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Underrun Heels?



Maybe It's the Shoes

American Quarter Horses are part of ongoing research into the effect of shoes on injury in racing and performance horses.

By Katie Navarra

PREVENTING INJURIES IN RACING AND PERFORMANCE HORSES IS a priority for owners, trainers and the professionals who take care of them, not only for the horses' welfare and well-being, but also for the longevity of their careers.

It's an important topic for the professors and graduate students at the University of California-Davis School of Veterinary Medicine in Davis, California. So much so, that graduate student Vanessa Dahl proposed studying the effect that horseshoe length can have in creating hoof-wall strains and fetlock extensions – also known as underrun hooves.

"Vanessa had a keen interest in understanding how underrun hooves develop and hypothesized that there were a couple of different ways that the problem might be occurring after observing how shoes are applied in racing and performance horses," says her adviser, Dr. Susan Stover, a UC-Davis veterinarian and professor of anatomy, physiology and cell biology.

Specifically, the duo is trying to understand how underrun heels develop and the role horseshoe length might play in the condition's progression. Preliminary work began in 2015 and continues with 12 Quarter Horses included in the study.

It can be challenging to manage a horse's feet. Underrun heels are one of the most common abnormalities today. Balancing an acceptable appearance with a shape and structure that supports the horse's conformation is not always an easy task. For racing and performance horses that are expected to stay in work, it can be particularly frustrating. Environmental factors, genetics and poor hoof care can compound the issue. And based on Vanessa's observations, horseshoe length might be contributing to the issue.

Defining Underrun Heels

UNDERRUN HOOVES ARE ALSO KNOWN AS UNDERRUN HEELS OR long toe/low heel. While horses can have low heels, which is more prevalent in some breeds than others, an underrun heel is not a normal hoof conformation, Vanessa explains.

"Underrun heels are defined as a difference of five degrees or more between toe and heel angles with the heel angle being more acute," Dr. Stover says. "The tubules that make up the hoof wall go from a vertical orientation to a more horizontal orientation, especially at the heels of the hoof."

It is common practice in the racing industry to shoe horses with shorter bar lengths to help prevent a horse from pulling a shoe with the hind foot when running. The large majority of these horses also have underrun heels, which has been associated with fetlock breakdowns.

"Since a large portion of racehorses have this underrun hoof conformation, it was suspected that shoe length might be playing a part in encouraging this type of hoof growth," Vanessa says.

The condition has also been seen in performance horses. Rather than fetlock injuries, performance horses tend to experience gluteal pain and foot pain.



COURTESY OF VANESSA DAHL

Gluteal pain occurs over the rump region of the hindquarters. Symptoms can range from a reluctance to perform to bad behavior or an abnormal gait. Horses with gluteal pain might also have sore backs, show resistance to the rider or be unable to create impulse from the hind end. Palpating the gluteal muscles in the hindquarters can confirm the source of pain.

Study Design

THE UC-DAVIS STUDY BEGAN WITH AN EXPERIMENT ON cadaver limbs of nine horses that had been euthanized for reasons unrelated to this study. Instruments to measure load were placed on the cadaver legs. Then each leg was put in a machine that loads it with a force equivalent to the force of a canter and the researchers took measurements.

"This method is a great way to perform an experiment in a controlled environment, so we can control factors that are not usually possible to control, like a horse's patience," Vanessa explains. "This way, we can tease out specific changes."

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A full shoe, above, and a short shoe



It also prevents pain for live horses.

Specialty shoes were made to be able to change out different shoe lengths to compare fetlock extension, hoof distortion and hoof expansion under loading conditions similar to a canter.

After the initial cadaver study was completed, 14 Thoroughbreds and 12 Quarter Horses joined the study group, the goal then being to compare shoe length on hoof growth and hoof distortion. Horses are shod with one of two shoe length treatments for a period of 15 weeks.

At the end of the 15 weeks, the shoe length is switched and the second is tested for the next 15 weeks. Photographs are taken at each shoeing (every five weeks) to measure hoof angles and growth.

Defining an acceptable standard for hoof angles and growth is challenging. These measurements can vary quite a bit from one horse to the next and from one breed to another. Typically, hoof growth averages between 1/4 to 3/8 inch per month.

Most farriers tend to trim the hoof so that the toe angle matches that of the pastern, Vanessa explains. This means that a horse with a more upright pastern will have a more upright hoof and a horse with a longer, more sloping pastern will have a more sloping hoof.

This generally gives front hooves an average hoof angle of 52 degrees in the front feet and approximately 55 degrees in the hind feet. However, Dr. Stover cautions that there is quite a bit of range.

"It is up for debate, as professionals seem to change that definition as they learn more," she says.

What Does It Mean?

MANY OF HORSES WITH UNDERRUN HEELS EXPERIENCE FOOT PAIN that can become a chronic problem. These horses apply more pressure on the heel more than normal horses, and the increased stress causes heel pain. Prolonged discomfort leads to more downtime for rest and can limit a horse's performance ability.

The cushion structures within the heel inside the hoof are less prominent in underrun heels, decreasing the hoof's ability to absorb concussion.

"There is greater compression on the navicular bone because of increased tension in the deep digital flexor tendon that runs over the navicular bone, which could play a role in navicular syndrome, though more studies need to be done to confirm this.

The typical treatment is to raise the heels with a wedge pad, but that treatment doesn't help to bring the tubules back to a more upright orientation. Instead, it furthers the bending in a forward direction, Dr. Stover says.

Whether or not underrun heels can be corrected is currently up for debate. Vanessa hopes the study will answer whether proper management will alleviate the problem.

"The horses with the full shoe condition should have a hoof growth that grows toward a more correct orientation," she predicts.

The researchers think horseshoe length plays a key role in management. Their goal is to publish the full findings from the cadaver study later this year. The results of the live study are projected to be available in 2019. ■

Katie Navarra is a special contributor to the Journal. To comment, write to aqhajrnl@aqha.org.