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Defense and Barriers of the Equine Distal Limb & Foot

Context

The equine foot is a complex set of structures that enables horses to ambulate over most surfaces, conserve energy, and be athletic despite their large size. As 90% of lamenesses in the horse are isolated to the foot, it is essential that veterinary professionals are able to identify structures, describe their normal functions, and define the topographic relationships of structures found within the foot. Communication with clients around these concepts is essential to enacting effective treatment plans, improving the quality of life for your patients and returning them to normal function.

Learning Outcomes

By the end of the session, you should be able to:

- ☐ Identify the insensitive external features of the equine foot.
- ☐ Identify the sensitive internal structures of the equine foot to include the secondary laminae found only in equids.
- ☐ Explain the topographical relationships of the various structures of the equine foot.
- ☐ Describe how the structures of the dermis and epidermis function to suspend the weight of the horse from the hoof wall.
- ☐ Describe how the structures of the equine foot mitigate physical forces when weight bearing (including break over).
- ☐ Describe the effects of laminitis (inflammation of the lamina) on the vasculature, dermal layers (corium), distal tendons and phalanges of the equine hoof.

Criteria for Success

1. Use resources effectively to complete all learning outcomes.
2. Meet all expectations for the learning community during ALE participation.
3. Complete the Connect section.
4. Devise a plan to clear up points of confusion on your own.

Active Learning Instructions

1. **Identify** the following structures of the distal limb and hoof model as you disassemble it:
   - ☐ Coronet (not present, but should be able to define its location)
   - ☐ Hoof regions
     - ☐ Quarter
     - ☐ Heel
     - ☐ Bulbs of heel
     - ☐ Toe
   - ☐ Epidermal components (insensitive)
     - ☐ Wall
     - ☐ Bars
     - ☐ Frog
     - ☐ White line
     - ☐ Sole
   - ☐ Layers of the hoof wall
     - ☐ Stratum externum
     - ☐ Periople

- ☐ Stratum medium
- ☐ Stratum internum
- ☐ Stratum basale (exists at the cellular level). Define its location.
- ☐ Basement membrane (exists at the cellular level). Define its location.

- ☐ Dermal components (sensitive)
  - ☐ Layers of the dermis (corium)
    - ☐ Perioplic corium
    - ☐ Coronary corium
    - ☐ Laminar corium
      - ☐ Primary laminae
      - ☐ Secondary laminae (exists at the cellular level - not visible)
    - ☐ Frog corium
    - ☐ Sole corium

- ☐ Tendons, ligaments & soft tissue structures
  - ☐ Distal tendon of superficial digital flexor (SDF)
  - ☐ Distal tendon of deep digital flexor (DDF)
  - ☐ Distal tendon of the long or common digital extensor
  - ☐ Suspensory ligament (Interosseous ligament)
  - ☐ Medial & lateral extensor branches of the interosseous ligament
  - ☐ Distal sesamoidean ligaments
  - ☐ Lateral cartilages
  - ☐ Digital cushion

- ☐ Bones & bony structures
  - ☐ Cannon bone (metacarpal/metatarsal 3)
  - ☐ Splint bones (metacarpals/metatarsals 2 & 4)
    - ☐ Buttons
  - ☐ Medial & lateral proximal sesamoids
  - ☐ Long pastern, short pastern & coffin bones (proximal [P1], middle [P2] & distal [P3] phalanges)
    - ☐ Extensor process of P3
  - ☐ Navicular bone (distal sesamoid)

- ☐ Joints (do not disarticulate the joints- leave collateral ligaments intact)
  - ☐ Metacarpophalangeal/metatarsophalangeal (fetlock) joint
  - ☐ Proximal interphalangeal (pastern) joint
  - ☐ Distal interphalangeal (coffin) joint

Note: Stop deconstructing the model at this point.

2. The vasculature of the forelimb or the hindlimb between the proximal cannon bone to the toe is in place on the model. **Identify** each of the following structures. Assume it is a right forelimb and a left hindlimb.
   - ☐ Arteries
     - ☐ Dorsal pedal artery (hindlimb)
     - ☐ Dorsal metatarsal artery (hindlimb)
     - ☐ Medial & lateral palmar/plantar arteries
     - ☐ Medial & lateral palmar/plantar digital arteries
   - ☐ Veins
     - ☐ Cephalic vein (forelimb)
     - ☐ Accessory cephalic vein (forelimb)

3. The innervation between the proximal cannon bone to the toe of the forelimb or the hindlimb is in place on the model. One model is of a right forelimb, the other is a left hindlimb. Determine which is which, then **identify** the following structures:

- ☐ Nerves of the distal forelimb:
  - ☐ Dorsal branch of the ulnar nerve
  - ☐ Musculocutaneous nerve
  - ☐ Medial palmar nerve
    - ☐ Communicating branch
    - ☐ Medial palmar digital nerve
    - ☐ Dorsal branch of the medial palmar digital nerve
  - ☐ Lateral palmar nerve
    - ☐ Medial & lateral palmar metacarpal nerves
    - ☐ Lateral palmar digital nerve
    - ☐ Dorsal branch of the lateral palmar digital nerve
- ☐ Nerves of the distal hindlimb:
  - ☐ Deep peroneal nerve
    - ☐ Medial & lateral dorsal metatarsal nerves
  - ☐ Superficial peroneal nerve
  - ☐ Saphenous nerve.
  - ☐ Medial plantar nerve
    - ☐ Communicating branch
    - ☐ Medial plantar digital nerve
    - ☐ Dorsal branch of the medial plantar digital nerves
  - ☐ Lateral plantar nerve
    - ☐ Medial & lateral plantar metatarsal nerves
    - ☐ Lateral plantar digital nerve
    - ☐ Dorsal branch of the lateral digital nerve

4. **Reassemble** the model, associating structure & location to function.

5. **Demonstrate** the landing and breakover pattern of the equine foot.

Connect

1. Complete all learning outcomes listed above.
2. Describe all of the differences between the feet of an ox, pig, horse and dog.
3. Explain a motor pathway from the brain to P3 naming every structure along the way.
4. Explain a sensory pathway from level of P3 to the brain naming every structure along the way.
5. Describe the main route for arterial supply from the heart to the toe.
6. Describe the main route for venous return from the toe to the heart.