Reptile pathology
Necropsy techniques and common diseases

Shannon Martinson, BSc, DVM, MVSc, DACVP
Diagnostic Services, Atlantic Veterinary College
November 2013
Reptile pathology: Introduction
Reptile pathology: Performing a necropsy

Wide variation in morphology – therefore use different techniques.

Dorsoventrally Flattened
Laterally Flattened

Reptiles with armour
Long tubes
Reptile pathology: Lizard Necropsy

Dorsoventrally Flattened – Ventral Midline Incision

Bearded Dragon
Reptile pathology: Lizard Necropsy

Dorsoventrally Flattened – Ventral Midline Incision

Bearded Dragon
Reptile pathology: Lizard Necropsy

Dorsoventrally Flattened – Ventral Midline Incision

Bearded Dragon
Laterally Flattened – Remove the right or left lateral body wall

Veiled chameleon
Laterally Flattened – Remove the right or left lateral body wall
Reptile pathology: Lizard Necropsy

Veiled chameleon
Reptile pathology: Turtle Necropsy

Reptiles with armour – Remove the plastron

Snapping turtle
Reptile pathology: Turtle Necropsy

Snapping turtle
Reptile pathology: Lizard Necropsy

- Assess Body Condition
  - Coelomic adipose stores - fat pads in the caudal coloem
  - Muscle mass, fat deposits in the tail (leopard geckos)
After opening carcasses, my approach for each of these is similar:

- Separately remove the liver, the heart and the lungs (can collect the pluck or take things out separately)
- Remove / reflect the gastrointestinal tract – open entire length
- Find the spleen and remove it
- Find and remove the gonads +/- adrenal glands
- Evaluate and remove the kidneys +/- open the bladder (chelonians, some lizards)
- Remove the head and fix, or collect the brain
- Check joints
Reptile pathology: Lizard Necropsy

Bearded Dragon
Liver

- Remove the liver first (it’s often in the way)
- Handle tissues gently!
- Then evaluate the heart and lungs
  - Together or separately

Bearded Dragon

Reptile pathology: Lizard Necropsy
Reptile pathology: Lizard Necropsy

Bearded Dragon

Heart and lungs
Reptile pathology: Lizard Necropsy

Liver

Lung – with air sac like extensions

Heart

Liver

Veiled chameleon
• Either remove the Intestinal tract or reflect it out of the way
• Find and remove spleen, gonad and kidneys*
• Adrenal usually located between the kidney and gonad
Kidneys can be tricky:
• Split the pelvis – they are always more caudal and dorsal than you expect!
Spleen and pancreas are often close together and associated with the stomach/duodenum.
Reptile pathology: Lizard Necropsy

- Sometimes the gonad is very easily identified, but other times....

Black-throated monitor

Follicles on Ovary

Oviduct

Testicles
Reptile pathology: Lizard Necropsy

- Remove the head and collect the brain (or place entire head in formalin)
  - Open skull in similar manner as a mammal (but the brain is pretty tiny)
  - Always open a few joints in lizards and turtles

Brain

[Image of a black-throated monitor brain]
Reptile pathology: Lizard Necropsy

• The gastrointestinal tract (GIT) is relatively short
• The separate segments (esophagus, stomach, intestine) are ill-defined
• The GIT terminates in the cloaca (as do the reproductive and urinary tracts), which opens to the skin via the vent.
Reptile pathology: Lizard Necropsy
Reptile pathology: Turtle Necropsy

- Remove the heart
Reptile pathology: Turtle Necropsy

- Remove the liver
Reptile pathology: Turtle Necropsy

- Remove the liver
Reptile pathology: Turtle Necropsy

- Remove the trachea/bronchi and lungs
  - The lungs are located very dorsally (like in birds)
- Then remove the GIT – keep and eye out for the spleen and pancreas
Reptile pathology: Turtle Necropsy

- With everything removed – can look for the gonads!
- The kidneys are deep in the pelvic canal – split the pelvis to find them.
Reptile pathology: Snake Necropsy

Boa constrictor

Long Tube–Ventral Midline Incision
Reptile pathology: Snake Necropsy

Boa constrictor

Long Tube– Ventral Midline Incision
Reptile pathology: Snake Necropsy

- Assess Body Condition

- Should have coelomic adipose stores

Ball python

Boa constrictor

Emaciation
Reptile pathology: Snake Necropsy

Boa constrictor

Long Tube– Ventral Midline Incision
Reptile pathology: Snake Necropsy

Boa constrictor
Reptile pathology: Snake Necropsy

Liver
Heart
Lung
Carpet Python
Reptile pathology: Snake Necropsy

Lungs
- Long tube
- Central lumen
- Have two lungs, but the left is small
- Air sac like extensions extend over liver
The gall bladder is not in the liver – it is more caudal
The spleen and pancreas are usually close to the gallbladder.
Reptile pathology: Snake Necropsy

- Gonads are caudal to the gallbladder and cranial to the kidneys
- Adrenal glands are attached via the mesorchium / mesovarium
• Gonads are caudal to the gallbladder and cranial to the kidneys
• Adrenal glands are attached via the mesorchium / mesovarium
The right kidney is slightly cranial to the left.
The kidneys are made up of multiple lobules
Reptile pathology: Snake Necropsy

- Remove all of the viscera together as a tube and collect organs individually
- Allows evaluation of the spinal column (ventral aspect)
Reptile pathology: Snake Necropsy

Boa constrictor

- Alimentary tract
  - The alimentary tract is relatively short with little delineation between the different segments
  - The esophagus is thin walled and distensible, followed by a thicker muscular stomach
  - The small intestine and large intestine are separated by the cecum
The alimentary tract is relatively short with little delineation between the different segments. The esophagus is thin walled and distensible, followed by a thicker muscular stomach. The small intestine and large intestine are separated by the cecum.
• Alimentary tract
  • The alimentary tract is relatively short with little delineation between the different segments
  • The esophagus is thin walled and distensible, followed by a thicker muscular stomach
  • The small intestine and large intestine are separated by the cecum
Diseases related to husbandry 

Bacterial disease

Viral disease

Parasitic Disease

Fungal Disease

Neoplasia
Species specific requirements are often unknown

Problems often related to:

- Housing conditions
  - Temperature
  - Lighting
  - Humidity

- Nutrition
  - Dietary excesses
  - Dietary deficiencies

Poor husbandry is a major contributing factor in many diseases of captive reptiles!
Disease related to husbandry

Leopard Gecko

Dysecydysis:
- Incomplete/retained shed
- Low humidity
- Poor nutrition
- Vitamin A deficiency?
- Underlying disease
- Gangrenous necrosis of digits
- Subspectacular abscesses

Boa constrictor
Disease related to husbandry

**Gout**

- Build-up of uric acid to toxic levels → crystalline deposits in tissues
- Uric acid is a product of protein metabolism → excreted by kidneys
- Levels become excessive:
  - If too much animal based protein is fed (especially to herbivores)
  - If the animal is dehydrated
  - If the animal has existing renal disease

**Articular Gout**
Gout

- Clinical signs:
  - Reluctance to move → Pain and decreased range of motion of affected joints
  - Anorexia and decreased water consumption
  - Visceral Gout: Deposits in pericardium, liver, kidney, spleen

Disease related to husbandry
Thermal Injury

- Skin burns are not uncommon
  - Direct contact with heat sources

Commonly implicated
- Hotrocks ‘death rocks’
- Heating pads
- Spot lights

Panther Chameleon
Disease related to husbandry

Metabolic Bone Disease – Nutritional 2° hyperparathyroidism

Cornell Veterinary Medicine

Gretchen E. Kaufman, DVM, (c) 2002

www.exoticpetvet.com/images/V%20Cham%20mbd%201.jpg

reptile-savvy.webs.com/Beardie-MBD.jpg
Pathogenesis

Dietary Phosphorous / Calcium imbalance (or ↓Vitamin D or lack of UV exposure)

↑ Plasma Phosphorous or ↓ Plasma Calcium

Parathyroid gland hyperplasia / hypertrophy

↑ Parathyroid hormone

Mobilization of Calcium from bone – Osteoporosis, osteomalacia + / - fibrous connective tissue deposition (fibrous osteodystrophy)
Infectious Disease

- Bacterial disease are common and often are considered opportunistic
- Gram negative bacteria!
- A wide array of viruses have been detected in tissues from reptiles
  - Most are circumstantially incriminated as causes of disease
- Parasites are very common in free ranging and captive reptiles
  - Cause little/no morbidity in free ranging individuals
- Often infectious disease will occur in cases when husbandry is suboptimal or animals are stressed
- Co-infections are common!
Infectious Disease - Bacterial

‘Mouth rot’

- Ulcerative stomatitis
- Bacterial infection
  - *Aeromonas, Pseudomonas*...
  - Often secondary:
    - Vitamin A deficiency has been implicated
**Entamoeba invadens**

- Carried by asymptomatic carriers (turtles)
- Necrotizing enterocolitis and hepatitis in snakes
- Clinical signs: listlessness, anorexia, mucoid/bloody feces
Entamoeba invadens
Inclusion Body Disease!

Multisystemic disease: Inclusions are present in the epithelial cells of most organs and neurons with the brain.
Inclusion Body Disease

- Originally described in the Boidae family
  - Pythons
  - Boa constrictors
- More recently
  - Palm vipers, Corn snakes, King snake
- Probable world-wide distribution
- Viral Disease?
  - Inclusions are not virus particles....
    - 68 kDa protein
  - Retrovirus?
  - Arenavirus (2012)
Inclusion Body Disease

- Clinical signs
  - Anorexia, regurgitation, neurologic signs
  - Increased susceptibility to infectious disease
    - Pneumonia, mouth rot, enteritis
  - Eventual death / euthanasia

Fibrinonecrotizing enteritis

Mottling of the liver - lipidosis

Pneumonia
Infectious Disease - Fungal

Fungal Disease - Chrysosporium

Chrysosporium anamorph of Nannizziopsis vriesii (CANV) or Chrysosporium ophiodiicola

- Cutaneous fungal infection
- Common in captive lizards
- Emerging Disease of wild snakes

https://farm3.staticflickr.com/2843/9057876323_da3c761dce_z.jpg
Fungal Disease - Chrysosporium

- Most important fungal pathogen of reptiles
- Skin lesions in captive lizards
  - Geckos, Bearded dragons
- Emerging Disease of wild snakes
  - Eastern Mississauga Rattlesnake
Neoplasia

- Neoplasia is relatively common in captive reptiles
  - Based on reviews, possible higher incidence in snakes
  - Several tumour types reported
    - Lymphoma/leukemia, renal carcinoma, and soft tissue sarcomas are reported most commonly
Red swollen lungs with abundant mucoid yellow material in the central lumen – pneumonia?
Neoplasia

Histology:
• Monomorphic population of round cells
• Round cell sarcoma
• Likely lymphoma
Reptile pathology: Conclusions

This a diverse group – the anatomy and the necropsy methods vary

It is important to consider underlying husbandry problems

Despite their diversity – reptile pathology is similar to that of mammals... but is slightly more awesome
Questions?

Thanks to Dr H Fenton, Dr A Lopez, Ali Frye and Len Doucette who took many of these pictures