

Unraveling a Common Neurological Disease

Horses with neuroaxonal dystrophy (NAD) exhibit signs similar to humans ‘under the influence.’ They may stand with forelimbs too far apart (or too close), have difficulty navigating curbs or hills, or lack coordination while walking and making tight turns. Manifestations of the disease can vary among horses with some showing mild performance issues, while others are severely debilitated. Although there is no cure yet for NAD, one of most common equine neurological diseases, researchers are closing in on how to prevent the onset of symptoms.

Dr. Carrie Finno, interim director of the Center for Equine Health, said studies show that vitamin E is necessary to prevent degeneration of the neurons and axons throughout the brain and spinal cord during early life in many species. Axons are the part of nerve cells that transmit impulses, so when those cells are damaged, communication breaks down between the brain and the rest of the body, leading to a lack of coordination.

“We still don’t understand the cause of the degeneration, but we do know there is an interaction between genetics and nutrition for this disease to manifest,” Finno said. “You need the perfect storm of genetic susceptibility and a deficiency of vitamin E during the first few years of life.”

Researchers in Finno’s laboratory are working hard to develop a genetic test for NAD in horses,



“There is an interaction between genetics and nutrition for this disease to manifest.”

– Dr. Carrie Finno

but until one is available, she advises horse owners to supplement pregnant mares with at least 5,000 IU/day of vitamin E, using the “natural” liquid formulation, and the foal with 2000 IU/day as soon as it’s born. The supplement may not entirely eliminate the disease, but it does appear to result in less severe neurological signs if the foal receives supplementation during the early stages of life.

“While rare, complications from over-supplementing vitamin E can occur,” Finno said, “so we recommend keeping a close eye on the levels. Once we have a genetic test, we can advise people on which of their mares and foals to supplement.”

Finno pointed out the following criteria that clinicians look for in suspected cases of NAD:

- Onset of neurological signs at 6-36 months of age that either stabilize or progress slowly
- History of related horses that appear similarly affected

continued

Unraveling a Common Neurological Disease (continued)

- History of low vitamin E or poor nutrition during first year of life
- Negative EPM titer (blood and/or spinal fluid)
- Normal neck x-rays +/- normal myelogram
- Negative for West Nile Virus

Horses aren't the only species affected by neurologic disease due to vitamin E deficiency; humans also suffer. The genetic basis for the disease has been identified in humans, but that same gene has been excluded as a candidate in the horse. NAD appears to equally affect males and females and is present across horse breeds.

Foals with NAD look normal at birth. Neurological abnormalities can be subtle and even be missed for years unless the horse is specifically examined for neurological disease. Unfortunately, a definitive diagnosis of NAD requires examination of a particular section of the spinal cord during post-mortem examination. Without a necropsy, clinicians cannot positively diagnose the disease.

"There may be a lot of missed diagnoses out there, so we're committed to identifying the genetic mutation responsible and developing a test as soon as we can," Finno said.

Dr. Carrie Finno's lab received a National Institutes of Health grant to expand its equine NAD studies using horses as comparative models for humans. Research reveals a number of similarities in how vitamin E deficient neurodegeneration takes place in the equine and human systems. Finno hopes the funding will allow her team to establish a basic mechanism for how vitamin E deficiency contributes to neurodegenerative diseases across species.