

# NIGHT VISION in endurance horses

by Melinda Newton, DVM

**R**iding at night is my favorite part of 100 mile endurance rides. I love riding under the stars with perhaps a few glowbars attached to the breast collar, a red-light headlamp on my helmet, and— if I'm lucky—a moon overhead. Unlike other sports such as trail running, where participants rely on a bright headlamp to illuminate the trail before them after sunset, riding at night is an exercise of trust in the equine partner and their night vision.

Some estimates put the horse's night vision at 50% better than humans, but what does this actually mean, in the practical sense? Current thought is a horse on a moonlit night can see as far as we can in full sunlight.

A 2009 study explored just how good equine night vision is by using positive reinforcement to teach horses to identify different shapes and then lowering light levels in the study area. Light levels approximated moonlight, starlight, and darkness found on a moonless night under tree cover. Only when levels were dropped to pitch-black did horses have trouble identifying large and medium-sized shapes; however, even at this low-light level the horses easily navigated around in their enclosures, avoiding testing equipment, a feat the human researchers could not duplicate.

The researchers became unwitting participants in their own experiment, presumably to the chagrin of their bruised shins, while adjusting equipment in the dark enclosures.

While asking my mount to correctly distinguish a triangle from a circle by starlight may not be a part of my next endurance ride, this study probably confirms the suspicions of most who have ridden in night conditions. Horses have an almost magical ability to navigate terrain at night and can probably see that rock in the middle of the trail, even if we can't. It is usually best to trust them to choose the right path without flooding their view with artificial light.



However, there are limits to their night vision. One of my scariest moments in an endurance ride was riding through a pitch-black unmarked trail under heavy tree cover at a 100 mile endurance ride. Ride management had run out of glowbars and wished us luck, assuring us it was a short section. Blindly crashing through the underbrush as both of us desperately looked for the trail in blackness so thick I couldn't see my hand in front of my face, my mare seemed as blind as

I was until we got back onto the road and under the stars.

Why are horses so good at night? The horse eye has several adaptations enabling them to spot prowling nighttime wolves better than their human riders. The sheer size of the large horse eye can collect more of the available light. Horse pupils can also dilate to an astounding degree, collecting as much of that light as can be had and directing it towards the back of the eyeball.

The presence of a reflective panel on the retina called a tapetum lucidum is another low-light adaptation. It's the glowing thing you see when you shine your flashlight into the bushes and see a wild animal looking back at you—at least until you figure out it's just your house cat. This panel at the back of the eye reflects light and scatters it across the photoreceptors in the eye, letting the eyes see more in low light conditions. The trade-off for this scattered light is a decrease in visual resolution.

Light receptors in the eye come in two

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forms, rods and cones. Cones are responsible for color and daytime vision, while rods are responsible for night vision. I can remember a high school physics experiment that compared the differences between rods and cones in the eye. It takes time for the rods in our eyes to activate once the lights go off, which is what we refer to as letting our eyes get used to the dark. For the experiment we sat at our desks with our heads down and our fingers pressed over our eyelids to prevent any light from coming in, letting our rods take over.

After 10 minutes the teacher led us outside, our fingers still pressed over our eyelids, into a bright sunny day. On cue we opened our eyes and then closed them quickly—just a blink. There was a perfect impression of the landscape inside our eyelids but with the wrong colors, kind of like the negative of a picture. We could do this two or three times until the light deactivated the rods, and our eyes switched over to primary cone, or bright light, vision.

The distribution of these types of light receptors has very important implications for night vision. Both horses and humans have similar rod and cone ratios, with rod photoreceptors dominating in number over cones, but the distribution on the retina between the two species is different.

Cones in humans, used for daylight color vision, are concentrated in the middle of the visual field, while the rods are found in the periphery of our vision. This is why we can see things better at night if we don't look directly at them.

The horse's distribution of photoreceptors is intended to maximize the ability of the horse to detect movement, scan the earth-sky interface and see things at night, while sacrificing some aspects of daylight vision.

Using a white light seriously impacts the horse's night vision, and it does that for longer than the light impacts ours because of these physiological differences in our eyes. While the horse eye is better at night, it also takes it longer to adapt to the darkness once exposed to light—approximately 15 minutes as compared to the five to 10 minutes for the human eye. This is why your horse will stumble on its way to the water trough or on the trail after you've flashed him in the eyes with your flashlight on a dark night, even though your eyes have already adjusted back to darkness.

If you must use a white light on the trail to navigate for a short time, allow your horse to graze in the dark for 15 minutes, especially if the trail is technical, before remounting and continuing.

There are many things that can go wrong during a night ride, but rarely is it a problem with your mount's night vision. Some horses have an unusual hereditary condition called Congenital Stationary Night Blindness (CSNB) that can cause night blindness in horses. This rare genetic, non-progressive disease is most commonly described in Appaloosas but has also been identified in Thoroughbreds and Paso Finos.

What is known as "moon blindness" is not related to night vision at all, but is a term often used for recurrent uveitis, a painful condition of the eye with a variety of risk factors. If you have concerns about your horse's night vision, schedule an ophthalmic exam with your veterinarian.

When I'm not riding 100 miles, I still enjoy the occasional night conditioning ride at home, or an arena session under the stars. With season-shortened days, you may be saddling up after sunset too. Whether you choose to confine your night riding to endurance rides only, or head out into the darkness from home, understanding the physiology behind how we see at night will set you and your endurance mount up for success. ■

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