Elephant Postmortem Examination

Practical Application of General Principles

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Compilation of Experiences “Lessons Learned”

academic, zoo, field situations clinician/pathologist perspective
Elephant Necropsy Procedure

Essential References (*equipment, techniques, tissues)


- Guidelines for Control of Tuberculosis in Elephants, USDA (current)

- * Elephant SSP Necropsy Protocol (current)
- Elephant SSP EEHV Protocol (current)
Why perform a postmortem examination?

“The purpose of a necropsy is to answer questions.”

Barry G. Harmon, DVM, PhD, DACVP
What are the questions?

“There are known knowns. These are things we know that we know.

There are known unknowns. There are things that we know we don't know.

But there are also unknown unknowns. There are things we don't know we don't know.”

Donald Rumsfeld
Identify and Agree on Questions, Expectations And Plan Before Necropsy

- Establish cause of death?
- Scientific/health benefit to elephants/humans?
- Confirm or determine TB status?
- Document “known” health issues? (best way?)
- Discover “unknown” health issues?
- Necropsy leader must know questions, make a plan with prioritized tasks
- Establish agreement on Plan A
- Also agree on Plan B for “unknown” (granulomatous disease)
Pre-Planning

- Plan before needed
- Identify necropsy team/leader in advance (Plan A/Plan B)
- Ideal leader: pathologist/clinician with elephant necropsy experience
- Institution? Vet School /Diagnostic Lab? Field Situation?
- Animal <-> Necropsy Team?
Balancing Act

- Time available
  Tissue deterioration–Personnel–Equipment–Tasks

- Personnel
  - Academic/non-TB case
    - 10–20 people (teams) @ 5–6 hours for complete details
  - Field or TB suspect/positive
    - Smaller group(s) of “essential” team members

- Level of Detail
  All tissues? TB only? Joints? Feet? Neuro?

- Equipment Choice and Power Availability
Other Factors

- **Weather**: Cold, Heat, Rain, Snow, Wind

- **Exposure/Spread of Potential Pathogens**: TB but also *Salmonella* sp.? Others?

- **Sensitivity**: Beloved animal, grief, psychological effect on staff, other animals; choice of procedures and equipment
Preparation for Procedure

- Heavy equipment /personnel move animal to necropsy site (platform helpful in field)
- Back up equipment (if breakdown)

- Hoist or Equipment to manipulate at beginning/after necropsy

- Ice in bags (1000 – 2000 #) on/around abdomen to counteract heat from digestive tract

- Remove ice before procedure (slippery !)
Settle Responsibility/Authority

- Owner, Vet, Pathologist of Record
- Choice of necropsy site/burial (local regs)
- Choice/training necropsy team members
- Safety/risk hazards/PPE
- Submit tissues, distribute lab results
- Reporting to health authorities if needed
- How is client/record confidentiality handled
- Press Inquiries
- Issuing Preliminary (if any) vs Final Results
Personal Protective Equipment (PPE)

- Tyvek gowns/hoods – sturdy, room for physical exertion, water resistant
- Gloves – double
- Aprons on dissection team members
- Respiratory Protection
- Face Protection?
Respiratory Protection

- “Surgical mask is not adequate” to prevent transmission of *M. tuberculosis*
- NIOSH–rated N–, R–, P–95, 99, 100 mask
- +/- face shield
- PAPR (powered air–purifying particulate respirator)
N95 mask fit test
- proper size, correct fit
- PAPR better if facial hair
N95 mask, gown/hood, apron, boots
PAPRs

Half hood PAPR

Full hood with scarf
“The facility's risk assessment may identify a limited number of selected settings (e.g., bronchoscopy performed on patients suspected of having TB or autopsy performed on deceased persons suspected of having had active TB at the time of death) where the estimated risk for transmission of *M. tuberculosis* may be such that a level of respiratory protection exceeding the standard criteria is appropriate. In such circumstances, a level of respiratory protection exceeding the standard criteria and compatible with patient-care delivery (e.g., negative-pressure respirators that are more protective; powered air-purifying particulate respirators {PAPRs}; or positive-pressure airline, half-mask respirators) should be provided by employers to HCWs who are exposed to *M. tuberculosis*. Information on these and other respirators may be found in the NIOSH Guide to Industrial Respiratory Protection (55)”
Organizing the Procedure Institution or Field

- Move animal to necropsy site
- Clean/dirty tables (material storage/tissue processing)
- Cold packs for fresh tissues
- Respiratory protection (levels) available
- Extra PAPRs and charged batteries
Organizing the Procedure Institution or Field

- Heavy equipment operator
- Dissection team (3–5)
- Tissue transfer/processing person(s) or teams
- “Helpers”:
  - Notetaker(s) – tissue collection/tissue processing
  - Photodocumenter(s)
  - Safety monitor
  - Gown assist/re-taping person(s)
  - Re-supply person(s)
Field Situation/Burial

- Ideal if potential TB case
- Establish a perimeter – exclude other animals and non-essential personnel
- Power? Water? Shade? Rain/Snow shelter?
- Rest breaks? Monitor for exhaustion
- Perform procedure, bury all non-disinfectable/reusable materials in grave
Gravesite overview

- Move on platform
- Plastic lining around site and down edges
- Tables on edge (if not TB suspect)
- Tables inside grave (if TB suspect)
- Plastic cover on tables
- Red–yellow–green zones
  - during procedure
  - at clean up
  - bury contaminated on site
Gravesite orientation/clean up zones

Heavy equipment needed

Move animal to site
Manipulate during/after procedure
Basic Approach

- Assess risk/choose PPE for dissection team/processor/"helpers"
- General exam, dissection, abdominal tissue exam/collection
- Distance/dismiss non-essential personnel until thoracic cavity entered and declared “OK” by “thoracic team” members with PAPRs
- Approach thoracic cavity through diaphragm (Montali protocol for TB suspect)
- Or disarticulate ribs manually (BBC video)?
Modifications: Granulomas found during necropsy/TB suspect/TB positive

- Distance/dismiss non-essential personnel
- PAPRs for dissection team + processor(s)
- N95s +/- face shields for “helpers”
- Tissue collection inside grave (tables)
- Re-prioritize tissue collection/reduce time of exposure
- May divide cranial/caudal teams for speed
- Avoid power tools
TB or Not TB?  That is the question
“Careful Examination of Respiratory System”

- We do not use acid fast staining at site (time, technique, few bacilli in \textit{Mt}b)
- Trunk -> pharynx -> trachea -> lungs + lymph nodes
- Normal elephant LNs inapparent
- Tonsillar regions, submandibular, tracheobronchial, regional tracheal and thoracic LN priority
- All LN (mesenteric, perirenal, reproductive) if evidence of advanced pulmonary TB
Palpate lobes of both lungs thoroughly
Sample all areas
Subdivide tissues: Formalin and Fresh
NUMEROUS (5 or more) sections of suspicious lesions
Take and label matching samples (Granuloma #1A, 1B, etc) for histo–culture–PCR
Submit lung and LN samples for culture if ruling out mycobacterial infection even if no lesions are evident
Tissue Check Lists – laminate/use dry erase pens

Formalin Tissue List

Fresh Tissue List
Samples from dissection team (pathologist notes) for processing

Identification

Abnormal findings, Directives for PCR, culture
Passing tissue from pathologist to tissue processor

Note takers
Tissue processing: Formalin (double sets ?) Fresh ( # sets ?)
Sample Collection

- Pieces of tissue (not swabs)
- Culture: multiple (~1–2 inch) pieces
- Tissue for formalin: ½ inch thick (maximum)
- 10 parts formalin: 1 part tissue ratio
- Collect from normal and abnormal (transition zones are best)
Labelling tissues

Mega Cassettes

Paper Laundry Tags
Tubes for collection of fresh tissues
Collection of fresh tissues

- Whirl-paks
- Chemical – proof pen
Don’t forget sampling for non–TB cultures, histopathology, PCR
Clean up / Disinfection

- Tuberculocide outside containers
- Back out: Red/yellow/green zones
- Wipe/soak/contact time for removed disinfectables
- “Helpers” (masked) help degown
- Green zone: extra scrubs, boots
- Leave materials in grave
- Roll plastic *et al* into grave
- Fresh tissues – freezing/shipping
- Fresh tissues for non-TB culture?
- Formalin tissues 7–14 days
- We cut in tissues while masked
- Process, read slides, issue report
- Storage of duplicate samples?
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QUESTIONS ?