Newly Discovered Shock Absorber in the Equine Foot

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7-24-07 Pete Ramey Copyright 2007

Important note: These are just preliminary observations. They are my interpretation after several conversations about it with Dr. Bowker. The completed research project is coming eventually, but people who went to his last clinic are buzzing about it, so I thought I'd try to clear it up.]

Robert Bowker VMD, PhD has been teaching for many years that the blood flow in the equine foot acts as a hydraulic shock absorber. Most of his focus has been on the back half of the foot, but more recently he's paying more attention to energy dissipating features in the front half of the foot as well.

Recent data shows that peripheral loading of the foot reduces hoof perfusion by almost 50%.... Immediately. This does not necessarily cause tissue death, because the sole's corium is filled with a huge number of micro-vessels; a tremendous amount more than is needed for healthy tissue life. Bowker feels these 'extra' blood vessels are for hydraulic energy dissipation, but more recently he's discovered that the entire structure of the sole's corium is a mixture of venous microvasculature surrounded by proteoglycans- an extremely elastic structure (along with a "honeycomb" framework of keratinized sole). This type of structure is known to have "use it or loose it" tendencies. The more it is used the better it develops.

Bowker has noticed that unhealthy or underdeveloped equine feet have a thin solar corium that is fairly uniform all the way across (1-3 mm), but healthy, well developed feet have a much thicker corium in the outer periphery. This thicker corium may be 3-5 mm thick (or more) in the healthiest hooves.

Aside from a tremendous "Gel Pad" shock absorber, this thicker corium also allows for a great deal of expansion room of the front half of the foot. This is very significant, as many people still think the expansion only happens in the back half of the foot; where the foundation for the hoof capsule is cartilage instead of bone.

The pictures below are 10mm thick slices taken 12mm behind the apex of the frog. Notice as I apply hard pressure with my hand, the solar corium flattens, the frog moves to the ground and the walls spread dramatically. The force required to do this is basically "as hard as I can push". As this is studied more, we'll elaborate, but I thought you'd like to hear about it now. Pete

The walls can spread significantly as pressure is applied to P3 and the sole flattens. The thicker corium at the distal border of P3 is compressed, pushing blood to the back of the foot through an energy dampening network of micro-vessels. Then when the load is released, the elastic nature of the sole's corium and "spring tension in the hoof capsule snaps it all back into place for the next stride. (These pictures are the exact same size, of the same slice, and taken from the exact same range, 2 second time lapse.)

At Rest

Applying Hard Pressure

Also note that this pressure does not create a separational force on the laminae; they actually compress!!! If the wall was not allowed to expand, the same downward force would stretch the laminae.

The thin corium at the center of P3 seems to thicken with weight bearing, as the corium at the outer periphery is compressed.