FETLOCK HYPEREXTENSION SYNDROME IN CAMELIDS
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Key Points:
- Suspensory ligament injury may be inciting factor in affected juvenile llamas
- Decreased liver copper, increased serum zinc, and increased vitamin D in affected animals
- Fetlock hyperextension more likely in llamas, castrated males, and older animals

Fetlock hyperextension (Figure 1) can affect any age camelid, is widely recognized as a conformation fault, and may ultimately lead to degenerative joint disease of the fetlocks, calcification of the soft tissues, and greatly reduced mobility. Previous studies have characterized fetlock hyperextension in llamas through ultrasonography, radiography, biochemical and molecular techniques. In juvenile llamas, there was evidence of collagen and proteoglycan changes associated with trauma and healing. Significantly increased type III collagen expression and proteoglycan content was found in the suspensory ligament of affected juvenile animals. Type III collagen is expressed in acutely damaged tendons and ligaments, supporting suspensory ligament injury as an inciting factor in fetlock hyperextension. Interestingly, a previous study in adult llamas did not show an increase of type III collagen expression in affected animals, likely reflecting the chronicity of the condition in older animals.

Alterations in trace mineral levels in the liver and serum have also been found in affected llamas, including significantly decreased liver copper, increased serum zinc and trends for decreased serum copper and manganese and increased serum molybdenum levels. In juvenile llamas, there were significantly more affected animals having clinically low (outside laboratory reference range) liver cobalt, and a trend for low liver zinc, iron, and manganese levels compared to control llamas. These trace mineral differences may reflect mineral imbalances in the diet of affected llamas. Secondary copper deficiency induced by excess of other minerals has been reported as a cause of sway disease of Bactrian camels, which may induce fetlock hyperextension similar to that seen in llamas.

A current study has expanded the number of animals evaluated for serum trace mineral analysis and examines sex hormone and vitamin D levels in affected llamas. Serum was collected from 94 animals, including 79 llamas and 15 alpacas. Higher serum zinc levels (p<0.001) and vitamin D levels (p=0.004) were significantly associated with fetlock hyperextension. In addition, surveys were sent to llama owners to gather epidemiological information about prevalence and environmental factors contributing to this disease (972 total animals: 573 llamas, 399 alpacas). Information regarding age of onset, number of affected animals in herd, feed and supplements given, type of housing, and management practices were included in the survey. Multiple logistic regression was performed using Stata/IC 11.1 (p<0.05). Llamas were significantly more likely to be affected with fetlock hyperextension than alpacas (p=0.004). The overall prevalence for llamas was 13.3%, compared to alpacas at 0.7%. Castrated males were most likely to be identified as having fetlock hyperextension (p=0.003). Age was also a significant factor in reported affected camelids: animals >10 years were 39 times more likely to be affected than <4 years (p<0.001). Owners universally reported no difference in management between affected and unaffected animals. There was also no difference in animals supplemented with trace minerals vs. those not supplemented (p=0.6).
**Fig. 1:** Llama with fetlock hyperextension.

**References:**


