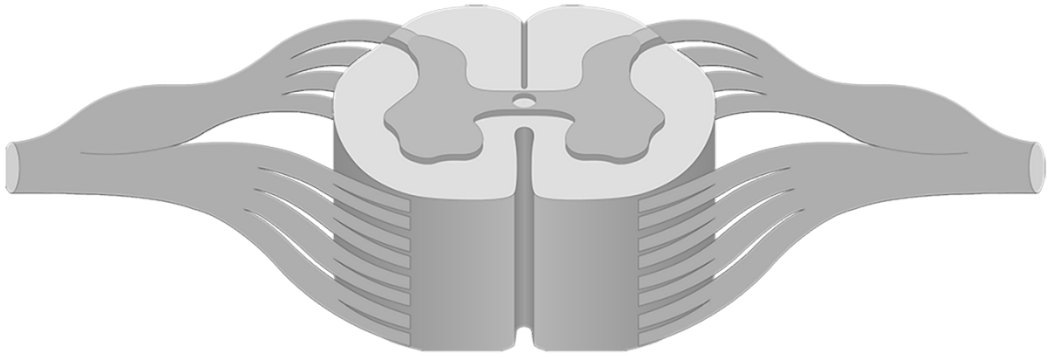
How does photobiomodulation work?

- Specific wavelengths of light stimulate the body's natural ability to heal
- Light interacts with tissues at the cellular level increasing metabolic activity
- Light stimulation increases production of cellular energy (ATP)
- ATP is the energy source cells use to heal body damage
- 650nm - Targets skin cells to create healthy tissue that resists pathogens
- 810nm - Targets the enzymes capable of accelerating the healing process
- 915nm - Targets the hemoglobin to release more oxygen to the tissue
- 980nm - Increases blood flow, delivering nutrients and eliminating waste





Spinal Cord Dissection



Dissection Guide

The spinal cord is a long cylinder of nervous tissue. The spinal cord and spinal roots are enveloped by dura mater. Within dura mater, the spinal cord is suspended by bilateral denticulate ligaments and surrounded by subarachnoid space filled with cerebrospinal fluid. Dorsal and ventral spinal roots unite to form spinal nerves which exit the vertebral canal at intervertebral foramina.

- **Locate the dura mater and carefully peel it away from the spinal cord using your thumb forceps and tissue scissors**

The spinal cord is divided into spinal cord segments. Each segment gives rise to paired spinal nerves. Dorsal and ventral spinal roots arise as a series of rootlets.

- **Locate the paired spinal root nerves and show to instructor**

A spinal ganglion is present distally on each dorsal root. The bovine spinal cord has 8 cervical, 13 thoracic, 6 lumbar, 5 sacral and 5 caudal segments. The following table compares species.

Spinal cord segments in different species (for reference purposes):

Dog: 8 cervical; 13 thoracic; 7 lumbar; 3 sacral; & 5 caudal = 36 total

Cat: 8 cervical; 13 thoracic; 7 lumbar; 3 sacral; & 5 caudal = 36 total

Bovine: 8 cervical; 13 thoracic; 6 lumbar; 5 sacral; & 5 caudal = 37 total

Horse: 8 cervical; 18 thoracic; 6 lumbar; 5 sacral; & 5 caudal = 42 total

Swine: 8 cervical; 15/14 thoracic; 6/7 lumbar; 4 sacral; & 5 caudal = 38 total

Human: 8 cervical; 12 thoracic; 5 lumbar; 5 sacral; & 1 coccygeal = 31 total

Note that the horse has the most spinal segments from the common species. Humans have the least. Can you guess why?

- **Pick an area of the spinal cord and cut through it with your scalpel using your thumb forceps to stabilize as you cut. Cut through the spinal cord again so that you have a cross-section piece to observe.**

Spinal gray matter is butterfly-shaped. Spinal gray matter is divided bilaterally into dorsal horn, intermediate substance, and ventral horn. Intermediate substance lacks precise boundaries; in general, it is around the central canal and between dorsal and ventral horns. The central canal is the cerebrospinal fluid-filled space that runs longitudinally through the length of the entire spinal cord.

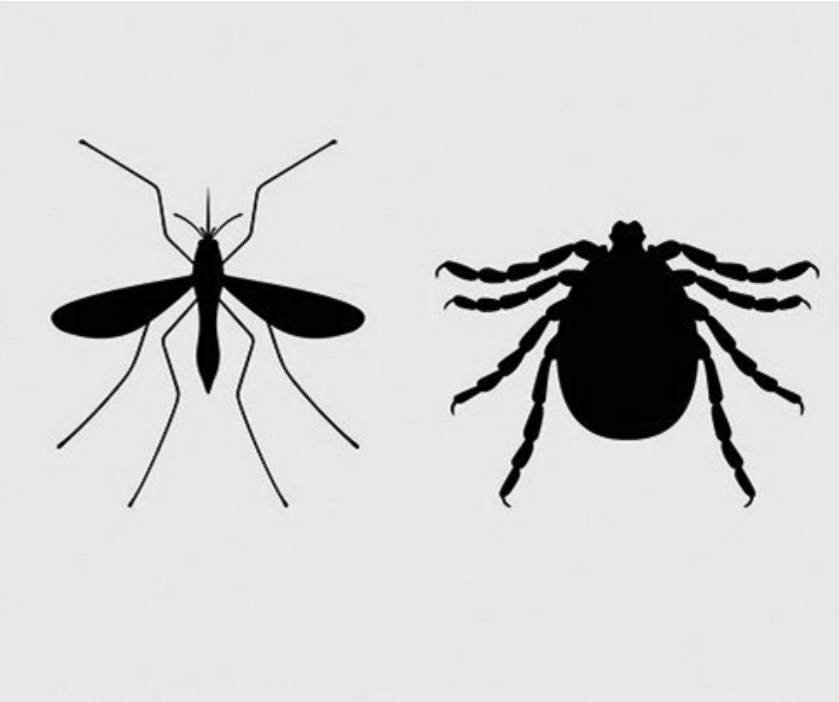
- **Locate the dorsal horns, ventral horns, intermediate area, central canal and neural groove remnant.**

In each half of the spinal cord, white matter is divided into three major bundles, called funiculi. They are the dorsal funiculus, lateral funiculus and ventral funiculus. Spinal white matter consists of nerve fibers entering from dorsal roots; nerve fibers exiting to ventral roots; and millions of longitudinally oriented fibers organized into spinal tracts.

- **Locate the dorsal, lateral and ventral funiculi**
- **When finished:**
  - Place all spinal cord matter in red trashcan
  - Rinse dissection pad in washing tray
  - Dry pad with paper towel and place back in its holder
  - Give scalpel to instructor's assistant for blade removal
  - Place all instruments in the instrument washing tray

Notes

Blood Critters



Vector-Borne Neurological Disease

- Parasites that gain access to blood can transmit diseases
- Vector-borne infections of the nervous system are devastating
- Tick and mosquitos are the main vectors for infectious disease in vet med
- **Ticks can transmit**
  - Lyme Disease
  - Hepatozoonosis
  - Tick Paralysis
  - Rocky Mountain Spotted Fever
- **Mosquitos can transmit**
  - West Nile Virus
  - Eastern Equine Encephalitis Virus (EEE)
  - Western Equine Encephalitis Virus (WEE)
  - Venezuelan Equine Encephalitis Virus (VEE)
  - Malaria
  - Zika Virus

Lyme Disease

- Transmitted by deer ticks *(Ixodes scapularis)*
- Lyme Disease is caused by the rickettsial organism *Borrelia burgdorferi*
- Majority of cases are reported in the Northeast and Great Lakes area
- Tick must be attached to animal for about 48 hours in order to transmit the bacteria to the animal's bloodstream
- Symptoms in dogs and humans range from lameness, fever, swollen lymph nodes and joints, reduced appetite and seizures to severe CNS impairment
- Can be treated with antibiotics and steroids
- Can be prevented by controlling ticks and tick bites
- Lyme Disease vaccine available for dogs and humans (not cats)

Canine Hepatozoonosis

- Transmitted by gulf coast ticks *(Amblyomma maculatum)*
- Disease is caused by the protozoal organism *Hepatozoon americanum*
- The disease is more common in the southern and southeastern U.S.
- Hepatozoonosis may affect the bones, liver, spleen, muscles, small blood vessels in the heart muscle and the intestinal tract
- Usually treated with antibiotics and steroids
- Can be prevented by controlling ticks and tick bites

Tick Paralysis

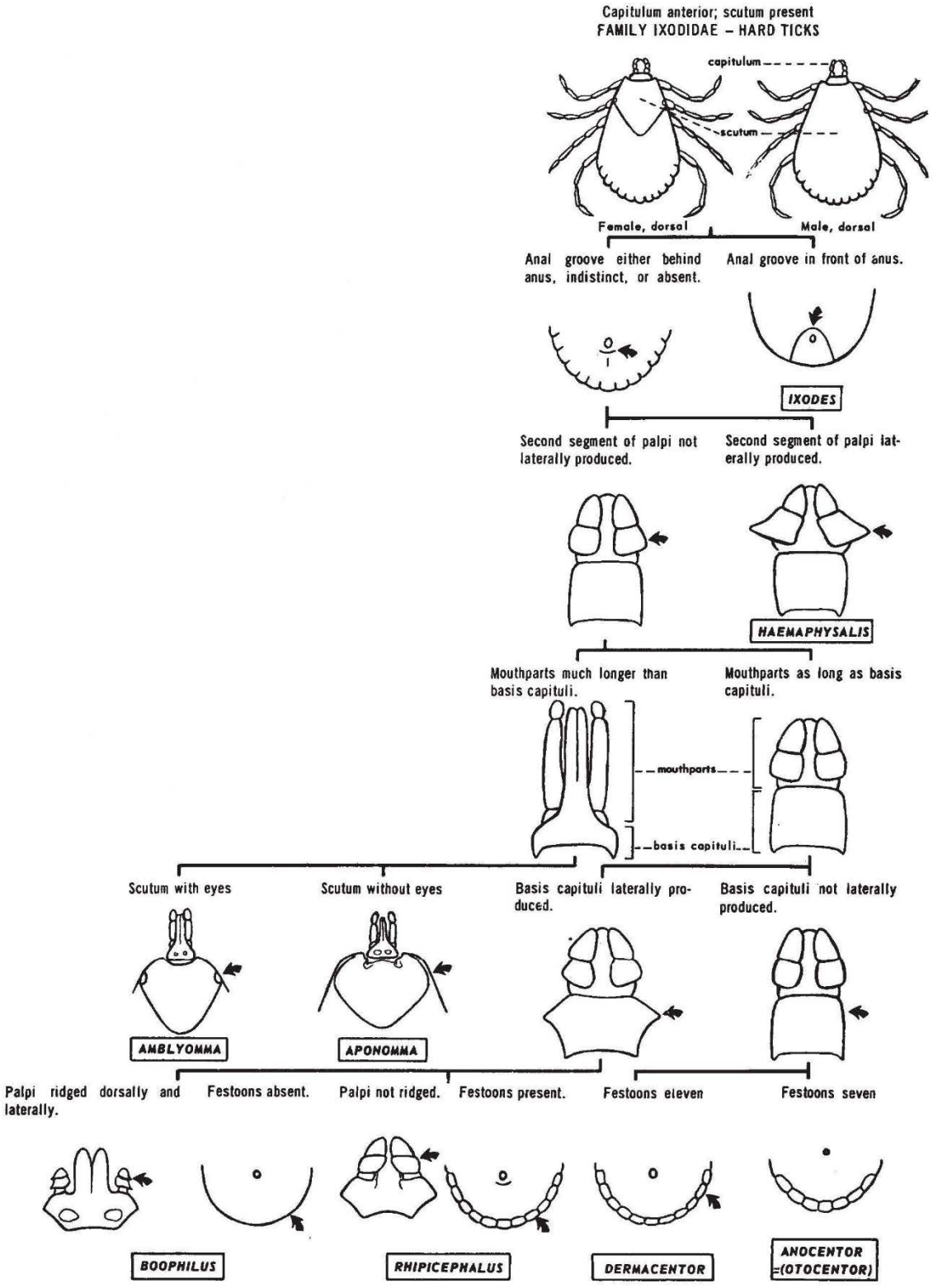
- Transmitted by at least 5 different species of ticks in the U.S.
- Disease is caused by the secretion of a neurotoxin
- Signs begin about a week after an animal is first bitten by ticks
- In dogs, disease begins with weakness in the rear legs, eventually involving all four limbs, followed by difficulty breathing and swallowing
- Death may result if the condition progresses further
- Cats appear to have immunity to the neurotoxin
- Symptoms go away once ticks are removed
- An antitoxin is available, but is very expensive

Rocky Mountain Spotted Fever

- Transmitted by the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and, in parts of the southwestern United States and Mexico, the brown dog tick (*Rhipicephalus sanguineus*)
- Disease caused by the rickettsial organism *Rickettsia rickettsia*
- Commonly seen in dogs in the east, Midwest, and plains region of the U.S.
- Low incidence of infection in cats
- Tick must be attached to the dog or cat for at least 5 hours in order for transmission of the organism to occur
- Symptoms may include fever, reduced appetite, depression, pain in the joints, lameness, vomiting, and diarrhea
- Some animals may develop heart abnormalities, pneumonia, kidney failure, liver damage, or even neurological signs like seizures or stumbling
- Usually treated with antibiotics
- No vaccine available

Species	Larva	Nymph	Male	Female	Partially Fed Female	Fully Fed Female
Deer Tick *ixodes scapularis*						
Dog Tick *Dermacentor variabilis*						
Lone Star Tick *Amblyomma americanum*						
Brown Dog Tick *Rhipicephalus sanguineus*						

Tick Identification Key



West Nile Virus

- Transmitted by the *Culex* species of mosquito
- The leading cause of mosquito-borne disease in the continental U.S.
- West Nile Virus (WNL) is a flavivirus (RNA virus)
- Primarily affects birds causing them to be off balance and unable to stand
- Birds usually die within a few days of showing symptoms
- WNL can also infect horses, cats, dogs, rabbits, alligators and humans
- Most animals have no clinical signs
- Humans may have flu-like symptoms that are usually mild
- Horses symptoms can include lethargy, weakness, ataxia, paralysis or death
- A WNL vaccine is available

EEE, WEE and VEE

- Transmitted by *Culiseta* mosquitos
- EEE occurs in the Eastern U.S. (east of Mississippi River) and Canada
- WEE occurs in Argentina to Western Canada and in U.S. states west of the Mississippi River
- VEE occurs in Central and South America, although it has been reported in Mexico and the U.S.
- VEE is reportable to the health department as a foreign animal disease (FAD)
- Disease is caused by an alphavirus (RNA virus)
- Mainly infects birds, but can infect humans and animals (horse in particular)
- Birds usually have no symptoms making them reservoirs for the virus
- Symptoms in horses include fever, weakness, ataxia and even death
- Humans symptoms can be like the flu or like the severe horse symptoms
- Permanent brain damage, coma and death may also occur in human cases
- There is no treatment and horses usually die within 3 days
- AN EEE/WEE/VEE combination vaccine is available

Malaria

- Transmitted by *Anopheles* mosquitos
- Malaria is caused by the *Plasmodium* protozoan parasite
- Mostly infects humans and primates
- Birds, bats, lizards and antelopes are also hosts for malaria parasites
- Several species of Hawaiian birds have become extinct due to malaria
- No reports of illness in domestic animal species
- More than 215 million cases are reported in humans each year
- More than 400,000 of those infected die
- People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness
- There is no vaccine, but antimalarial medication is available

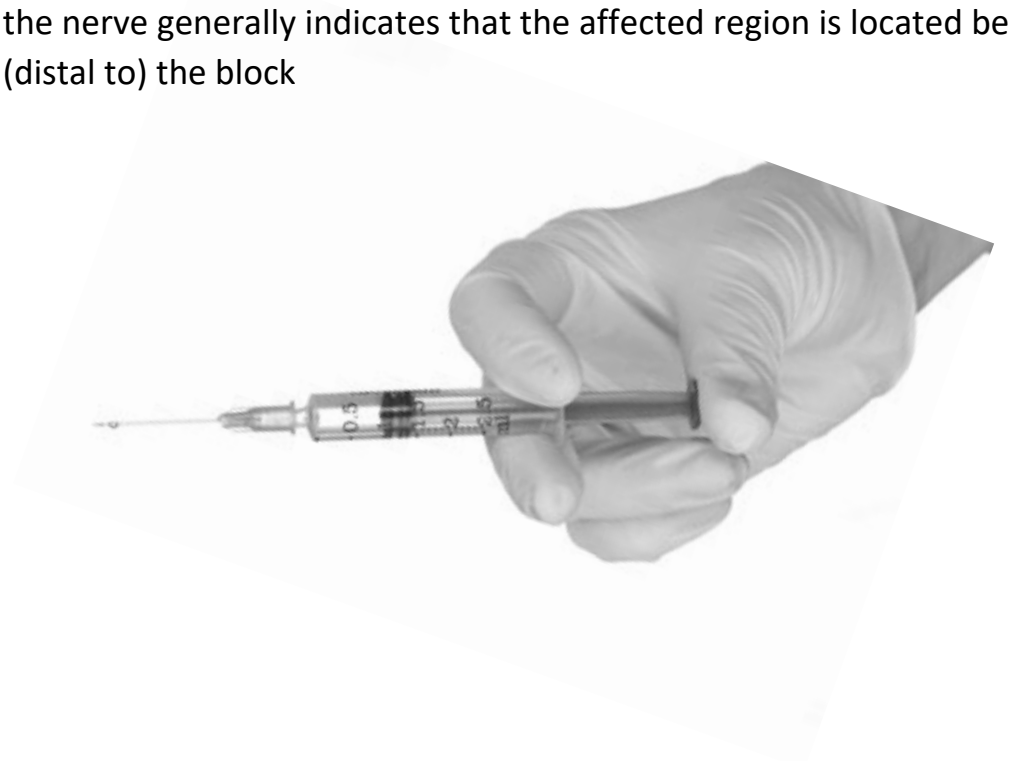
Zika Virus

- Transmitted by *Aedes* mosquitos, but can also be sexually transmitted
- Zika Virus is a flavivirus (RNA virus)
- Known to cause disease in humans and primates
- Too early to know if other animals can become infected
- In humans, the virus causes a rash, fever, red eyes and joint pain
- Virus can cross the trans placental barrier to infect the human fetus
- Virus disrupts development of the fetal brain causing microcephaly

Horse Nerve Blocks

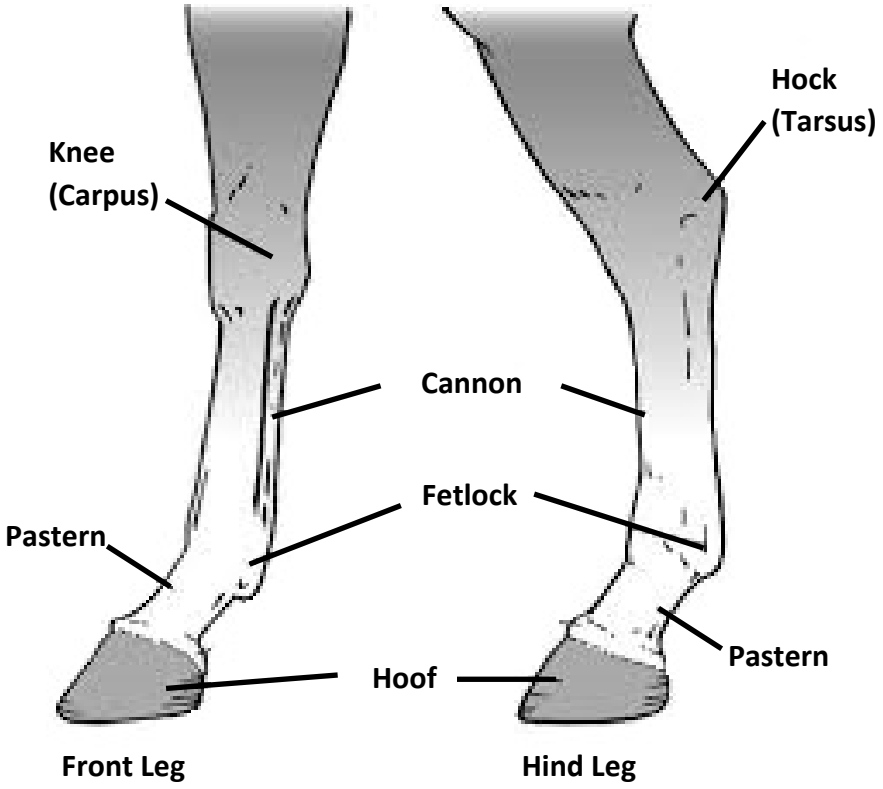
Why do we use nerve blocks?

- The equine limb is a complex system relying on multiple interactions for movement and to counteract gravity
- Pain sensation is conveyed from the affected area to the brain by efferent nerves
- The main nerve branches in the lower limbs (front and hind) travel down the back (palmar or plantar) aspect of the leg on either side of the leg (medial and lateral)
- Nerve blocks are used at specific points along these nerves in order to localize pain to a region
- Nerve blocks give the veterinarian clues as to where to focus diagnostics, such as X-rays and/or ultrasound
- Common anesthetic drugs used for the blocks are lidocaine (1 hour) and mepivacaine (2 hours)
- Because interpretation of nerve blocks is so delicate, it is critical to apply the blocks in a systematic fashion and only after a thorough lameness evaluation is performed
- Improvement in the horse's gait following injection at specific sites along the nerve generally indicates that the affected region is located below (distal to) the block

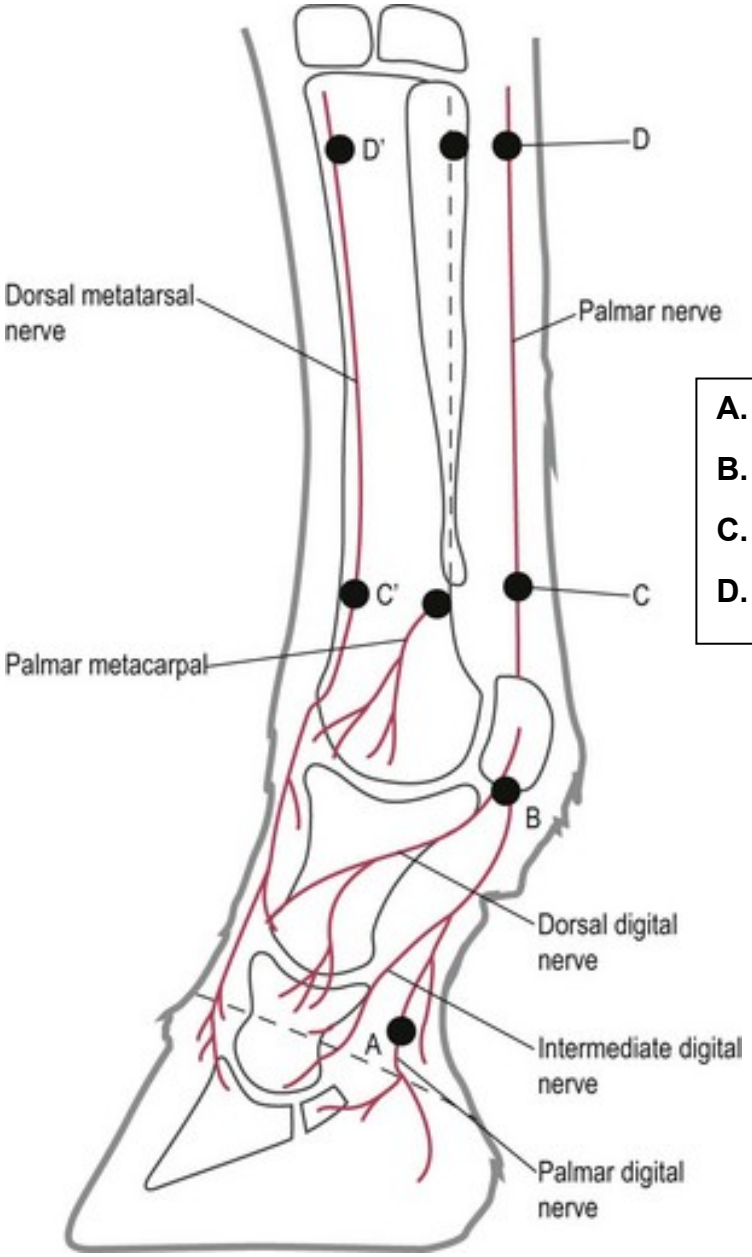


Common Nerve Blocks for Horses

- **Palmar/Plantar Digital** (PD) Block anesthetizes the distal interphalangeal joint, the sole and the navicular structures and soft tissues of the heel
- **Abaxial Sesamoid Block** anesthetizes the foot, second phalanx, proximal interphalangeal joint, digital annular and distal sesamoidean ligaments, distal superficial and deep digital flexor tendons
- **Low Palmar/Plantar (Low 4-Point) Block** desensitizes deep structures of the fetlock and all distal structures
- **High Palmar/Plantar (High 4-Point) Block** desensitizes the deep and superficial digital flexor tendons, splint bones and their interosseous ligaments, proximal suspensory ligament and inferior check ligament



Injection Sites



A. Palmer/Plantar Digital

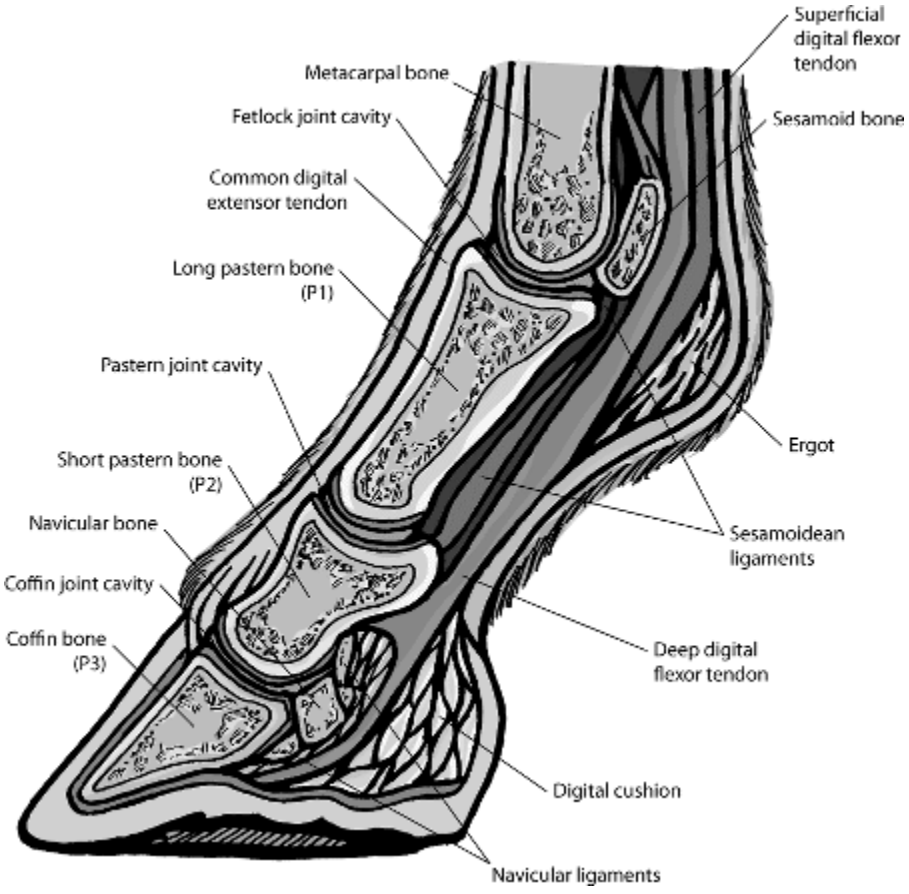
B. Abaxial Sesamoid

C. Low 4-Point

D. High 4-Point

Injection Site Landmarks

- **PD Block** - Palpate neurovascular bundles, abaxial to the flexor tendons and insert needle at the level of the collateral cartilages
- **Abaxial Sesamoid Block** - Palpate neurovascular bundle as it courses over the abaxial surfaces of the proximal sesamoid bones and insert needle at basisesamoid level on axial side of n-v bundle with needle pointed slightly abaxial and distally
- **Low 4-Point Block** - Palpate deep digital flexor tendon (DDFT) and the suspensory ligament (SL) and insert the needle parallel to the ground and perpendicular to the skin between the DDFT and the SL
- **High 4-Point Block** - insert the needle just distal to the carpometacarpal joint and perpendicular to the palmarolateral or palmaromedial aspect of the limb, advancing the needle to the dorsal surface of the deep digital flexor tendon and location of the palmar nerve



Notes

Totes Me Goats

The Basics

Goat Characteristics

- Life expectancy of 15-18 years
- Gestation period of 145 to 152 days
- Does reach sexual maturity at 4-12 months of age
- Estrus cycle ranges from 18 to 24 days
- Multiple births are common

Vital Signs

- Heart Rate 70 to 80 beats per minute
- Breathing Rate 15 to 30 breaths per minute
- Body Temperature 101-103.5°F

Examination Important Points

- BCS and TPR
- FAMACHA
- Hooves
- Repro status

Common Problems

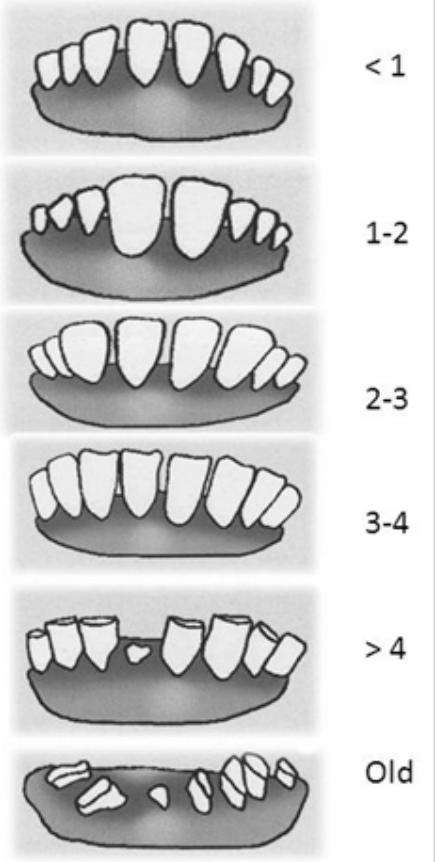
- Internal parasites
- Hoof problems
- Grass tetany and bloat
- Reproduction problems (females)
- Urinary calculi (males)

Aging Goats

NCAT Video on Aging by Teeth

https://youtu.be/gwpXzdE7h1I

- Look at lower teeth
- Age by looking at permanent incisors
- Varies by individual animal, breed, environment and nutrition



Treating Internal Parasites

FAMACHA

- System for treating animals on a need basis
- Animals categorized by level of anemia
- Used primarily for *Haemonchus contortus* (barber pole worm)

Fecal Egg Count

- Determine worm burden
- Determine if parasites are susceptible to anthelminthic
- Measured as number of eggs per gram of feces

UAPB Video on FEC
https://youtu.be/5E2-FhuT2Qw

For specific treatments, refer to following articles at www.wormx.info

FAMACHA Information Guide
Deworming and Resistance
Genetic Selection
Pasture Management
Parasite Biology Impacts Control

Fun with Raptors

Notes

DIVISION OF AGRICULTURE

RESEARCH & EXTENSION

University of Arkansas System

4-H VETERINARY SCIENCE