



## Structures of the Foot

- Coffin Bone: the major bone of the foot that supports the horse's weight (the hoof wall is the *major* weight bearing structure)
- Navicular Bone: small wedge-shaped bone laying under the back of the coffin bone
- Navicular Bursa: fluid filled sac which cushions the navicular bone and the deep digital flexor tendon
- Deep Digital Flexor Tendon: Crosses the navicular bone and attaches to the underside of the coffin bone
- Digital cushion (aka plantar cushion): spongy structure above the frog containing blood vessels. Pressure on digital cushion helps to pump blood supply back up the leg with each step
- Coronary Band (aka coronet): Outer band of tissue at the hairline from which the hoof grows (at a rate of about  $\frac{1}{4}$  to  $\frac{3}{8}$  inch per month)
- Corium: The deep tissue beneath the coronary band that produces the horn
- Wall: Hard outer shell of the hoof made of tiny hairline tubules called "insensitive laminae". The wall of the hoof supports the horse's weight. The wall angles backwards at each end forming the "bars". These aid in absorbing shock and allowing the foot to expand under pressure. Most of the horse's weight is borne by the wall of the feet.
- Sensitive Laminae: Tiny hairlike tubules that grow from the surface of the coffin bone and interlock with the insensitive laminae of the wall. The sensitive laminae have blood and nerve supply. The interlocking of these 2 types of laminae suspends the coffin bone in a strong, hard, protective casing that can flex under pressure
- Periople: Thin varnish-like outer layer of the hoof which keeps moisture in
- Sole: the ground surface of the hoof, inside the wall. The outer layer of the sole is insensitive, the sensitive sole is the deep layer next to the underside of the coffin bone which has blood and nerve supply. The sole should be arched or concave, not flat.
- White Line: the junction between the sole & the hoof wall
- Frog: Rubbery, wedge-shaped structure that lies between the heels. The frog normally makes contact with the ground first. The frog helps to absorb shock and helps to pump blood back up the leg by compressing the digital cushion at each step.
- Lateral Cartilages: Wing-shaped cartilages that extend from the upper sides of the coffin bone and form the flexible bulbs of the heels. They aid in foot expansion.

As weight is placed on the hoof, pressure is transmitted through the phalanges to the wall and onto the digital cushion and frog. The frog presses up on the digital cushion, which flattens and is forced outward against the lateral cartilages. The frog also is flattened and tends to push the bars of the wall apart. When the foot is lifted, the frog and other flexible structures of the foot return to their original position.

When the foot is placed on the ground, blood is forced from the foot to the leg by the increase in pressure and by the change in shape of the digital cushion and the frog. The pressure and the change in shape compress the veins in the foot. When the foot is lifted,

the compression is relieved and blood flows into the veins again. In this way, the movement of these structures in the hoof acts as a pump. Exercise increases the blood circulation in the foot and favors good hoof growth. Lack of exercise, dryness of the horny wall, and poor nutrition inhibit hoof growth.

### Functions of the Foot

- Weight bearing:
  - Hoof wall carries most of the horse's weight
  - Frog also bears weight when hoof sinks onto soft ground
  - Sole can bear some weight but it's main function is protection of deeper structures within the foot
- Absorbing shock
  - The foot is a major shock absorber along with the joints and angles of the legs
  - Elastic structures like the frog, digital cushion, and lateral cartilages, and expansion of the walls and heels, help the foot absorb shock reducing concussion to bones and joints
- Pumping blood
  - The lower leg and foot have no muscles to aid in pumping blood. They are also a long way away from the heart.
  - The pumping action of the foot during movement helps the circulation
  - Blood enters foot thru the digital arteries. The blood vessels of the hoof run thru the digital cushion. With each step the digital cushion is squeezed between the coffin bone, lateral cartilages, and frog, compressing the veins and pumping blood back up the leg toward the heart. One-way valves in these veins prevent the blood from returning to the foot.
- Traction:
  - Ground surface of the foot provides a nonslip surface on different kinds of ground
    - The frog helps prevent slipping on hard ground
    - The arched shape of the sole helps stabilize the foot on soft ground
    - The front edge of the hoof digs into the ground as it breaks over
- Protection
  - Tough, insensitive outer structures protect softer, sensitive parts inside
  - Hoof wall, sole, and frog are insensitive and can tolerate concussion, abrasion, heat and cold
  - Periople seals the hoof protecting the horn from moisture loss
  - The outside of the coronary band is less sensitive than the inner coronary band, but is more sensitive than the other outer structures of the foot
- Growth and Repair
  - The foot constantly repairs itself
  - Dead cells and those worn away by contact with the ground are replaced
  - Hoof wall grown from the corium which is located beneath the coronary band and is like the nail bed that fingernails grow from
  - The corium produces horn tubules which make up the horny wall of the hoof. It also produces the periople.

