



Functions of the Hoof

The function of the hoof is to carry and move the body, anytime and regardless of temperature, terrain and age of the horse.

Protection

The thick horn capsule protects the inside of the hoof from mechanical forces. It grows enough to withstand the natural abrasion of 10 and more miles a day. The more the horse moves, the more horn will be produced.



Temperature Insulation

Horses living for months on end in snow and ice around the arctic circle maintain a steady temperature inside the hoof capsule; "hot" shoeing does not overheat the inside of the hoof. The hoof capsule functions as an insulator for the sensitive



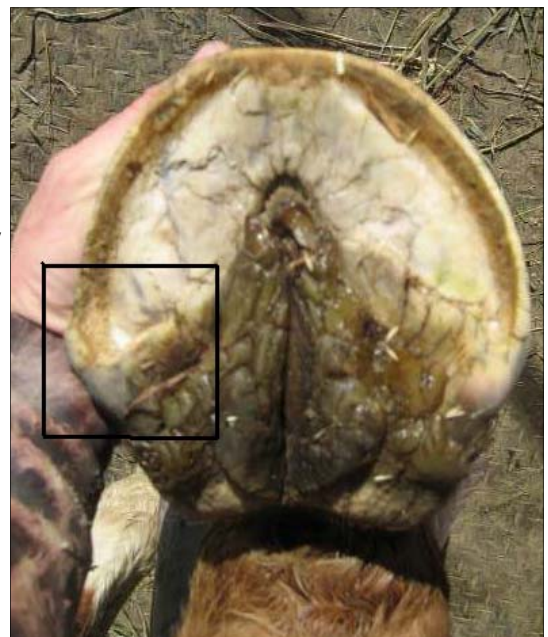
structures inside the hoof. No matter if the horse lives for months in icy conditions or in a hot desert climate, the hoof capsule always keeps the inner temperature at around 100° F. This way the metabolism inside the hoof can function optimally.



Traction

The hoof is conical in shape, the wall meets the ground at an angle, giving the hoof a wedge-like action on soft, slippery ground.

Frog, bulb and heels are all on the same level in a sound hoof. On weight bearing this provides a suction cup effect on very slick terrain, like wet pavement or ice. In the heel-bar triangle the walls and bars act like skid brakes. In a naturally worn hoof the walls are rounded.



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Suction Cup Effect

Another mechanism that plays a role in stability is the suction cup effect of solar concavity. The DDFT inserts into the flexor surface of P3 and into the dermis that underlies the bars of the heels. When the fetlock is hyperextended, immediately after placement of the foot, tension in the DDFT would draw up on the interior of the sole and create a "suction cup" effect that pulls the bearing surface of the hoof wall firmly onto the ground.

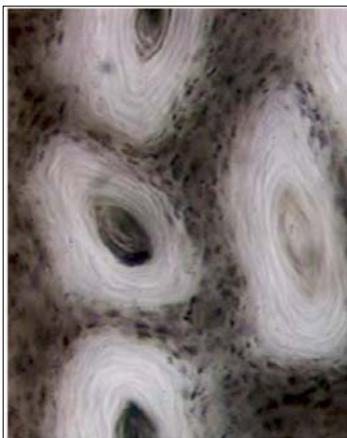
This suction effect would be released as the body weight swings forward ahead of the limb and the fetlock straightens prior to the limb being lifted off the ground again.

Because of its rounded shape, concave underside, and elastic wedge of the frog at the back, the shape of the hoof capsule on its own is likely to create a suction cup effect on at least some types of surface when the hoof capsule is loaded.

Shock Absorption

In a natural hoof the bones are aligned in such a way that upon weight bearing the impact force is partially absorbed similar to a leaf spring.

The spiral horn tubules act like natural springs. The Veterinarian University in Zurich /Switzerland conducted various studies proving the reversible compression of horn tubules. Horn tubules can only move independently when the connective horn between them is intact and elastic.



Left: This picture is a magnification of these shock-absorbing horn tubules



Lamellae and laminar horn have a tight, but elastic bond, they also contribute to shock absorption.



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The lateral cartilage functions as a lateral shock absorber and eases stress in breakover



Heart Supporting Circulatory Pump (NOT)

By being flexible (expanding on weight bearing, narrowing during non-weight bearing), the hoof capsule acts as a circulatory pump in the area of the corium, supporting the heart with each step by moving the blood from the far end of the extremities back up the leg to the body.

At least that is what we believed in until Dr. Robert Bowker told us that the heart of the horse is totally adequate for his size and the horse is one of the few animals who has pulsating veins, which means the veins themselves transport the blood up the legs, no pumping from the hoof capsule is required. This makes sense as the shod horse would otherwise not be capable of doing anything.

Feeling

Last but not least the hoof functions as a conductor of sensations. The horse is able to feel the ground through the tough hoof capsule and respond to this feeling appropriately (i.e. not placing full weight on the hoof when stepping on a sharp rock). As a prey animal the horse also relies on vibrating sensations transmitted through the hoof capsule, thus warning him of oncoming predators long before he can see or smell them.



Picture credits:

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HoofCareUnLtd. and The Glass Horse-The Equine Distal Limb

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