HOW TO
PREPARE BIRD SPECIMENS

Part 13 – Determining cause of death

Part A – Poisons
Part B – What is wildlife forensic pathology & Fishing, hunting, and trauma wound analysis
Part C – Collision with man-made structures
Part D – Diseases & Parasites
The Migratory Bird Conventions Act regulates the take and possession of birds in Canada. The Migratory Bird Treaty Act regulates the take and possession of birds in the United States. In addition, the provinces (in Canada) and the states (in the United States) also require permits. For some species SARA, ESA, or CITES permits may be required.

Check the laws of your country and obtain the proper permits; failure to do so may result in civil and/or criminal penalties.

When handling dead birds, it is probably impossible to tell if a bird is infected with a pathogen that may cause human illness even if you know the cause of death to be a wound or an injury. Take reasonable precautions to protect yourself. The Ornithological Council offers a peer-reviewed fact sheet on avian zoonotic disease and safety precautions for those who handle birds in the field and in the lab.

http://www.nmph.si.edu/BIRDNET/documents/WNV&H5N1-FactSheet.pdf
Report All Suspected Poisonings to the Proper Authorities

Reviewing this PowerPoint does not replace the need to consult a certified avian pathologist.

• In many museums, the majority of new museum specimens are salvaged birds. This presentation will aid novice preparators to more accurately identify and record cause of death.

• It is hoped that this cell phone accessible reference will aid individuals who find dead birds to better describe what they have found. It is stressed that dead wildlife and related evidence must not be compromised before wildlife enforcement personal arrive. Poisons are dealt with first (Part 13a) because many are equally lethal to humans.
Take a reference photograph containing a landmark. Something that is visually incontrovertible.

A minor error in recording GPS coordinates can lead to a case being dismissed.

A reference tree, building, etc. is unlikely to move!
This is a hard bone lesion which could be Avian Tuberculosis, **STOP work immediately.**

**Put on a face mask:**
- Freeze the bird
- Disinfect all surfaces and tools

Contact and arrange transport to a testing facility.
If this is not possible – arrange for the bird to be incinerated.
Only a licensed pathologist should cut into the bone mass checking for a crumbly caseous core. A sub-sample is then sent for testing.
Avian Tuberculosis can manifested as a single or clusters of caseous granulomas produced by the body to combat bacteria. These nodules are also produced to combat fungus infections and non-tubercular bacteria.

Accurate diagnosis only possible after PCR, culture, and/or histopathology testing.

Note the concentric rings visible when the firm nodule comprised of compressed laminated caseous material is cut in half.
All Avian Tuberculosis Test run on this Snowy Owl were negative.

These histographs are of the granulomas shown in the previous slide. Fungal elements were found within the caseous granulomas. Grocott’s stain (purple) was applied to enhance the fungus.
If you see white granules in the liver. **STOP work immediately. Put on a face mask.** Freeze the bird. Disinfect all surfaces and tools. Contact a licensed pathologist.

Based on a sample of two white granules, this crane tested **Positive** for Avian Tuberculosis. Unless the licensed pathologist wants to necropsy the bird, **INCINERATE IMMEDIATELY**.
Sarcocystis is a parasitic protozoan infection.
(Rice belly or Rice Breast Disease)

Waterfowl affected with Sarcocystis rileyi usually do not look or act sick and generally the disease is not fatal. Slice open the breast and look for cream coloured cylindrical cysts running in parallel lines in the breast or thigh muscles. Less commonly occurs in heart or smooth muscles of the digestive tract.

Severe infections may cause muscle loss with resultant lameness or weakness.

Sarcocystis found in waterfowl presents no known hazard to humans.

http://www.dnr.state.md.us/wildlife/Hunt_Trap/waterfowl/sarcocystis.asp
Airsacculitus refers to inflamed air sacs.

Typically air sacs are thicker than normal, and appear white or opaque rather than transparent. Purulent (pus) or caseous (cheese-like) material may accumulate within the air sacs.

Airsacculitus is caused by:
- Aspergillosis
- E. Coli bacteria
- Avian cholera
- Mycoplasmosis
- Orthithobacteriosis
- Other diseases
A healthy air sac is pseudo-transparent, stretchy, and pink in colour.
In the early stages, *Aspergillus* fungus manifests itself as small nodes on the syrinx or air sacs of vegetarian, omnivorous, and carnivorous birds.
As the *Aspergillus* infection progresses, air sacs become thick, leathery, and often a yellow-green colour. Both these air sacs have been sliced open.

*Aspergillus* is a large genus of mold (fungus) found on decaying vegetation in damp environments. It is a natural part of the decay process. Birds become infected when they aspirate the fungus spores.
Birds with severe *Aspergillus* frequently exhibit nodes in the lungs. Such birds have trouble breathing. Flying takes a huge effort. Collisions with cars, wires, and electrocutions are often the manner of death.
Gout is caused by elevated levels of uric acid in the blood.

This wan has uric acid crystals on multiple organs and joints. Arthritic joint pain is caused when uric acid crystals deposited directly on bone or on tissue near a joint.
Birds get internal and external cancers.
This is the crop and esophagus.

This is a growth.

Photo document and measure growths before removing.

http://www.poultryindustrycouncil.ca/pdfs/factsheets/fs_136.pdf
Slice the growth.
Look at its internal structure.

A cancerous growth is a solid mass. This growth is composed of layers confirming that it is a.....

Preserve in Booor solution will minimize discoloration.

Help ?????
Check the soft palate of young birds with misshaped beaks.

*Trichomonas gallinae* (a protozoan) causes white or yellow ulceration in the soft palate and may extend to the top of the digestive and/or respiratory tract. Chicks catch the disease when fed an infected bird or possibly from an infected parent. Adult birds rarely get *Trichomonas*.

This highly infectious condition is called canker in pigeons and froounce in raptors.

*Trichomonas gallinae* is not known to infect humans.
These are ---- on the soft palate and base of the tongue of a 5 year old Bald Eagle.
This Northwestern Crow has avian dry pox.

The Ornithological Council has a peer-reviewed fact sheet on avian zoonotic disease and safety precautions for those who handle birds in the field and in the lab.

http://www.nmnh.si.edu/BRDNET/documents/WNV&H5N1-FactSheet.pdf
Avian Pox
(cutaneous or “dry” pox)

Vectors of this virus are blood feeding (hematophagous) arthropods such as fleas, several mosquito genera, and other biting insects.

Photos courtesy of Dr. Victoria Bowes
Van Riper et al proposed the following method for describing pox lesions:

- Light (1 lesion)
- Moderate (2 lesions)
- Heavy (3 or more or 1 large head lesion)

Lesions can coalesce causing partial blindness. Foot lesions can result in toe loss.
Avian pox viruses target specific bird families. It is very unlikely that crow pox would infect eagles.

There is nothing wrong with this crow’s eye. The camera has captured the blue nictitating membrane moving across the eye.
Skin lesions similar to avian pox virus are caused by:

- Nutritional deficiencies
- Mycotoxins
- *Papilloma* virus
- Scaly leg mites

For a definitive diagnosis, tissue is stained and viewed under a light or electron microscope.

Lesions excised with a sterile scalpel are either frozen at -20°C or preserved in 10% neutral-buffered formalin prior to histopathology assessment.
This Rock Pigeon was found on a road. Massive internal bleeding confirmed that it died due to a vehicle collision, not a foot infection.

DON'T ASSUME EVERY LESION IS AVIAN POX.
The feet of this pigeon became infected after its feet were constricted by a red nylon rope.

Note that only two toes remain on one of the feet.
The feather on the right has a normal shaft.

The feather on the left has a constricted base. It has been reported that this is typical of a feather grown while a bird is recovering from West Nile Virus. The author could not find a veterinary reference to confirming this conclusion.

Very few birds recover from West Nile Virus.
Bumblefoot (ulcerative pododermatitis) is a bacterial infection (*Staphylococcus aureus*) which causes inflammation and sores.

Mild: Small reddened area or small shiny patch
Moderate: Some penetration has occurred (as see above)
Severe: Distortion of the contours of the foot and/or the toes

Found in wild raptors but more common in domestic birds.
Avian Keratin Disorder (Long Bill) results in overgrowth of the rhamphotheca, the outer keratinized layer of the beak.

Beak deformities in birds are typically caused by:

- Infectious agents
- Parasites
- Genetic abnormalities
- Exposure to environmental contaminants
- Nutritional deficiencies

Photo courtesy of J T Schopp
The cause of Avian Keratin Disorder is unknown. Diurnal raptors, hummingbirds, woodpeckers, and passerines get it.
The Falcon Research Group commissioned this N. John Schmitt drawing to promote discussion and encourage more accurate reporting of Avian Keratin Disorder.
The tomia on the maxilla of these song sparrows is overgrown. It does not appear to have affected their health.

Photo taken at the Louisiana State University Museum of Natural Science

Photos of live bird, courtesy of Dr. Heather York, NE
This adult Indigo Bunting was migrating. Despite the beak deformity, her body condition was good. She had visible fat reserves.
No tests were done on this Brown Thrasher. Scaly leg mites are suspected. Check the whole bird for affected areas.
The heavy louse infestation is easy to see on this Snowy Owl. Poor heath sometimes results in heavy lice infestations. They are never the cause of death.

Photo courtesy of Dan Zazelenchuk

Photo courtesy of Donald Griffiths
Spencer Entomology Collection
For more complete information on ectoparasites, please go to:

**Part 9 - Washing Birds for Ectoparasites**

This section describes and illustrates different types of ectoparasites. It includes references and website links.

http://beatymuseum.ubc.ca/research/birds


If you have photos, or additional information you wish to contribute to this topic please email: ildiko@zoology.ubc.ca
IN MEMORIUM

DR. REX KENNER
Former Curator of the Cowan Tetrapod Collection who encouraged me to begin this project.

At the 2012 Society for Wildlife Forensic Science Conference:

LUCY WEBSTER and NGAIO RICHARDS

independently informed me that this series was incomplete without a “Determining Cause of Death” presentation. Without their prodding and encouragement, I would not have tackled this topic.

If it was not for the tutelage of Dr. Victoria Bowes, Diagnostic Avian Pathologist for the British Columbia Ministry of Agriculture, and her toleration of my many questions while she was busy doing necropsies, I would still be struggling to compile this presentation.

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Unless otherwise indicted, all pictures were taken by the author at the Cowan Tetrapod Collection, University of British Columbia Beaty Biodiversity Museum.
Introduction: The look of the bird & A few things to look for
  Part 1 - Spread wings, a good way to start
  Part 2 - Skinning your first bird
  Part 3 - Other skinning methods
  Part 4 - Stuffing your first bird
  Part 5 - Other stuffing and pinning methods & Bird parts
  Part 6 - Sexing birds using gonads (includes 2 quizzes with answer sheets)
  Part 7 - Determining skull pneumatization & Skeleton preparation
  Part 8 - DNA tissue sampling & Gut analysis
  Part 9 - Washing skins for ectoparasites & Drying washed skins
  Part 10 - Recording fat levels & Cleaning fatty or stinky skins
  Part 11 - Flat skins, shmoos, and other types of study skins
  Part 12 - Preserving eggs and shell fragments (in prep)
  Part 13 - Determining cause of death
  Part 14 - Labelling: the most important step

To download another PowerPoint presentation in this series go to:
http://www.beatymuseum.ubc.ca/research/birds