Signalment and History

- 6-year-old American Paint gelding
- The gelding had new owners who purchased him 7 months prior
- During a show, the gelding exhibited unusual behavior and appeared to suddenly become blind

History and Physical Exam

A 6-year-old American Paint gelding displayed unusual behavior during a show, appearing to be agitated in his round pen. He was following the fence line, but as he did, his head crashed with each fence post. Surrounding observers thought the horse seemed blind. They were able to approach the horse and calm him down until the owner was notified.

The horse was conscious but only partially responsive to external stimuli, and showed some unusual, repetitive lip movements that made a ‘smacking’ sound. The lip movement stopped shortly after the owner arrived, and the horse was described as ‘not himself’ for at least 24 hours. He was not interested in food.

The horse was brought to a nearby referral center, where a physical exam and blood work, including glucose and electrolyte concentrations, were normal.

The owners had purchased this horse 7 months prior, knowing that the horse had been deaf probably from birth on. Unusual behavior of agitation and unresponsiveness had been observed twice before, but had always been explained with ‘colic.’

During one episode, the horse was found recumbent in the trailer after a 6-hour drive from the show grounds to home. He appeared agitated, and showed muscle fasciculations and some traumatic skin lesions.

With each episode, the horse was treated with flunixin meglumine and xylazine which seemed beneficial, but treatment took several hours to show an effect.

The horse was routinely vaccinated against EEE/WEE/WNV and Tetanus.

List of Differential Diagnoses

- Behavioral problems
- Response to pain, coping with pain

CONTACT INFO

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At Colorado State University, equine veterinary care is delivered through the collaboration of three nationally recognized equine service centers:

- Colorado State University Veterinary Teaching Hospital Equine Service
- Colorado State University Equine Reproduction Laboratory
- Colorado State University Orthopaedic Research Center

Equine treatment capabilities at CSU are at the forefront of equine veterinary medicine through the shared expertise of these organizations.

Questions regarding this case file may be directed to:

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csvth.colostate.edu
• Unobserved collapse with observed post-collapse behavior
• Unobserved (or misinterpreted) seizure activity followed by a post-ictal period

Pro and Contra Argumentation for Each DDx

• Behavioral problems: Behavior is a possibility, as it can appear unexpectedly and can show with a variety of presentations. However, according to the owner, the horse’s character and behavior had always been immaculate under a variety of circumstances, with other horses, at different show grounds, and with veterinarians and farriers alike.

• Response to pain, coping with pain: A potential source for pain was not identified, although physical exams following an episode were incomplete. On the other hand, there were responses to non-steroidal anti-inflammatory administration; however, with simultaneous xylazine administration, it remained unclear which of the 2 treatments the response could have been attributed to.

• Unobserved collapse with observed post-collapse behavior: Collapse can be defined as a loss of postural tone with or without loss of consciousness, and can be subdivided into syncopal and non-syncopal events. A syncopal collapse is characterized by cerebral hypoperfusion, while a non-syncopal collapse with loss of consciousness can be caused by seizure, sleep disorder (narcolepsy), or hypoglycemia (Lyle et al., J Vet Intern Med 2010).

Unless there is sustained cardiac disease or persistent hyperinsulinemia, abnormal post-‘event’ behavior with a prolonged duration is most likely due to a seizure, and the post-event is also called the post-ictal phase. A post-ictal period in horses varies in duration between 1–5 days, and is associated with a variety of clinical findings including obtundation, ataxia, cortical blindness, cranial nerve abnormalities, etc. A seizure is an extremely energy-consuming condition for the brain. There is inappropriate release of neurotransmitters, activation of membrane pumps, and a delay in re-establishing resting membrane potential and neurotransmitter break-down or re-uptake. Some neurotransmitters are extremely neurotoxic. The post-ictal period is therefore a period of brain restoration.

As there was a concern for horse welfare and human safety, the horse was brought to the Colorado State University Veterinary Teaching Hospital for a comprehensive work-up. We found no abnormalities during a physical examination, and a CBC and a chemistry profile were normal.

Epilepsy was our primary suspicion based on the history, the event frequency, and the likelihood of observations during post-ictus. A seizure can be partial or generalized, or an initially partial seizure develops into a generalized seizure. Epilepsy is defined when more than two individual seizure events have occurred over time, and can be familial, cryptogenic, or symptomatic (i.e., secondary to known disease). Epilepsy in horses is most commonly cryptogenic (about 50 percent of cases). In a review of epilepsy cases, one-third was found to be symptomatic (Lacombe et al., EVJ 2012). It is, therefore, worthwhile to look for possible epilepsy causes, as they may be responsive to therapy.

Common causes for symptomatic epilepsy in horses without systemic abnormalities are:

i. EPM
ii. Post-brain ischemia scarring
iii. Pituitary hyperplasia
iv. Other CNS infections (Strep. equi equi; EEE, WEE, WNV; Halicephalobus gingivalis, Listeria monocytogenes, etc.)
v. Vascular aneurysm, vasculitis
vi. Neoplasia
vii. Immune-mediated disorders resulting in inflammation and vasculitis
Further Diagnostics

Complete neurological examination
- Comments: Causes for symptomatic epilepsy usually show with a wider range of clinical (neurological) signs.
- Results: Normal exam findings, except deafness.

Observations during hospitalization
- Comments: We have hospitalized a number of horses with a suggestive history of epilepsy at the CSU-VTH Equine Hospital. We have a stall available with padded walls and continuous camera surveillance. However, from experience we have learned that epilepsy events may be suppressed in a new environment. Also, because these events can be infrequent, a 3–4 week observational period may not be long enough.
- Results: In week 4 of hospitalization, the horse showed unusual muzzle movements, flehmen and repetitive, fast ‘eye blinking’ for about 10 minutes. In week 5, we observed (and recorded—click here to see the video) partial seizure activity with left-side repetitive eye blinking, head turn, some torticollis culminating into vertical head-neck movements, and repetitive hind limb activity. We successfully terminated this event by administering 50 mg of diazepam IV.

CT Study combined with an Iohexol contrast study
- Comments: The CT study, which was followed by CSF collection and analysis, was done in week 1 of hospitalization. An MR-study would have been preferred; however, the setup of the equipment does not allow a head-MR in an adult horse at CSU. Iohexol contrast accentuates regions with increased blood flow during a CT study.
- Results: Normal appearance of structures; no areas with increased contrast uptake. Special attention was paid to the pituitary gland (Fig. 1), both temporo-stylohyoid joints (Fig. 2), and to the basisphenoid and petrosal bone.

CSF analysis
- Comments: This analysis is a ‘must’ for accurate EPM diagnosis; CSF can further reveal inflammatory/neoplastic conditions.
- Results: SAG 2,3,4 CSF to serum ratio was negative, <1: 2.5 in CSF, 1: 250 in serum. Hence, a negative EPM diagnosis. Furthermore, cell count in CSF was increased with 11 nucleated cells/μL, primarily lymphocytes, no
neutrophils. Total protein was normal at 39 mg/dL. As CSF was collected following the CT study, we believe that the mild pleocytosis is due to contrast administration which has been associated with causing a mild form of (cerebral?) vasculitis.

EEG

- Comments: EEG is likely to reveal sub-clinical seizure activity in the brain. EEG is also helpful in localizing an area or focus of heightened seizure activity (Fig. 3). Unfortunately, although the EEG equipment was already purchased, it had not been delivered and set up for use when the horse hospitalized. The owner allowed us to enlist the horse as a positive control to record an EEG under general anesthesia. Following this procedure, the horse was euthanized and a detailed post-mortem exam followed.
- Results: Throughout the exam we observed increased spiking activity in a bipolar and in a reference montage.

Post-mortem exam

- Despite collecting a multitude of samples from the brain, no abnormalities were found.
- Diagnosis: Cryptogenic Epilepsy

Summary

- Epilepsy in horses is rare; however, it has substantial implications for horse welfare and human safety. Occasionally, an event of collapse or (un)conscious abnormal behavior may be seen. More common is the second-hand description from an observer who discovers a horse in disarray, after unusual ‘noises’ were heard in the barn, and/or one detects the horse rather frequently with acute cuts and bruises without a plausible cause.
- There must be a pharmacological intervention during an observed seizure, unless it is unsafe to approach the horse. Terminating a seizure will lessen subsequent brain damage and will shorten the post-ictal phase.
- EEG can provide important information about the presence of increased ‘spiking activity’ in the brain of epileptic but non-clinical horses (Fig. 4).

Clinicians involved: Dr. Alex Valdes, Ms. Jill Caperoon, Ms. Kris Perry, and Dr. Lutz Goehring
Call for Clinical Study Participants

For validation purposes of our newly purchased EEG equipment, we are looking to enroll horses with a presumed diagnosis of Seizures/Epilepsy in a study that includes a routine work-up with a neurological examination, a CT-exam of the head, CSF analysis, and routine blood work. Prior to the CT exam, but while under general anesthesia, EEG-data will be collected (free of charge). A $700 refund will be deducted from the total hospital invoice for each patient enrolled in this study.

For more information, please call or email:
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Upcoming Events at the VTH

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<th>EVENT</th>
<th>DATE(S)</th>
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<th>CONTACT/DETAILS</th>
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<tr>
<td>REFERRING VETERINARIAN DINNER</td>
<td>09/18/12</td>
<td><strong>Note New Time!</strong> 6:30 pm to 8:30 pm</td>
<td>Katie Briggs, 970-297-4266 or <a href="mailto:katie.briggs@colostate.edu">katie.briggs@colostate.edu</a></td>
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<td>Open Forum and Dinner, sponsored by Merial</td>
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<td>CONTINUING EDUCATION Diagnosis &amp; Treatment of Lameness in the Horse</td>
<td>09/19/12–09/21/12</td>
<td>8:00 am to 5:00 pm, all 3 days</td>
<td>Tiffany Banfield, 970-297-1273 or <a href="mailto:vetce@colostate.edu">vetce@colostate.edu</a> <a href="http://www.cvmbs.colostate.edu/clinsci/ce/">http://www.cvmbs.colostate.edu/clinsci/ce/</a></td>
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<td>EVENING ROUNDS FOR rDVMs</td>
<td>10/01/12</td>
<td>6:30 pm to 7:30 pm</td>
<td>Dr. Katie Seabaugh, <a href="mailto:katie.seabaugh@colostate.edu">katie.seabaugh@colostate.edu</a></td>
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<td>Join the Equine Department the first Monday of even-numbered months for evening table topics. A call-in option is available if you can't attend in person. October’s topic is TBD.</td>
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