TOPOGRAPHY OF THE HOOF

This description of the anatomy of the foot entails the hoof and all of the structures within it, with some reference to certain related structures. The hoof itself is nothing more than cornified epidermis, similar in makeup to the human fingernail, and contains no nerves or blood vessels but relies upon the corium, another inner layer just interior to the white line, to provide the circulation and sensitivity necessary to maintain a healthy foot. Since the hoof itself is not sensitive, we must understand its relationship to the inner structures in order to comprehend any lameness related to the hoof. The nomenclature (set of names) of the external parts of the hoof is divided into the following areas:

1. **The bulbs of the heel** - These structures are at the back part of the ground surface of the foot, behind the angle of the hoof wall. Internally they receive support from the digital (plantar) cushion.

2. **The frog** - This is a triangular or wedge-shaped structure with the apex pointing toward the front of the hoof and is terminated by the base at the rear. Two grooves, one on each side of this structure are known as the collateral sulcus, collateral grooves, or commissures. The central ridge is named the frog stay or spine of the frog and contains a furrow called the central sulcus or cleft.

3. **The bars** - Near the heel the wall of the hoof turns back toward the front portion and this continuation forms a ridge on both sides of the frog known as the bars.

4. **The wall** - The wall is that part of the hoof that is visible when the horse is standing. This surrounding structure encompasses the coffin bone and all inner parts. It is elastic in nature and continually grows downward from the coronet. It is divided into three general areas: toe (front), quarters (sides) and heel.

5. **The sole** - The sole makes up a major portion of the surface area of the bottom of the hoof. It provides support for the internal structures.

6. **The white line** - This boundary serves as a junction between the wall and the sole and is clearly visible around the circumference of the sole, although it is never truly white.

7. **Water line** - This is the point at which the hoof wall changes from pigmented to unpigmented horn.

The wall of the hoof is composed of a horny material that is produced continuously and must be worn off or trimmed off. The hoof wall does not contain blood vessels or nerves. In the front feet, the wall tends to be thickest at the toe; in the hind feet the hoof wall generally maintains a more uniform thickness. All external components are meant to be weight-bearing structures of the foot.
Inside the Hoof

Inside the hoof, lateral cartilages extend back and up from the inner and outer sides of the third phalanx (Figure 1). These cartilages are flexible, but as the horse ages, they are often ossified and replaced by bone.

![Figure 1](image1)

Between the second and third phalanges and above the deep flexor muscle tendon is a small bone called the navicular bone (Figure 2). The navicular bone and its associated bursa -- a fluid-filled sac that reduces friction between the tendon and the bone -- are involved in navicular syndrome, which is a common cause of lameness.

![Figure 2](image2)

The corium or pododerm (Figure 3) is the general term for a structure that is a massive supply of blood vessels that feed the hoof and function as a nutritional source to the hoof. Within this these blood vessels combined with nerves form a sensitive layer intimately attached to the inside of the hoof wall and the 3rd phalanx.

![Figure 3](image3)
The **digital (plantar) cushion** is a wedge-shaped modified subcutaneous tissue located within the back part of the hoof and is composed of elastic fibers and some cartilage. It is a mass of flexible material that contributes to the formation of the heels (Figure 4). This structure is one of the primary shock absorbers of the foot.

Flexible structures in the horse's hoof expand and contract with each step as weight is transferred from one foot to another. This process is referred to as “hoof mechanism.”

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, a highly elastic wedge-shaped mass, normally makes contact with the ground first. 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 (Figure 5). 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.