

# PASTURE-ASSOCIATED LAMINITIS

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Good quality forage provides necessary nutrients to grazing equids and should comprise the majority of a horse's diet. Most horses can handle the transition from consuming preserved forages (primarily hay) to rapidly growing grasses easily, yet certain conditions can pose concern for individual horses. Unfortunately, some horses are more sensitive to the amount of starches, simple sugars and fructans, also known as nonstructural carbohydrates (NSC), in lush green pastures and thus warrant specific management attention.

## Pasture-Associated Laminitis

Equine laminitis is a painful, debilitating disease affecting the laminae within the hoof. The laminae is a soft connective tissue responsible for holding the coffin bone within the hoof capsule securely to the hoof wall (Image 1). In a horse suffering from laminitis, decreased blood flow to the laminae occurs resulting in inflammation, death of the laminae tissue, and ultimately separation of the coffin bone from the hoof wall in advanced cases. Lack of laminae integrity leads to downward rotation of the coffin bone, and in severe laminitis cases, the coffin bone can rotate through the sole of the horse's hoof. This condition is also known as founder. While laminitis can be caused by many different scenarios — including repeated concussion on hard ground (road founder), hormone imbalance and grain overload — lush pasture can cause pasture-associated laminitis or grass founder and can be further complicated by obesity and insulin resistance.

Pasture-associated laminitis occurs when horses consume high levels of NSC. While NSC are present in all grasses during all growth stages, concentrations are highest during rapid growth, during times of direct sunlight, and after times of stress (e.g., drought). When horses consume high amounts of NSC, some these carbohydrates pass through the small intestine and spill over into the hindgut where they are rapidly fermented. This rapid fermentation causes the cecum to become more acidic and triggers multiple events, ultimately leading to laminitis. Additionally, horses that are obese or those suffering from insulin resistance may be more susceptible to pasture-associated laminitis.

## Factors Affecting NSC Levels in Grass

Different grass species can result in varying levels of NSC within pasture or hay. Cool-season grass species tend to accumulate more NSC as fructans, where warm-season grass species tend to accumulate more starches. As cool-season grasses grow most during the cooler months, NSC concentrations of sugars, starches and fructans tend to be higher in these grasses during spring and fall months.

Numerous factors can cause NSC levels in grasses to change from day to day. The time of day can greatly impact NSC content in the grass, with the lowest concentrations from approximately 2 a.m. to 9 a.m., and peak concentrations in the afternoon hours. Sunlight intensity will also cause an increase in NSC, as the sunnier the day, the more photosynthesis

occurring in the plant, and thus higher amounts of NSC that are produced. Grasses in mostly shady areas will tend to have lower NSC content when compared to grasses in sunny locations. Cooler temperatures below 40 degrees F overnight can also cause higher concentrations of NSC. This is because the plant will not utilize NSC stores overnight in lower temperatures, and the NSC will remain in the leaves rather than being used for growth or for energy storage in the root. Stress conditions that restrict plant growth, such as killing frosts, drought, non-lethal herbicide application and low soil fertility, can also increase NSC concentration in the plant.

## Management Tips

Keeping horses healthy and minimizing their risk of pasture-associated laminitis can be achieved through good management techniques. Increasing awareness of the nutrients provided by pastures, dried forages and other diet components is essential in understanding how to keep your horses healthy through the changing seasons.



*Image 1: The laminae is a soft, connective tissue within the hoof, responsible for holding the coffin bone to the hoof capsule. The laminae can be seen in this image as the dark red line, approximately 0.5 mm wide. (Image credit: Jennie Ivey, The University of Tennessee)*

- Aim to keep your horses at a moderate body condition score (BCS, range from 4 to 6, Image 2). Horses with an obese BCS ranging from 7 to 9 tend to display a predisposition for laminitis bouts. Reference UT Extension publication SP 782 “Equine Welfare Series: The Body Condition Scoring System” and SP 795 “Equine Welfare Series: Evaluating Your Horse’s Weight and Condition” for how to assess your horse’s BCS and estimate body weight.

- Current research shows NSC content is lowest in the overnight hours and peaks in the late afternoon to early evening hours; therefore, it is best to allow horses to turn out at night and remove from pasture by mid-morning.

- Use a grazing muzzle to limit your horse’s intake while out on pasture, especially during the spring and fall months, when cool-season grasses are growing quickly. If possible, limit grazing time or turnout in a dry lot pasture, especially for horses with predispositions to laminitis or with a history of laminitic incidents.



*Image 2: Keeping horses at an ideal body condition score ranging from 4 to 6 can help prevent incidences of pasture-associated laminitis due to insulin resistance. (Image credit: Jennie Ivey, The University of Tennessee)*

- Have your pasture, hay and other dietary components tested to gain a general understanding of the NSC content in your horse's diet. Horses that are insulin resistant or have had issues with laminitis in the past should consume a diet that is 10 percent or less in NSC when considering all sources of sugar and fructan.

- Generally speaking, as plants mature from the leafy to pre-bud stage, NSC levels decrease and fiber levels increase. The exact nutrient content of forages is dependent on many factors including pasture management, plant species, weather and geographic location. Remove grazing muzzles and increase grazing time gradually to avoid any unintentional overgrazing during this transition period. Typically, in Tennessee this transition can

occur anytime between mid-May through early June.

- Use good pasture management including regular mowing and pasture rotation.

For more information on nutritional management, forage testing, pasture-associated laminitis or pasture management, contact your county Extension office.

## Resources

Spring pasture, fructans and founder. Larry Lawrence, PhD and Stephanie Valberg, DVM. University of Minnesota Extension.

Pasture-Associated Laminitis. Raymond J. Geor, BVSc, MVSc, PhD. Veterinary Clinics of North America; Equine Practice. 2005. Volume 25, pages 39-50.



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