Overview of Skeletal Pathology
Welfare Issues in Poultry

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Causes of Lameness

• **Infectious**
  – **Viral Arthritis**
  – **Bacterial tenosynovitis/arthritis/osteomyelitis**
    • Gram positive bacteria: Staphylococcus and Enterococcus spp.
    • Gram negative and other bacteria

• **Noninfectious**
  – **Trauma**
  – **Nutritional**
    • Rickets and dyschondroplasia
  – **Developmental**
    • Conformation/developmental – rotations, varus, valgus
    • Conformational/Behavioral - avulsions
    • Tendonopathy/Tendonosis
Viral Arthritis
Acute Viral Arthritis: Broiler Tendon
Broilers 27 days, VA

Tendon

Tendon

Heart
Staphyloccocal Tenosynovitis
Clinical Signs
4/4 Birds Affected
Pullorum Disease
Escherichia coli
Pasteurella multocida
Pseudomonas aeruginosa
Ornithobacterium rhinotracheale

Dr. Joel Cline photo
Trauma

Microfractures in day-old chicks leading to ongoing lameness from long bone deformity
Long Bone Deformity: 1 day
Aseptic fracture of femoral head
Long Bone Defect: 1 Day
Proximal femur
Long Bone Deformity: 7 days
Femur - Remodeling and repair
Long Bone Deformity: Day 14
Proximal femur - Callus formation
Long Bone Deformity: 6 weeks
Healed telescopic fracture
Lameness

NUTRITION & RELATED
Rickets
Rickets

- Calcium
- Phosphorus
  - Ca:P ratio
- Vitamin D3
Rickets: Broilers, Ca/D3
w/ persistent embryonic cartilage
Rickets: Phosphorus

Critical Issue: Phytase enzyme usage and balance adjustment
Tibial dyschondroplasia (TD)

**Issues**
- Predisposition of heavy breeds
- Narrow Ca:P ratio
- Mycotoxin
- Copper deficiency

![Images of normal and dyschondroplasia bones](image-url)
Femoral head necrosis
Broiler chicken

Septic vs. Aseptic
Valgus deformity, broiler chicken

Distal

Proximal
Turkeys: Varus/Valgus
Turkeys: Avulsion of the Tibial Crest
Avulsion of Intertarsal Ligament
Turkey Poults
Broiler Breeders
Tendon Failure
Broilers
Complete and partial tendon failure
Broiler 60 days, Tendonopathy
Broiler 60 days,
Tendonopathy
Broiler 60 days, Tendonopathy
Tendonopathy/Tendonosis
Tendonopathy - Pathogenesis
Based on Histopathology of Spontaneous Lesion

• Promotional factors
  – Meat type chickens, warm weather, organic arsenicals, biomechanical stress

• Vascular event(s)
  – Broiler tendon poorly perfused (Doppler studies)
  – Arterial medial hyperplasia
  – Fibrin thrombosis

• Ischemia, collagen necrosis

• Granulation tissue (Type I → Type III collagen)

• Recurring episodes of tendon tearing/shearing and hemorrhage

• Tendon failure or partial failure with scar
Lameness Issues of Broilers by Age

- CAV Blue Wing
- E. maxima
- CAV Thymus Atrophy/T-Cell
- Bursal Dis / B-Cell
- E. coli, Ornithobacterium, Enterococcus
- Tendonosis
- Varus, valgus, slipped tendon
- Vertebral O/A
- Coccidia Vx or challenge
- E. maxima
- Viral Arthritis
- Rickets
- Viral Enteritis
- Viral Proventriculitis
- Feed change
- Trauma
- E. coli, Salmonella

Timeline:
- 1
- 7
- 14
- 21
- 28
- 35
- 42
- 49
- 56
Control Points of Lameness

• Infectious disease
  – Prevention
  – Controlling immunosuppression
    • Bursal disease, CAV

• Trauma
  – Hatchery equipment design and settings
  – Training and awareness

• Nutrition and related
  – Monitoring and diagnostics
  – Control of contributing diseases

• Tendonopathy/Tendonosis
  – Nutrition and behavior; risk factors?
  – Accurate diagnostics
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