Turtles

Anatomy, Infectious & Non-Infectious Diseases & Trauma

Elizabeth F. Daut, DVM
Wildlife Center of Virginia

Outline

- Anatomy
- Stabilization
- Infectious Diseases
- Non-Infectious Diseases
- Trauma

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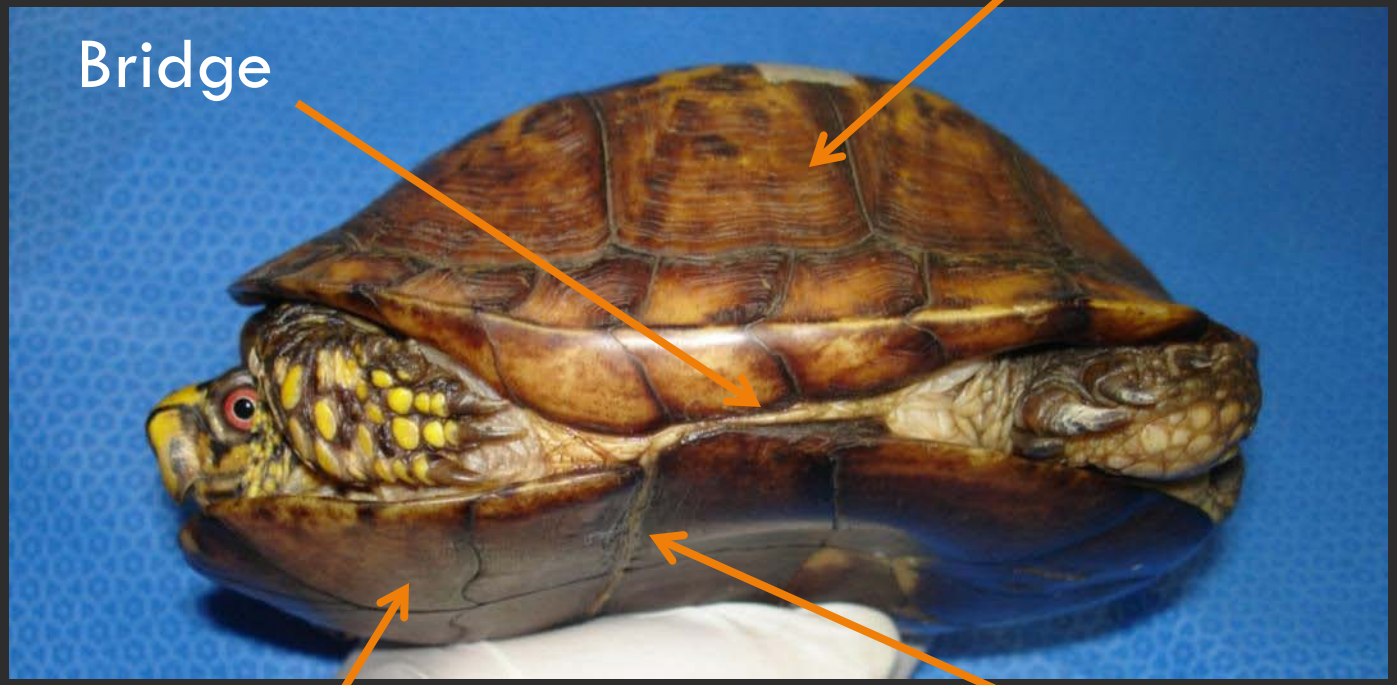
Poikilothermic

- Body temperature varies with that of the environment
- If not at the proper temperature, turtles can't digest food, metabolize drugs or recover from injuries
- Different species have different temperature requirements

- Preferred Optimal Temperature Zone (POTZ)
- Injured turtles should be kept at the higher end of their POTZ

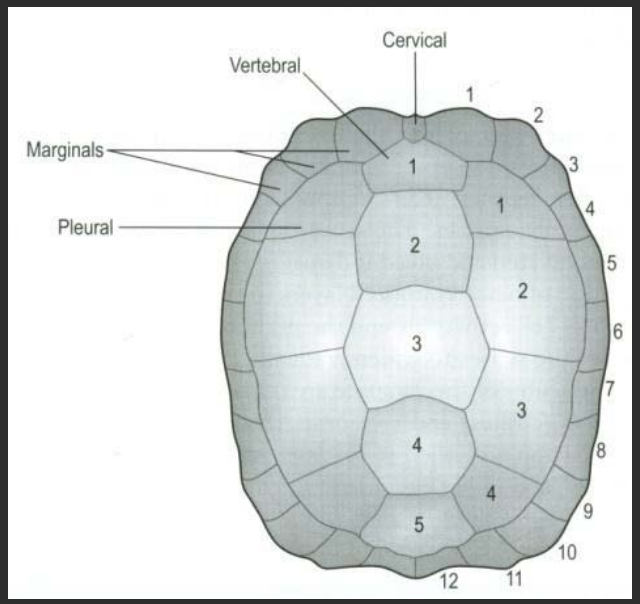
Shell

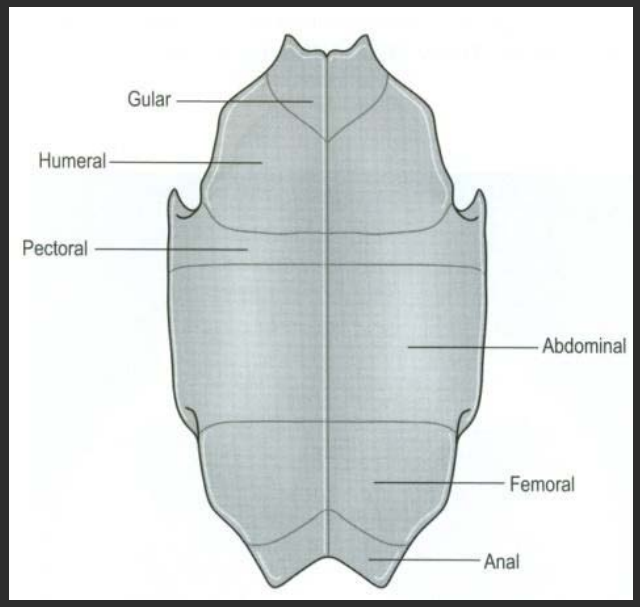


Shell

Scutes

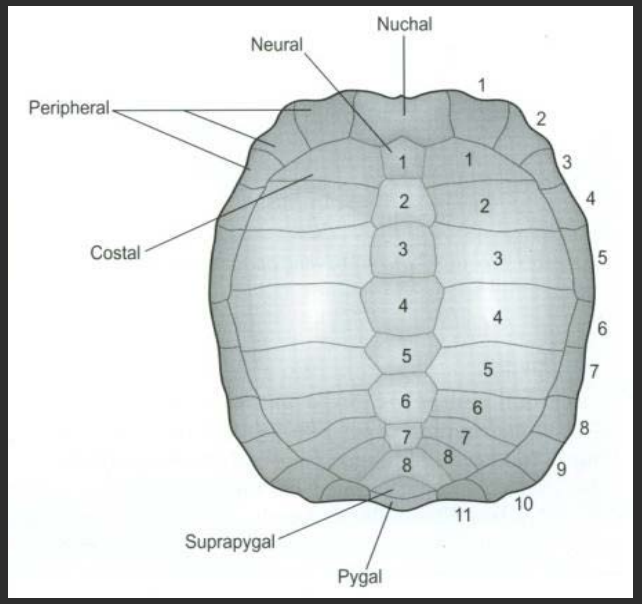
- Analogous to epidermis
- Innervated and vascular

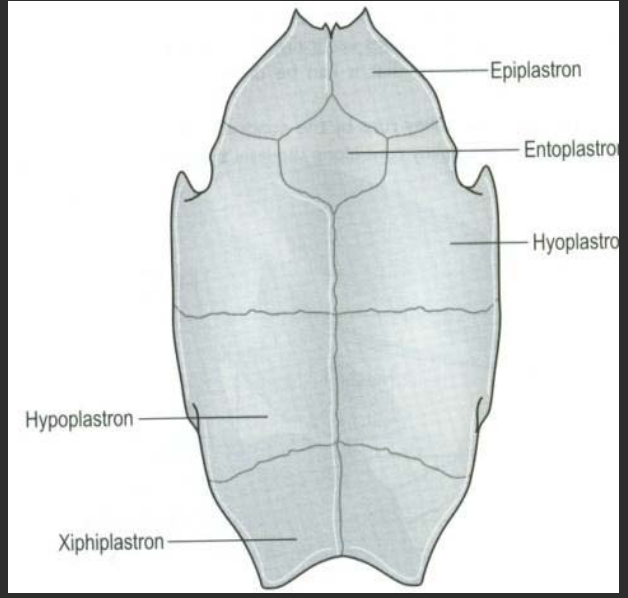




Osteoderms

- Bony plates
- Don't confuse as a fracture on rads

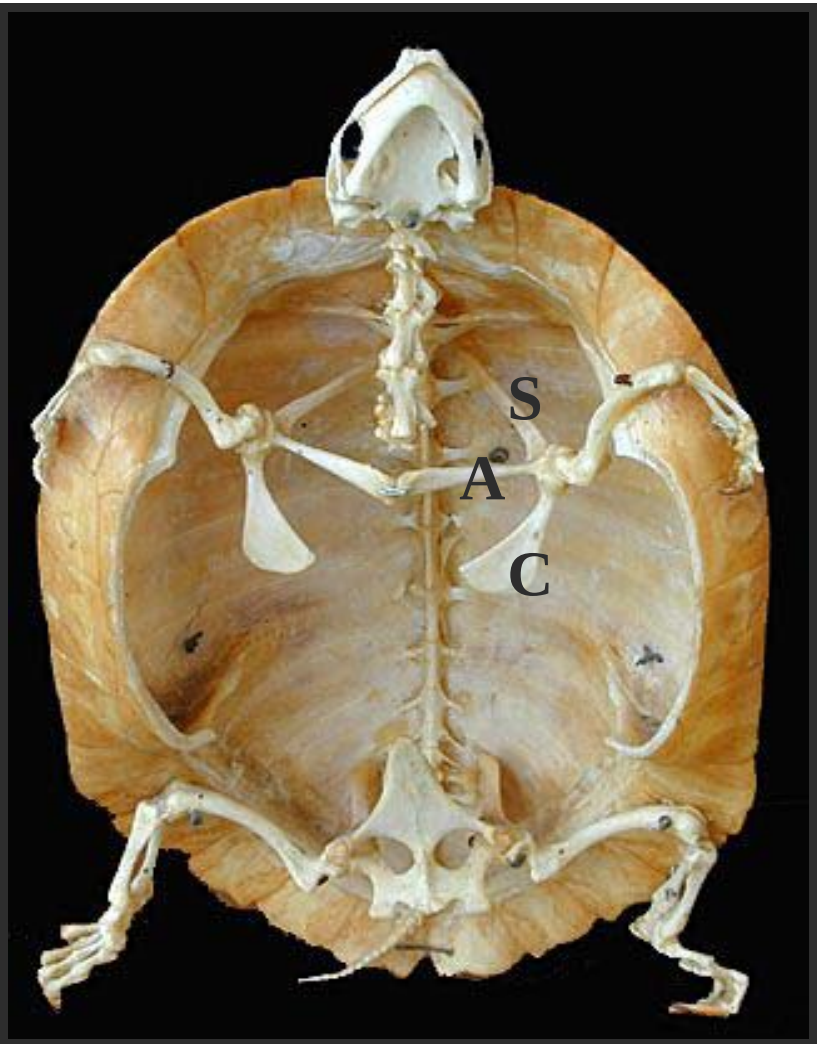




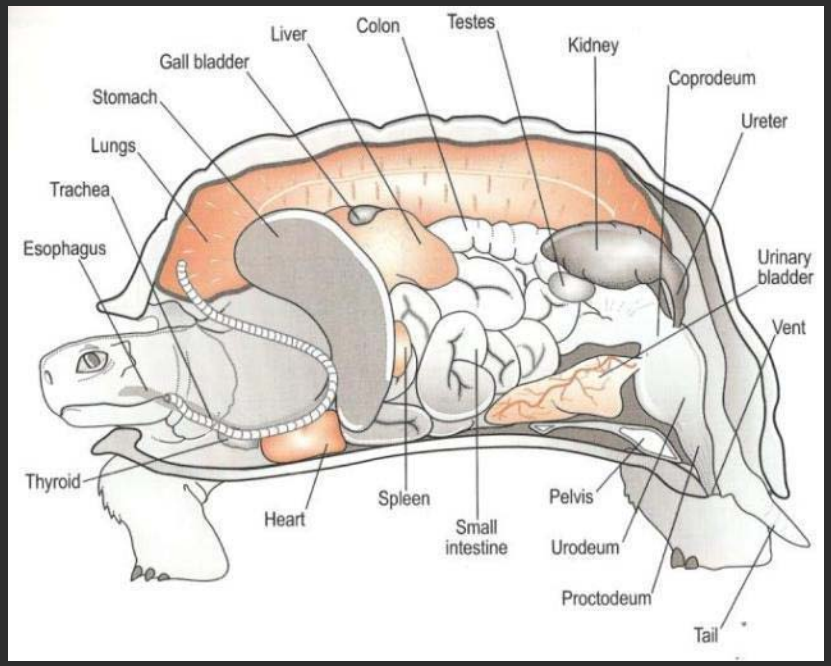
O'Malley, 2005

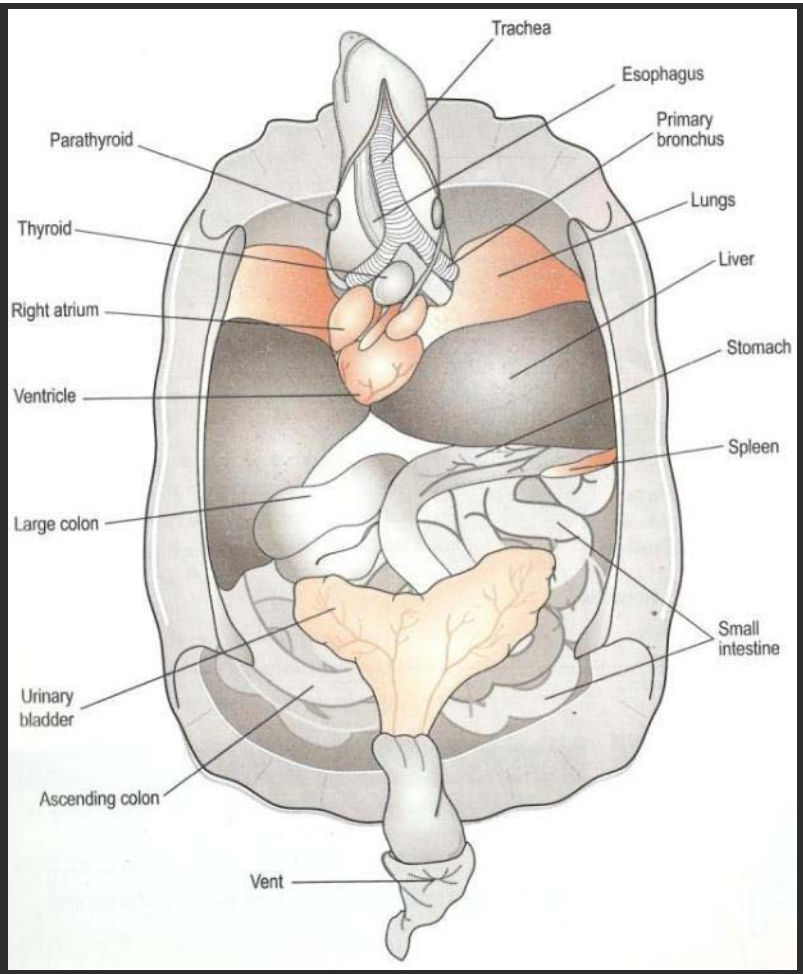
Skeleton

- Skull and Neck
- Scapula
  - Acromion
- Coracoid
- Thoracic limbs
- Vertebrae
- Pelvis
- Hind Limbs



Gross Anatomy

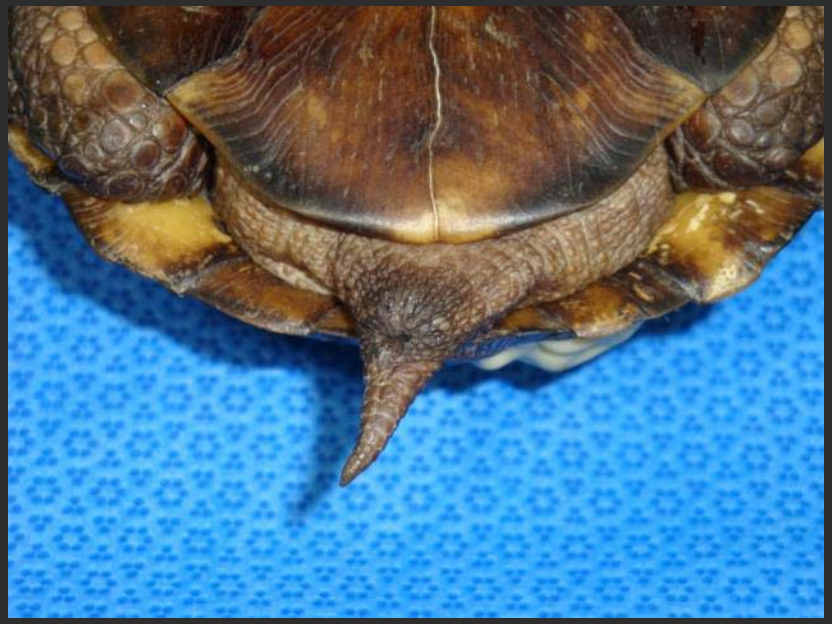




O'Malley, 2005

Lewbart

Sexing



Male – longer, thicker tail; vent is beyond carapace edge

Female – shorter, thinner tail; vent is at or near carapace edge

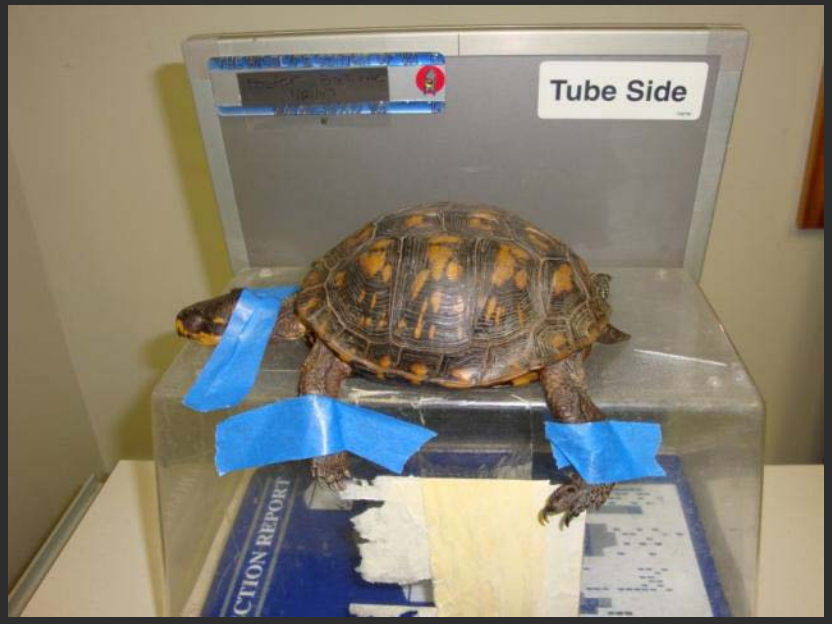
IV sites

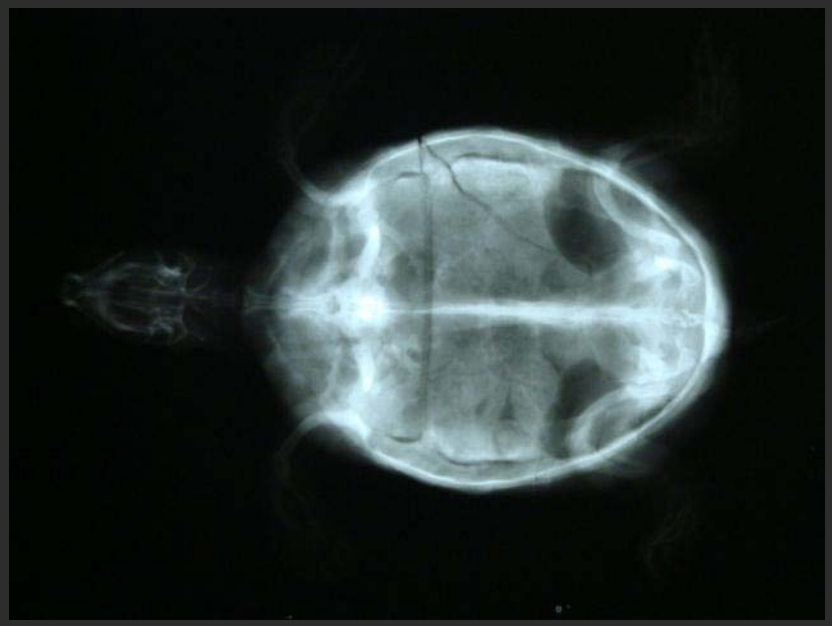
- Subcarapacial sinus
- Jugular veins
- Post-occipital sinus
- Brachial vein

Radiographic Positioning

- Three View Radiographs
  - Dorsoventral
    - Shell and limb fractures
  - Anterior Posterior (Horizontal Beam)
    - Most useful for lung injuries and pneumonia
  - Lateral (Horizontal Beam)
    - Shell and vertebral injuries


Tube Side


Tube Side



- Take radiographs of all female turtles in spring to check for eggs
- Can give Oxytocin to induce egg laying

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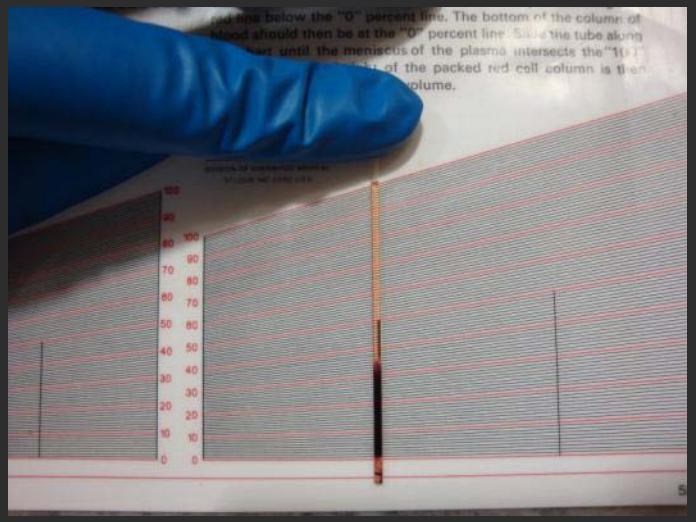
Stabilizing the Patient

- Fluid Therapy
- Antimicrobial Therapy
- Analgesia
- Nutrition

Forrester

Blood Volume and Hydration

- Assess blood volume
  - Packed cell volume and total solids
  - Anemia very common
    - IM iron dextran
- Fluids requirements vary by species
  - Soaking
- Fluid replacement plan:
  - Maintenance: 20-25 ml/kg/day
  - Replace about 25% of fluid deficit daily over 72-96hrs



Types of Fluids

- Water or Electrolyte solutions (Pedialyte)
- "Reptile Ringers"
  - 1 part 5% dextrose
  - 1 part normal saline
  - 1 part LRS
  - IV, SC or intracoelomic

Antimicrobial Selection

- Enrofloxacin
  - 5-15 mg/kg q 12-48hrs
  - PO, SC or ICe (must dilute for injection)
- Ceftazidime
  - 20mg/kg IM q 72hrs
- Amikacin
  - 5 mg/kg IM loading dose
    - Then 2.5 mg/kg q 72 hrs
    - Limit to 4-5 doses
    - Maintain hydration

Analgesics

- Opioids
  - Morphine
  - Buprenorphine
- NSAIDS
  - Ketoprofen
  - Meloxicam
- Local anesthetics

Renal Portal System

- The blood from the caudal regions of the body can shunt directly to the kidneys by the renal portal vein or bypass the kidneys and enter the liver and central venous system.
- System utilized during times of dehydration to conserve fluids
  - Blood not delivered to glomerulus and decreases GRF
- As long as patient is well hydrated, should not affect drug metabolism from hind end.

Nutritional Support

- Familiarize yourself with specific dietary requirements for that species
- Caloric replacement
  - Variety of food items
  - Encourage intake
  - Force feeding
  - Tube feeding

Assisted Nutrition

If patient is not eating well, low TP and developing SC edema…

Pharyngostomy tube

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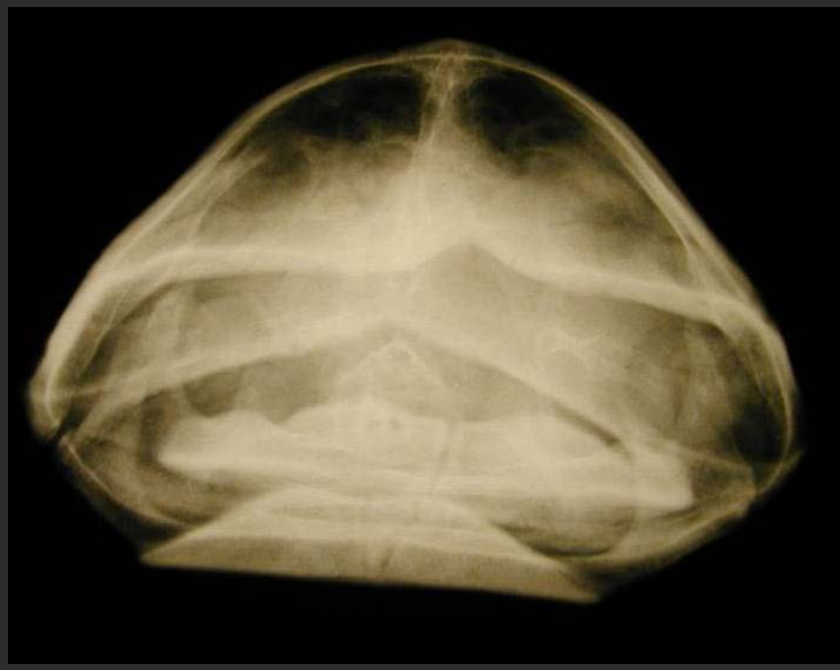
Respiratory Infections

- Increased respiratory sounds, nasal discharge, abnormal buoyancy
- *Mycoplasma*
- Gram negatives
- Viral
  - Herpesvirus,
  - Iridovirus (Ranavirus)



Viral Infections

- Clinical signs are similar for both herpes and iridovirus
  - Stomatitis
  - Nasal discharge
  - Conjunctivitis
- Treatment consists of supportive care
- May be long term carriers
- University of Florida (Elliot Jacobson)

Mycoplasma

- Common in desert tortoises (*Gopherus agassizii*) and Gopher tortoises (*Gopherus polyphemus*)
- Distinct strain in Eastern Box Turtles
- Presents as rhinitis, conjunctivitis
- Detection by serology
- Treatment - enrofloxacin
- Complete resolution???

- At WCV, we don't treat

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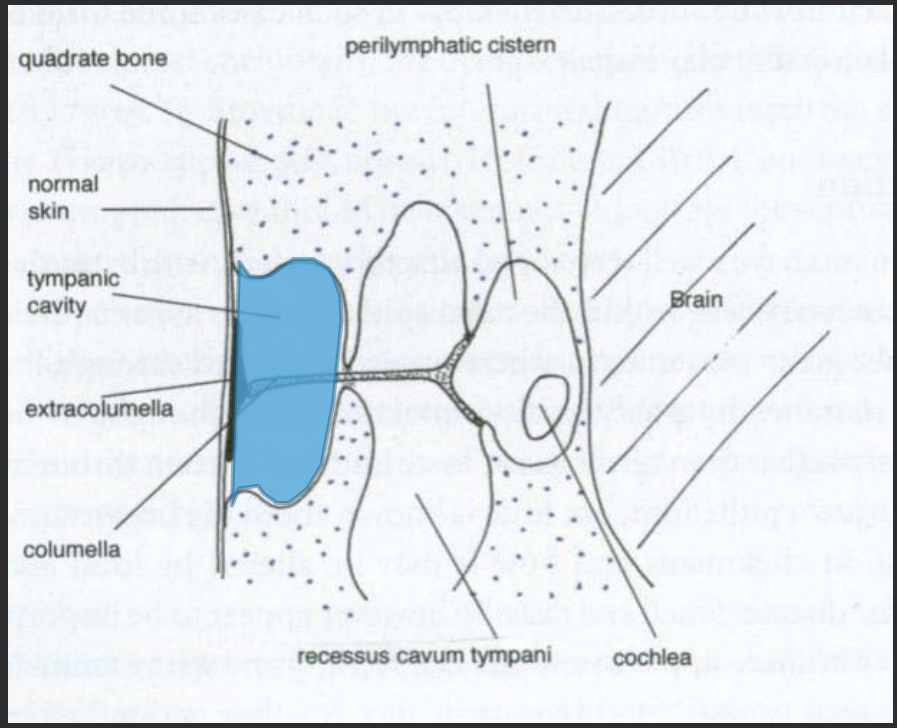
Aural Abscesses in Box Turtles

- Very common problem in eastern box turtles (*Terrapene carolina*)
- Can be uni- or bilateral
- May be linked to environmental organochlorines
  - Vitamin A disruptor
  - Immunosupressor

Ear Anatomy

- Tympanum membrane: undifferentiated skin
- Extracolumella: cartilaginous disc
- Columella: thin osseus shaft
- Mucin-secreting epithelium
- Communicate with oral cavity via Eustachian tube



McArthur *et al.* 2004

Pathophysiology

- Squamous metaplasia
- Hyperkeratinization
- Mucosal hyperplasia
- Mixed inflammatory response
- Mucosal erosion
- Caseous plug
  - Necrotic core
  - Outer zone: necrotic cellular debris, variable amount of keratin, inflammatory cells, mixed bacteria

Surgery

Treatment

- Analgesia (local & general)
- Wound-flushing (sterile saline)
- Topical antimicrobials (Triple-antibiotic ointment; Silvadene®)
- +/- Systemic antibiotics
- Reports of spontaneous resolution
- Recurrence??

MBD

- Chronic problem with no “quick fix”
- Generally considered to be caused by dietary and husbandry mismanagement
- Soft, pyramid shaped shell; overgrown beak and claws

Treatment

- Correct Ca:P ratio in the diet
- Improve UV light source
- Restore blood calcium levels if clinically hypocalcaemic
- Supplement oral Vit D3 (don't over supplement or may see metastatic mineralization)
  - Calcium glubionate 10/mg/kg/day
- May take 4-6 months of treatment

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Wound Assessment

- Location of shell fractures
  - Lungs
  - Wounds crossing midline can sever spinal cord
- Assess coelomic membrane
  - Infection
  - respiratory compromise
- Do not close infected wounds
- Neurologic exam
  - Limb use

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Great Spinal Walkers

- Intact deep pain response indicates that a stimulus reaches the brain
- Intact withdrawal reflex indicates that the spinal arc is intact
- Turtles have very strong withdrawal reflexes and can actually appear to "walk" despite having a completely severed spinal cord.
- Monitor defecation

Shell Stabilization

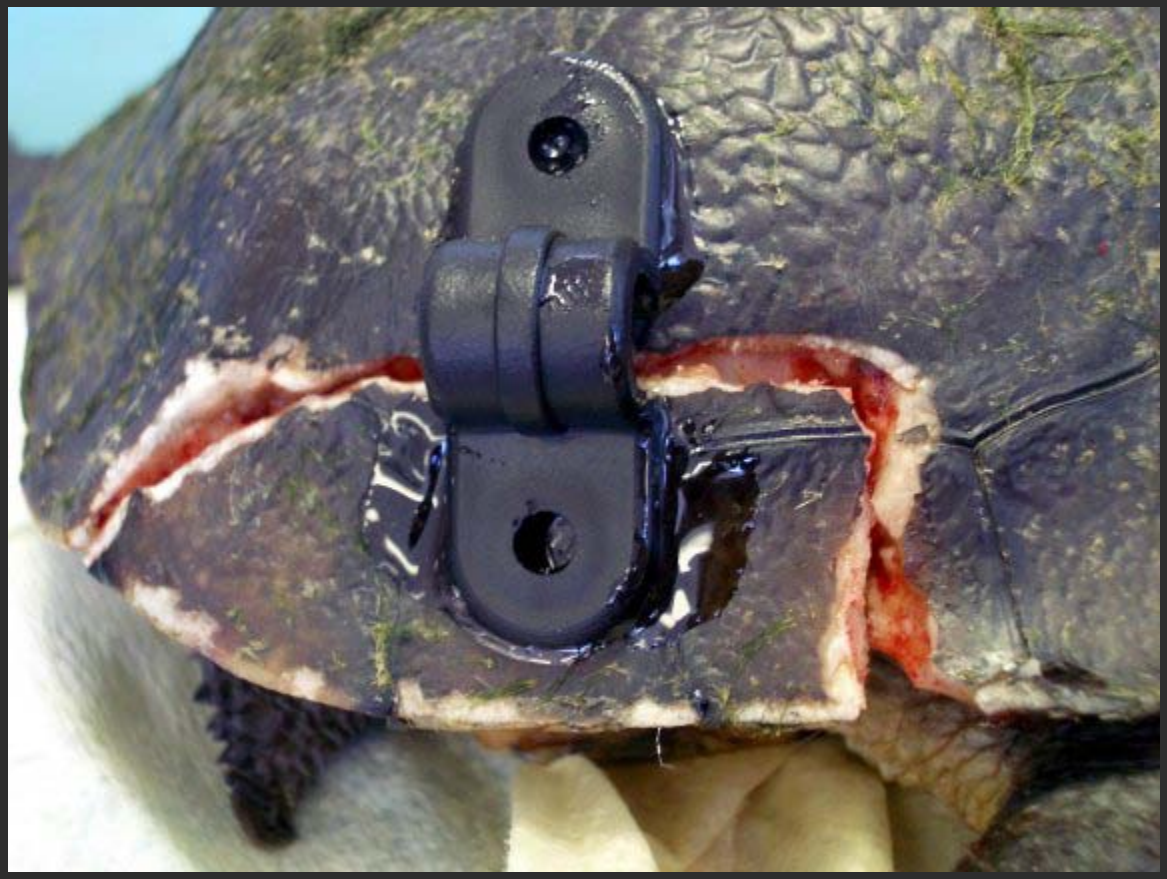
- Screws and wires
- Plates
- Epoxy
- Alternative fixators

Shell Stabilization

- Plates

Shell Stabilization

- Plastic saddles



Vella, 2009

Shell Stabilization

- Cable ties

Forrester and Satta, 2004

Shell Stabilization

- Thumb tacks & suture

Shane Boylan

Shell Stabilization

- Crazy glue

Would you think to euthanize?

Turtle Rescue of New Jersey
Harriet Forester

Next day

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Four months into the healing process

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Topical Wound Treatments

- Debridement
- Lavage
  - Saline, dilute betadine
- Topical treatment
  - Silver sulfadiazine cream
  - Triple antibiotic ointment
  - Sugar
- Rinse out old topicals during wound treatment
- Cautious with open coelomic wounds

Snapping Turtles are fun!

Release

- Always release turtles where they were found
- If it is a turtle of unknown origin, it should be placed in permanent captivity. GET thorough history on admission!
- You can release turtles with just one eye and just three legs
- Be patient. Turtles move and heal slowly.

References and Resources

<u>Identification, natural history:</u>

- Turtles of the U.S. and Canada by Ernst, Lovich and Barbour, Smithsonian Press, 1994
- Encyclopedia of Turtles by Dr. Peter Pritchard, TFH Publications, 1979
- Peterson Field Guides: Reptiles and Amphibians by Roger Conant and Joseph T. Collins, Houghton Mifflin Company, 1998

Turtle Rescue of New Jersey
Harriet Forrester

References and Resources

Medical information:

- Medicine and Surgery of Tortoises and Turtles, Stuart McArthur, Roger Wilkinson & Jean Meyer, Blackwell Publishing, 2004
- Reptile Medicine and Surgery, Douglas R. Mader, W.B. Saunders Company, 1996
- Exotic DVM Magazine

Turtle Rescue of New Jersey
Harriet Forrester

References and Resources

Husbandry (lighting, heating, nutrition, etc.):

- Tortoise and Turtle Feeding Manual by A.C. Highfield, Carapace Press, London, 2000
- Practical Encyclopedia of Keeping and Breeding Tortoises and Freshwater Turtles by A.C. Highfield, Carapace Press, London, 1996

Websites:

- Tortoise Trust at www.tortoisetrust.org
- World Chelonian Trust at www.chelonia.org
- Turtle Homes at www.turtlehomes.org

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