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Clues for Recognizing Confusing Neurologic Syndromes

One horse walks circles compulsively and appears as if he hasn't had his morning coffee. Another stands a bit lopsided and doesn't blink when you raise your hand toward her eye. The bad news is both horses show signs of potential neurologic disease, and their veterinarians are tasked with digging deep, remembering which sections of the nervous system control which body parts, and whether the function is same-side or mirrored. The good news is horses give very subtle clues that can help the clinician pinpoint the cause so treatment can start.

Robert MacKay, BVSC, PhD, Dipl. ACVIM, professor of Large Animal Clinical Sciences at the University of Florida College of Veterinary Science, described the possible meaning of some confusing neurologic findings the 2015 American Association of Equine Practitioners (AAEP) Convention, held Dec. 5-9, in Las Vegas.

Consciousness

MacKay began by describing the life-sustaining operation of consciousness, which is based in the reticular formation of the brain and runs the cardiovascular system, breathing, and swallowing. A part of this formation, called the ascending reticular activating system (ARAS), is responsible for wakefulness and transitions in and out of wakefulness. Injury location determines the effect on a horse's wakefulness. For instance, midbrain injury (to the uppermost part of the brainstem, which is involved in basic, unconscious body function) results in profound obtundation, or dulled alertness; cerebral injury (the portion of the brain concerned with conscious thought, perceptions, and learned skills) might have no effect at all to a serious effect on consciousness; and widespread injury to the forebrain, which, as it sounds, is the forward-most part of the vertebrate brain, including the cerebrum, hypothalamus, and thalamus, is necessary to moderately affect consciousness.

Behavioral Changes

Changes in a horse's behavior can also be explained by brain injury location. For instance, says MacKay, a horse with dementia is likely to have a forebrain lesion. Examples of neurologic deficits possibly attributable to brain injury include:

- Loss of learned behaviors (e.g., no longer knowing how to be led);
- Altered inherent behavior (e.g., a foal no longer bonding to his dam);
- Bizarre postures;
- Repetitive compulsive motor activity, such as circling;
- Teeth grinding, a nonspecific sign consistent with encephalitis;
- Head-grinding, often manifested as pushing forward into a stall corner with the head below the withers, one cause being hyperammonemia from coronavirus enteritis, which can cause encephalopathy;
- Compulsive yawning, which can occur with encephalopathy, especially that seen with liver disease;
- Self-mutilation, as seen in many rabies cases; and

Seizures, which might be classified as a form of dementia and can occur with Eastern equine encephalitis, for example.

Compulsive Circling

A horse that circles incessantly could have either asymmetric vestibular (pertaining to the balance mechanism in the inner ear and brain) injury or a forebrain lesion. The vestibular signs include:

- Head tilt and small and incomplete circles;
- Signs of accompanying cranial nerve dysfunction, such as facial paralysis or atrophy (wasting) of the jaw muscles; and
- Staggering and falling toward the inside of the circle, but the ability to make an accurate recovery.

A forebrain lesion, such as might be seen with moldy corn poisoning, causes the horse to:

- Hold his head vertically;
- Complete large coordinated circles (without staggering), though it results from compulsive behavior (dementia); and

Suffer from central blindness or diminished touch perception usually, but not always, of the eye or face on the outside of the circle.

Altered Menace Response and Pupillary Light Reflexes (PLRs)

When the horse fails to blink when a hand waves in his face, that's a deficit in the menace response. "Other reactions to the menace gesture, like head aversion and eyeball retraction into the socket, are not part of the menace response," MacKay said. "For clinical purposes to localize which part of the brain might be affected, this response appears to be generated by the brain cortex on the side opposite to the tested eye. In contrast, pupillary light reflexes (PLRs) use specific nerve pathways that go both directly and cross over the midbrain to cause constriction of the pupils."

Damaged Facial Nerves

"Injury external to the skull only affects one of the three branches (somatic branch) of the facial nerve," said MacKay. There may be loss of blink reflexes, but the eye is still able to retract, and the third eyelid still functions to spread the tear film across the cornea, although not as well as usual, so mild corneal ulcers might develop from slight dryness. In contrast, injury to the greater petrosal branch of the facial nerve within the skull leads to dry eye and rapid corneal damage due to a loss of multiple functions within the eye that deliver the tear film.

Nystagmus

This repetitive uncontrollable eye movement can be caused by neurologic lesions in various locations: a) a lesion in the vestibular system (which controls balance) referred to as peripheral nerve dysfunction; b) a lesion in the central nervous system medulla (the spinal cord, as with equine protozoal myeloencephalitis); or a central lesion within the cerebellum (which controls motor control and cognitive function), in which case the head tilts the direction opposite the lesion. Typically, peripheral and medullary lesions cause horizontal (side-to-side) nystagmus, while central lesions usually change orientation to patterns other than horizontal.

Take-Home Message

Specific neurologic signs can help the skilled, carefully observant veterinarian pin down or rule out lesion location to better define the cause and, when possible, implement appropriate treatment.