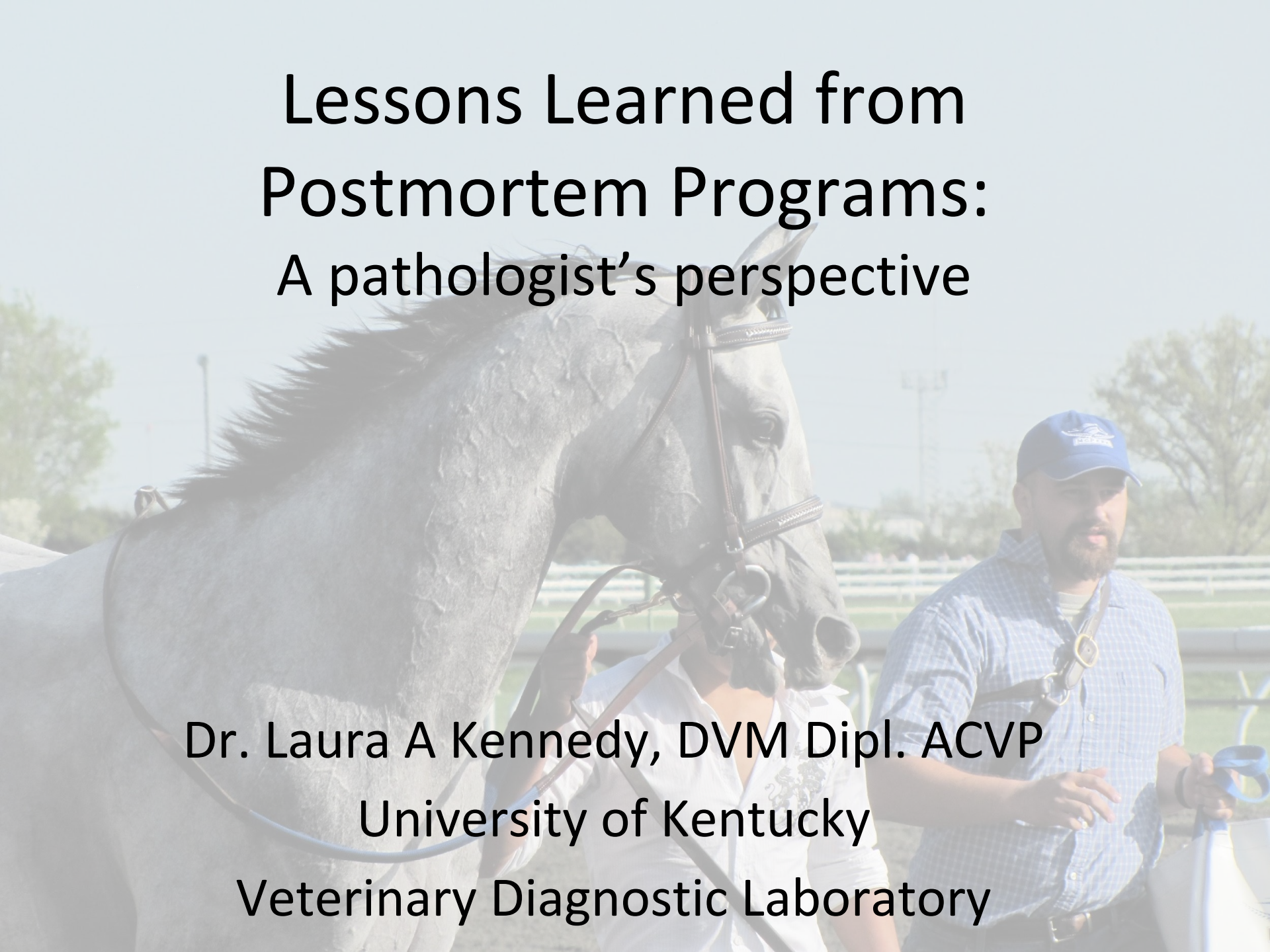
Lessons Learned from Postmortem Programs:

A pathologist's perspective



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Veterinary Diagnostic Laboratory

Introduction

- Evolution of the Kentucky program
- Description of current program
- Harmonization
- Future opportunities

Evolution of the KY program

- Began in late 2008
- Response to unusually high number of fatalities at Turfway Park in December of 2008 as well as high-profile breakdowns.
- Prior to 2008
  - Simple documentation of the injury
    - It is what you said it was.
  - Racing only
  - Keeneland – submitted training injuries at their own cost.

Evolution of the KY program

- 2008 – 2012
  - Racing fatalities
  - Detailed documentation of the injury
  - Examination of contralateral limb
- 2012-2014
  - All fatalities.
  - Extensive examination of the contralateral limb, with detailed reporting
- 2015
  - Scoring system developed for pre-existing pathology of the contralateral limb.

Necropsy protocol

- At the time of death, horse becomes property of the KHRC
- Unique identifier is attached to the horse
- Shipped to the laboratory by a private contractor
- Communication between the KHRC and UKVDL is initiated via emailing of a specialized accession form.

KHRC NECROPSY ACCESSION FORM

Date of Death | Time of Death | : |

Euthanized

KHRC Submitting Veterinarian

Attending Veterinarian

Name | Phone

Track | Race | Condition

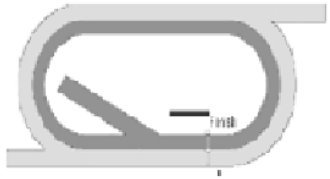
Breed

Horse	Tattoo	Color	Sex	Age

Case Information

☐ Racing ☐ Training

Location injury observed on track:



Other

Distance of race/work

Surface

Condition (dirt/syn)

Condition (turf)

Furosemide

Adjunct bleeder meds

Medications Administered: (check all that apply)

- ☐ Euthanasia Sol'n (CII)
- ☐ Acepromazine
- ☐ Detomidine
- ☐ Phenylbutazone
- ☐ Xylazine
- ☐ Succinylcholine
- ☐ Butorphanol
- ☐ Flunixin
- ☐ Pred sodium succinate

Other

Injury management: (check all that apply)

- ☐ Ambulance
- ☐ Compression boot
- ☐ Kimzey splint
- ☐ Robert Jones Bdg

Other

Injury/Trauma

Rabies suspect

Sudden Death/Unknown

Systems affected (select all that apply)
For multiple selections, hold down Ctrl key and click selection.

Other

Shoeing (select all that apply)
For multiple selections, hold down Ctrl key and click selection.

RF | LF | RH | LH

Antemortem diagnostics performed:

- ☐ Radiology
- ☐ Ultrasound

Imaging/other

- ☐ CBC
- ☐ Chemistry
- ☐ Serology
- ☐ Virus isolation
- ☐ Bacteriology

Clinical Observation, comments

Necropsy protocol

- Digital radiographs
- Detailed documentation of injury, preexisting pathology of the injured limb if possible
- **Contralateral limb – preexisting pathology, additional lesions**

Genesis of Catastrophic Injuries

- Fracture sites are consistent
- Fracture pattern is consistent for each type of injury.
- Preexisting pathology is consistent in each type of fracture
- Pre-existing pathology is bilaterally symmetric.

Characteristics of Condylar Fractures

- Lateral condylar:
  - Travel proximally and laterally
  - Exit the cortex approximately 8-12 cm proximally
  - Mild comminution
- Medial condylar:
  - Travel proximally and laterally
  - Cross midline within 1-2 cm
  - Exit the cortex just distal to the carpometacarpal or tarsometarsal joint
  - Generally comminuted

Left front, lateral condylar

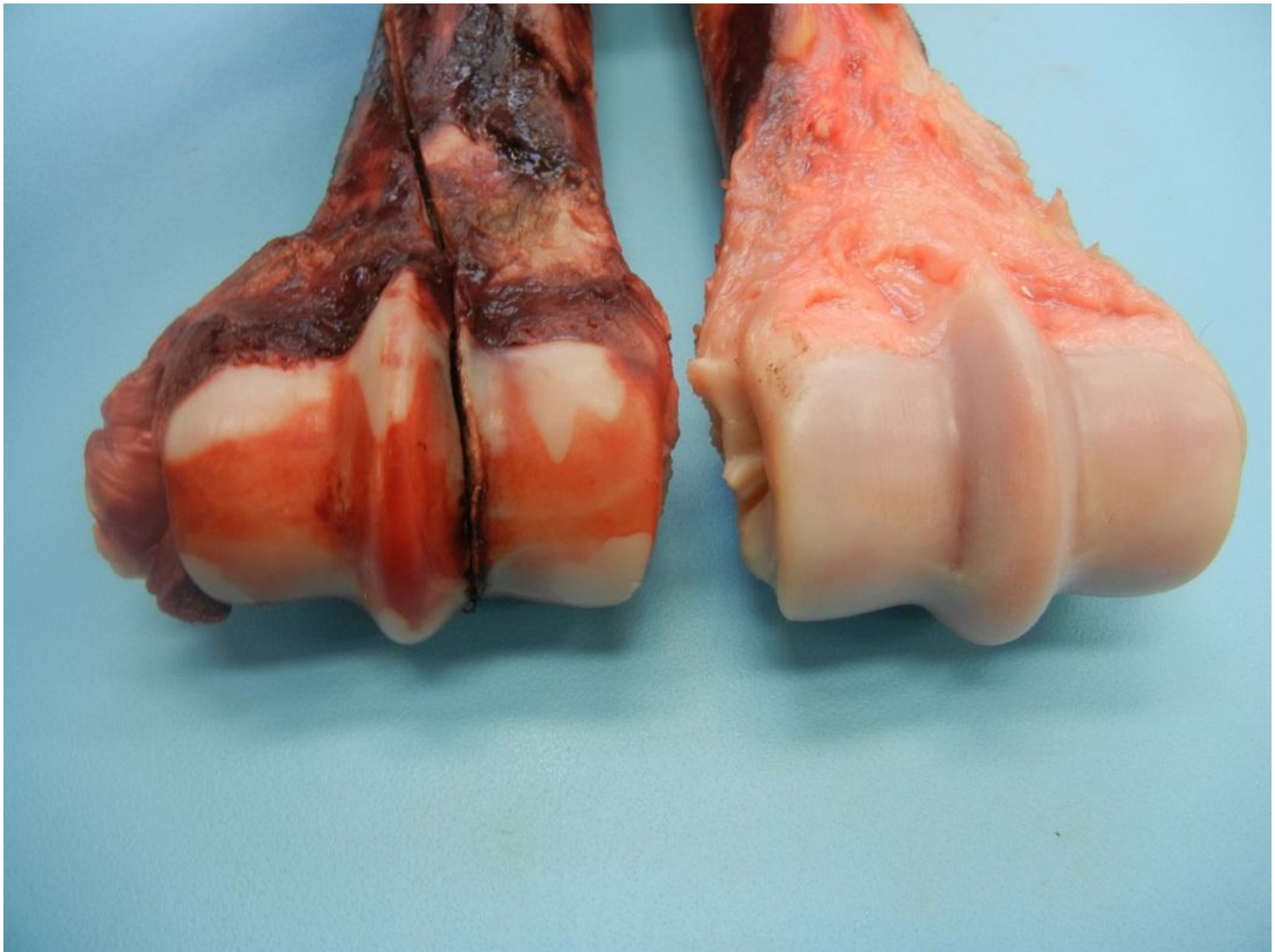
Left front, medial condylar

Pre-existing pathology: Third metacarpal and metatarsal

- Parasagittal groove scoring
- Transverse ridge pathology
  - Flattening
  - Cartilage erosion, ulceration
  - Subchondral bone necrosis
  - Subchondral sclerosis
- Dorsal metacarpal disease (DMD)

Pathology is symmetric

Condylar fractures, parasagittal groove



Transverse ridge pathology

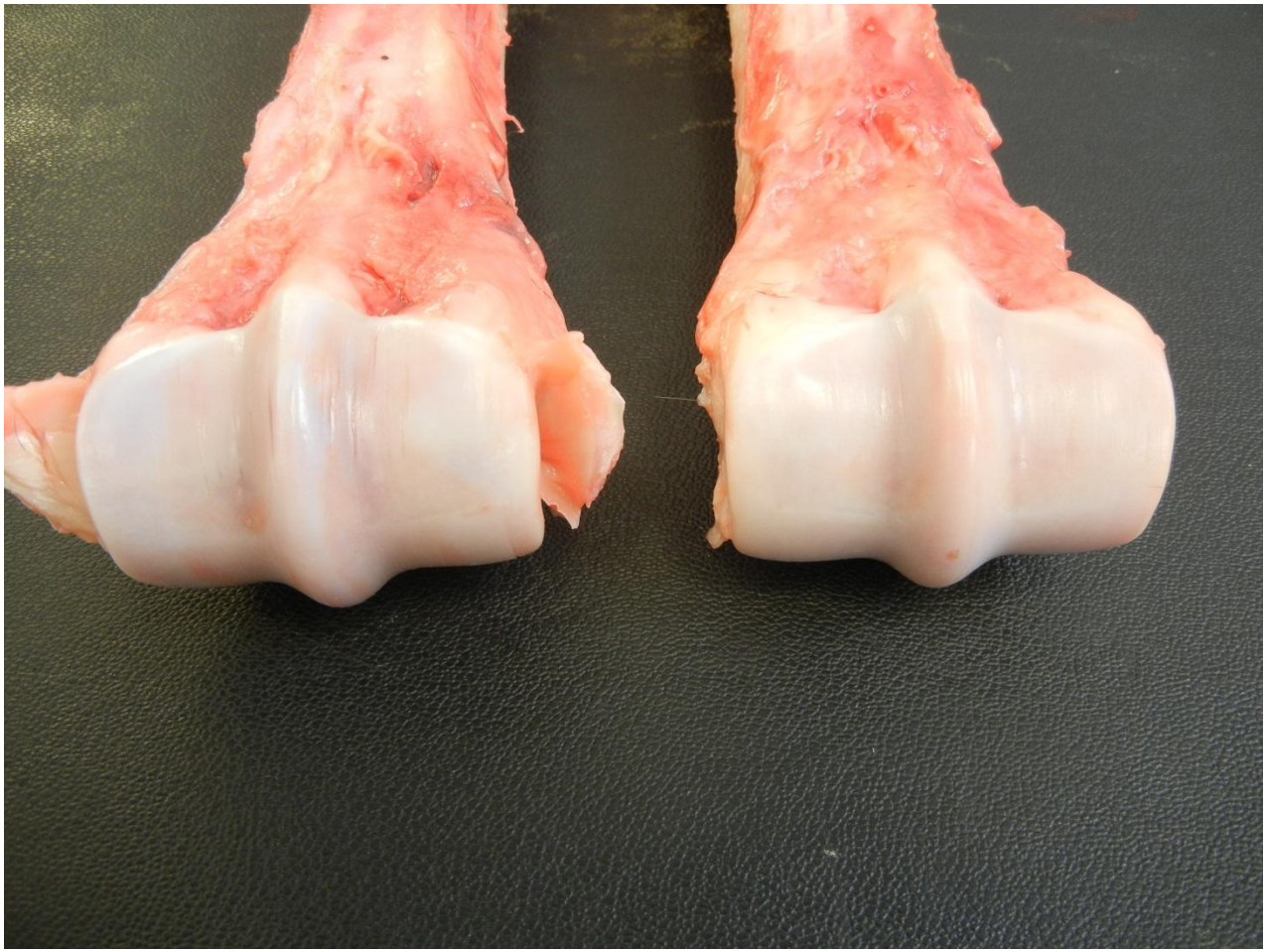
Dorsal metacarpal disease

Fracture through DMD or non-articular MC III fx

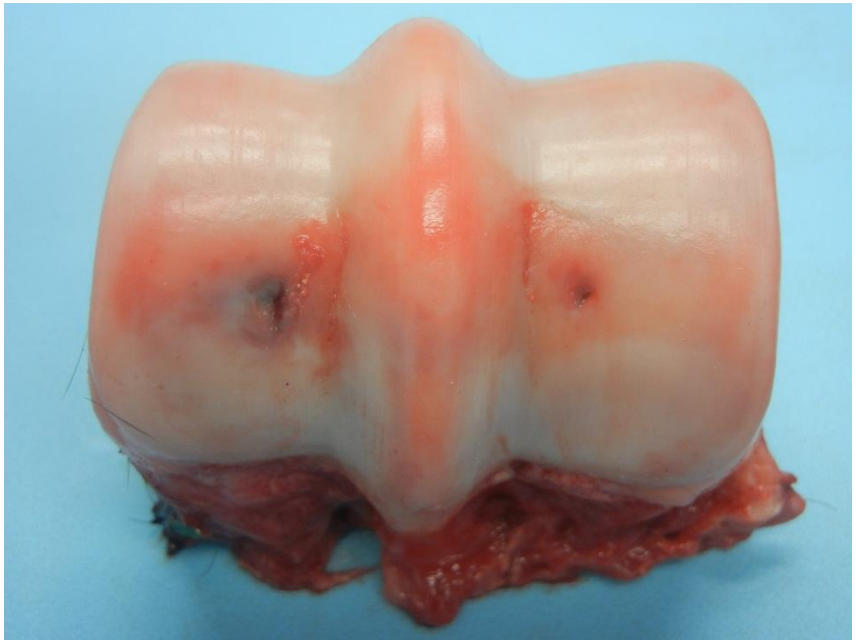
Controls

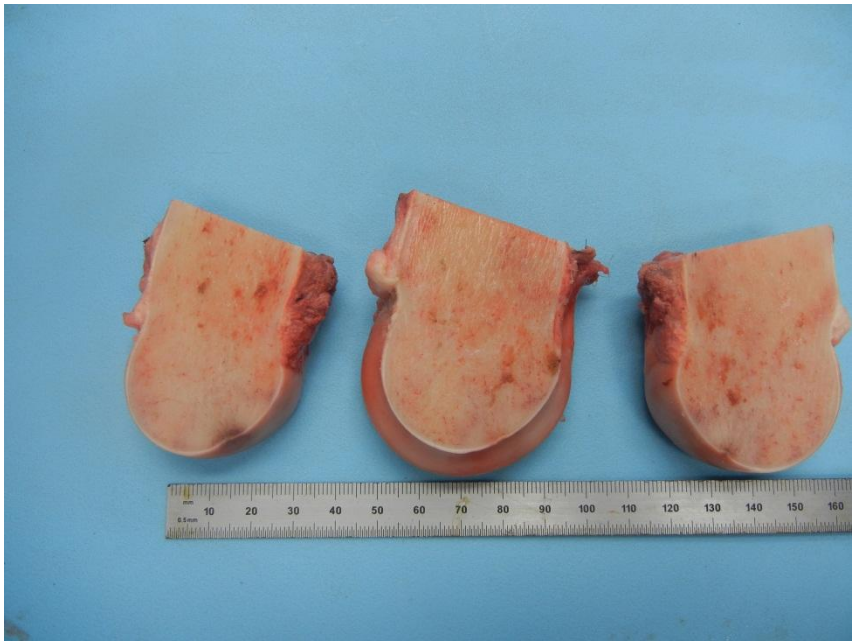
- What is a control horse?
  - Any horse that dies on the premises
  - In active training +/- racing
  - Exposed to the same environment
- What are the benefits?
  - Representative of the population as a whole
    - What do our horses look like?

Non-musculoskeletal



Starting gate accident





Scoring system

- Modified Pinchbeck system:
  - Postmortem evaluation of palmar osteochondral disease (traumatic osteochondrosis) of the metacarpo/metatarsophalangeal joint in Thoroughbred racehorses. EVJ, 2009
  - Pathological and clinical features associated with palmar/plantar osteochondral disease of the metacarpo/metatarsophalangeal joint in Thoroughbred racehorses. EVJ, 2013

Accession number: K150000

Horse information: 3 year old filly, racing, CD. Tattoo: O11111

Fracture information: Right forelimb: Open, comminuted, lateral condylar fracture.

Associated soft tissue pathology:

Palmar annular: T	Proximal digital annular: I	
Suspensory ligament: T	Lateral ext. susp: I	Medial ext susp: T
SDF: I	DDF: T	
Straight sesamoidian: I	Oblique sesamoidian: I	Intersesamoidian: R

*I=intact, T=torn, R=ruptured

Preexisting pathology:

Left forelimb, fetlock:

Articular cartilage scoring: 1

Left forelimb, third metcarpal bone:

Palmar osteochondral disease: 2

Cartilage loss, MC3: 1

Parasagittal groove scoring MC3: 2

Preexisting pathology:

Left forelimb, fetlock:

Articular cartilage scoring: 1

Left forelimb, third metcarpal bone:

Palmar osteochondral disease: 2

Cartilage loss, MC3: 1

Parasagittal groove scoring MC3: 2

Left forelimb, sesamoids:

Cartilage loss: 0

Marginal remodeling: 0

Left forelimb, dorsal impact:

Arthrosis of P1: 1

Villinodular pad proliferation: 0

Remodeling of MC3: 0

Left forelimb, palmar impact:

Condylar flattening: 1

Palmar pouch hyperplasia: 1

MC3 remodeling: 1

Scoring system

- Can be applied to all horses
  - Musculoskeletal fatalities
  - Non-musculoskeletal fatalities
    - “Controls”
- Peer-reviewed references
  - Lends credence
  - Allows for application by other institutions
- Scores can be entered into data systems

Photodocumentation

- A picture is worth a thousand words (or numbers)
- Communication with associated parties – regulatory and private veterinarians, trainers, stewards.
- Photographs allow for direct comparison with antemortem examinations and imaging.

Harmonization

- Many diagnostic laboratories perform postmortem examinations.
- Standardization is lacking
  - Why?
    - Little communication between labs
    - Many laboratories are asked to “perform postmortem examinations”
      - Lack of guidelines or information desired
      - Belief that racehorse necropsies have a research component *or* they already know what’s broken, what can I do?
      - Little interaction between laboratory and racing commission

Harmonization

- Musculoskeletal examination of racehorses does not require specialized skills, facilities or interest in racing.
- All capable pathologists can perform a thorough examination:
  - Knowledge of anatomy
  - Thoroughness
  - Detailed notes
  - Patience

Harmonization

- Current efforts include formation of a working group of pathologists involved in racing necropsies.
  - American College of Veterinary Pathologists
  - American Association of Veterinary Diagnosticians

- Presentations at regional and national meetings by individuals from various institutions

Looking forward in Kentucky

- Harmonization of pathology examination
  - Eventual EID-type database for postmortem examinations
- Development of dossiers for individual horses that include antemortem and postmortem data
- Genesis of an equine sports medicine working group at the University of Kentucky
  - Dr. Jamie MacLeod

The Myth of “The Bad Step” Still Exists

- Long-time reasoning behind fatalities
- Lends credence to the belief in the inevitability of injury.
- May have delayed investigation of fatalities and research into injury prevention.

Selected References

- Clegg PD. HBLB's advances in equine veterinary science and practice. Musculoskeletal disease and injury, now and in the future. Part !: Fractures and fatalities. Equine vet J (2011) 43 (6) 643-649.
- Kristoffersen M, Parkin TDH, Singer ER. Catastrophic biaxial proximal sesamoid bone fractures in UK Thoroughbred races (1999-2004): Horse characteristics and racing history. Equine vet J (2010) 42 (5) 420-424.
- Norrdin RW, Stover SM. Subchondral bone failure in overload arthrosis: A scanning electron microscopic study in horses. J Musculoskelet Neuronal Interact (2006) 6 (3) 251-257.
- O' Brien T, Baker TA, Brounts SH, Sample SJ, Markel MD, Scollay MC, Marquis P, Muir P. Detection of articular pathology of the distal aspect of the third metacarpal bone in Thoroughbred racehorses: Comparison of radiography, computed tomography and magnetic resonance imaging. Veterinary Surgery (2011) 40 942-951
- Parkin TDH, Clegg PD, French NP, Proudman CJ, Riggs CM, Singer ER, Webbon PM, Morgan KL. Catastrophic fracture of the lateral condyle of the third metacarpus/metatarsus in UK racehorses – fracture descriptions and pre-existing pathology. The Veterinary Journal (2006) 171: 157-165
- Riggs CM. Fractures – A preventable hazard of racing Thoroughbreds? The Veterinary Journal (2002) 163: 19-29.
- Stover S, Murray A, The California Postmortem Program: Leading the Way. Vet Clin Equine (2008) 24 21-36
- Verheyen KLP, Henley WE, Price JS, Wood JLN. Equine vet J (2005) 37 (5) 442-448

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