Forensic pathology

Forensic medicine

- Application of medical facts to legal issues
- Forensic pathology a specialty in veterinary medical science
- Veterinary pathologists not formally trained
  - On-the-job
  - Wildlife pathologists often most experienced
- Types of cases:
  - Assessment of welfare (animal abuse/neglect)
  - Poisoning/sudden death
  - Zoonoses
  - Human injury
  - Wildlife crimes
  - Liability, nuisance, fraud, damage/insurance
  - Speciation

Pathologist’s job in forensic investigations

- Provide law enforcement and legal system with objective data to make decisions (prosecute and render verdicts)
- Conduct examinations
  - Unbiased to avoid improper influence on interpretation of findings
- Maintain admissibility of evidence
- Document evidence and findings
- Protect institution and self from unreasonable costs and lost time in court
- Protect personal professional credibility
  - Determine: what law enforcement wants to know and whether it can be delivered
  - Anticipate: what might legal system, enforcement, defendant or press want to know, 6 mt. – 5 years from now
Diagnostic vs. forensic necropsies

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Forensic</th>
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<tbody>
<tr>
<td>- Determine cause of death</td>
<td>- Determine manner of death</td>
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<tr>
<td>- Advice on preventing future losses</td>
<td>- Emphasis on comparing history or suspicions from law enforcement with findings</td>
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<tr>
<td>- Emphasis on internal lesions</td>
<td>- Importance of external lesions/findings</td>
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<td>- Importance of positive findings</td>
<td>- Importance of negative findings</td>
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<td>- Emphasis:</td>
<td>- Preserve evidence</td>
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<td>- Cost-effective testing</td>
<td>- Time commitment</td>
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<td>- Generally unchallenged</td>
<td>- Chain of custody</td>
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<td>- Photographic documentation</td>
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<td>- Assume challenges to methodology, observations, objectivity and interpretation</td>
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Human forensic cases

- One species
- Big social investment/infrastructure for ruling out foul play
- Preeminence of
  - Traumatic death (murder; work-related)
  - Sexual abuse
  - Child abuse
  - Sudden unexpected death
  - Suicide
- Rich literature, esp. re toxicology & time of death
- Absence of hair coat
- Additional resources: ballistics; radiography; scene where remains found; medical history; AFIP training
- Established discipline of forensic pathology
  - Unlikely GP requested to do a post-mortem on a case with legal implications

Veterinary forensic cases

- Multiple species
- Small social investment/infrastructure to rule out foul play
- Importance of
  - Poaching: self-defense vs. illegal taking
  - Medically or surgically induced
  - Starvation/cruelty/animal abuse:
    - Regional tolerance for wildlife/livestock vs. companion animals
- Scant literature
- Limited educational resources
  - AHS and ASPCA courses on cruelty/neglect
- Discipline of forensic pathology
  - DVM asked to do post-mortem on cases with legal implications
Veterinary forensic cases

1. Unexpected (sudden) death
   1. Malicious poisoning
   2. Contaminated feed
   3. Death in clinic (minor surgery; boarding; grooming)
   4. Ingestion of illegal substances
   5. Shooting
   6. Environmental contamination
   7. Insurance cases

2. Starvation

3. Animal abuse/cruelty

4. Veterinary malpractice
   - Disputes between practices over case management

5. Disagreements with drug, vaccine, feed companies

6. Poaching or killing out of season

7. Animal-induced human injury

8. Bestiality

9. Death by aliens/black helicopters

The challenge of post-mortem changes

- Generally present, esp. in wildlife cases
- Impact of temperature, body condition, predation
- Decomposition:
  - Autolysis + bacterial putrefaction → skeletalization
  - Mummification
  - Adipocere

Common problems

1. Legal component not flagged on paperwork
2. Law enforcement’s questions not provided
3. Submitted by veterinarian/owner, not police or animal control, or agricultural department
4. Inadequate clinical/background history
5. Broken chain of custody
6. Unrealistic expectations (CSI syndrome)
7. Low ceiling on test charges
8. “Just find cause of death, I am not worried about cost”
What we do with forensic cases

- Document chain-of-custody
- Photograph lesions and condition of carcass
- Radiographs when severe trauma/bullets involved
- Detailed gross dissection (2 – 4 hours necropsy)
- Detailed descriptions (gross; histology; other)
- Retain samples for toxicology and microbiology, even when redundant
- Document conversations
- Freeze back carcass/body parts

Typical cost

- ~2 – 6 hours on necropsy
- ~1 – 4 hours reading slides
- ~1 – 4 hours in phone conversations
- ~1 – 4 hours record-keeping; shipping samples; labeling photos

Necropsy and histology: $100 (capped)
Pathologist's time: $900 - $1800

**$1000 - 2000**

Need to recover costs as time in court uncompensated and uncontrolled
Questions we often answer

- Could spontaneous disease account for sudden death?
- Was it starved?
- Did vaccination/medication/surgery make animal ill?
- Was surgery responsible for death?
- Was it shot?
  - Shot how, with what?
  - Provide bullet to state crime lab?
- Poison involved? If so, what?
- Do lesions square with owner’s/hunter’s story?
- Is animal progeny of specific sire?

Questions and samples we refer

- DNA or bone samples:
  - Species ID (wolf vs. dog)
  - Genetic relationship (UC Davis genetics laboratory)
  - Presumed human semen – state crime laboratory
- Bullets
  - State crime laboratory
- Unusual poisons
  - State toxicology laboratory has network of contacts with specialized toxicology/analytical laboratories
- Performance enhancement drugs (4-H animals; competitions)
  - Refer to drug testing laboratories

A common request we cannot meet

‘Just test for all known poisons’
Common findings in suspicious sudden death

- Dogs/cats:
  - Bleeding out (multiple causes)
  - Parvoviral enteritis
  - Antifreeze
  - Strychnine
- Cattle/horses/sheep
  - Bleeding out
  - Torsion/colic syndromes
  - Gastric rupture
  - Clostridial enteritis
  - Cranial/cervical fractures
  - Lightning
  - Lead/OP/tox1080

Bullets and dead animals

- Small rounds may kill big animals
- Need to know: blood near carcass?
- Bloody effusions from autolytic carcasses
- Careful examination of entire SKIN necessary – not aspect of routine necropsy
- Finding bullets time-consuming and difficult, esp. in large carcasses
  - Value of radiographs

Common findings in sudden death

- Electrocution burn marks, horse
- Splenic hematoma with hemoabdomen

Image: Dave Edmunds
Starvation EASY to confirm
Exculpating natural causes less so

Handling evidence

- Chain of evidence
- Submission
- Storage
- Necropsy
- Written records

"An overriding feature of any forensic examination is maintenance of continuous control over all specimens and information so that one can testify with certainty to their identity." Dr. G. Wobeser, WCVM, 1996

Chain-of-evidence

- 1st responsibility of person investigating:
  - Ensure evidence admissible in court of law
- Task begins with submission of specimen by law enforcement officials
- Includes:
  - Secure storage of evidence
  - Photographic documentation
  - Proper written records of findings
  - Documenting transfer of specimen for ancillary tests

Anyone who comes into possession of evidence may be called to testify in court about specimen’s identity
Chain of evidence

Forensic pathologist must maintain secure control over specimens and collected information until returned to law officials, or they are disposed of.

Submission

- Chain of custody log
- Documenting receipt of specimen
  - Sign & date log
  - Photos to support identity of specimen
- Evidence tags
- Markers ensure photographs has proven link to case

_People coming into possession of specimens are links in a chain._
_Chain of custody as strong as weakest link_

Storage

- If specimens maintained by the examiner, must be kept in secure area to avoid risk of contamination, mix-ups and tampering.
The forensic necropsy

- Document identity of specimen with photos
  - Markers/evidence tags:
    - Accession number for lab
    - Signature of pathologist
    - Date
    - Scale
  - Significant findings photographed with scale markers
  - Most have foresight to collect appropriate samples in correct manner at time of necropsy
  - Guidelines for packaging & shipping samples
  - Use experts in other disciplines to perform analyses outside area of knowledge

As pathologists we have to be cautious in drawing conclusions about ballistics or projectiles. They are best assessed by a forensic firearm specialist

Written records

- Necropsy report for forensic case differs from that of standard necropsy
- Descriptions concise
  - Need to be understood by non-medical persons
- Conclusions supported by relevant documentation
  - Photographs; tags; fixed or frozen tissue/samples
- ALL organ systems examined
  - Significant, incidental and normal findings
  - Ensure complete, thorough necropsy
- Reliance on veterinarian, owner, police to tell about significant features in animal’s environment
Submitter’s role in animal abuse cases

- Beforehand:
  - Ideal if he/she knows law
  - Determine which agency takes lead in animal abuse:
    - Police department
    - Animal control
    - Wildlife agency
    - Agricultural department
    - Federal agency
  - Clinical veterinarians:
    - In-house hospital policy regarding reporting animal abuse
    - Training and information on recognizing animal abuse for staff
    - Understanding about best way to approach cases

Violence to animals and aggression toward people

The authors found that 25% of aggressive criminals reported a history of five or more acts of cruelty to animals while less than 6% of nonaggressive criminals, and 0% of non-criminals, reported such a history... [The] severity of animal cruelty acts was rated significantly higher within the aggressive criminal group than in the other two groups.

Kellert & Felthous
Childhood cruelty toward animals among criminals and noncriminals.
Hum Relations 38: 1113–1129, 1985

Reporting and investigating animal abuse

- Guidelines:
  - Contact authorities
  - Work with investigators
  - Preserve/document evidence
  - Maintain chain of custody of evidence
  - Take pictures and label appropriately – “lock down” images
  - Maintain legible medical records as legal documents throughout treatment period—no white-out, no erasing
  - Store records securely
  - Prepare preliminary/final reports of law enforcement
  - Work with attorneys to prepare testimony
Case #1

- Gone 3 days
- Presented with multiple nails
- Died post-sedation
- Carcass presented
- Also presented:
  - Detailed oral history
  - Radiographs
  - Forensic request
Nails/BBs retrieved post-mortem

Case #2

Abortions: 45 - 122 DPV (n = 17)
12/28 heifers (42.8%)
5/180 (2.8%)
Total loss: 8% (17/208)
IBR confirmed in 7
ISOLATED IN 1

Uinta, WY Dec 10 – Feb 11 2011
Preg-check
MLV BoHV-1
MLV BoHV-1

283 days gestation

0.5 yr 1 yr 1.5 yr 2 yr 2.5 yr
Case #3

- Child found dead and partly eaten in neighbor’s yard
- Two Rottweilers
- Practitioner performed 1st post-mortem
- Crime lab performed 2nd examination
- WSVL performed 3rd
- Questions:
  - Was dog starved?
  - Pre-existing disease?

Fatal attack on child
**Case #4: Dogs with traumatic injury**

- Jack Russell Terriers
- Suspect abuse by owner’s boyfriend
- Dog #1 - Presented for vomiting/lethargy
  - Possible physical abuse or poisoning
- Dog #2 - Died and buried; exhumed body ~1 mo. later for necropsy after dog #1 died
- Dog #3 - Hospitalized & survived

**No evidence of poisoning**

Drug and toxic element screens negative

**Case #5**

- Distemper outbreak WY Aug – Oct 2010
- Sourced to local pet stores
- 24 dogs confirmed by WSVL
- Traced to large scale breeder (puppy mill) in Midwest
- Many irregularities on property
- Outcome: euthanasia of >1400 dogs
- Suspension of license to breed for 6 months
Case #6

- 6 mo. Pit bull; ownership unknown (denial)
- Killed in back yard, moved & thrown in ditch
- Two inebriated suspects:
  - Knife used to mutilate & kill
  - Straight-edge knife used to inflict >15 stab wounds & lacerations penetrating skull & thorax
    - Multiple ribs fractured
    - Heart & lungs stabbed w/massive hemorrhage
- Neck cut, severing trachea & carotid arteries
  - Almost complete decapitation
Stab wound with fractured skull

Thoracic laceration
Thoracic wall stab wounds

Stab wounds - hide
Stab wounds – heart and lung
Case #7
• Numerous emaciated bulls & cows
  o Animals confiscated by WLSB - suspected neglect

Numerous emaciated bulls & cows

Animals confiscated by WLSB - suspected neglect

Case #8

Serous atrophy of adipose tissue

Abomasal contents: Rope
Take home

- Area of increasing importance for veterinary pathologists:
  - Esp. animal abuse/neglect; wildlife
- Importance of:
  - Chain-of-custody
  - Knowing (and telling) what is realistic
  - Anticipating what will be issues in court
- Many tools available in human forensic pathology not pertinent or not validated in animal cases
- Increased awareness by public of forensic capabilities may create unrealistic expectations in animal cases