Vet Med 517-Equine Medicine

EQUINE METABOLIC SYNDROME (INSULIN DYSREGULATION)

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Topic Outline

- Introduction
- Ethiology and Pathogenesis
- Clinical findings
- Diagnosis
- Treatment
- Prevention

Introduction

- **Equine metabolic syndrome** (**EMS**) is a characteristic collection of clinical signs and clinicopathological changes in equids that increases their risk for developing **hyperinsulinemia-associated laminitis** (**HAL**), the leading cause of **laminitis**.
- **Insulin dysregulation** (**ID**) is the core component of the syndrome.
- EMS is found in both **horses** and **ponies** and has also been recognized in **donkeys**. Affected animals typically are obese, with increased body condition score overall and increased regional adiposity in the neck and tailhead regions.

Equine metabolic syndrome, generalized obesity

Equine metabolic syndrome, lean phenotype

EMS has the following typical patterns of development in different equids:

- In horses, it arises between the ages of **5** and **16 years**, with no recognized sex predilection.
- It is most common in ponies and in Saddlebreds, Tennessee Walking Horses, Paso Finos, Morgans, and Mustangs.
- It occurs infrequently in Thoroughbreds and Standardbreds; however, any horse can develop EMS.

Etiology and Pathogenesis

- Equine metabolic syndrome develops because of a disturbance in the relationship between circulating glucose and insulin, leading to insulin dysregulation.
- The specific origin of ID is currently unknown and likely involves the combination of a diet inappropriately high in nonstructural carbohydrates and a favorable genetic background leading to hyperinsulinemia and insulin resistance.
- Hyperinsulinemia leads to laminitis in horses and ponies, and HAL represents approximately **90%** of the cases of laminitis in the general equine population.

Etiology and Pathogenesis

- Although they are two different conditions, pituitary pars intermedia dysfunction (PPID) and EMS can occur concurrently in middle-aged and older horses in approximately **30%** of cases.
- Therefore, when they reach the age of **12–15 years**, horses with EMS should be monitored to detect the onset of PPID.
- Alternatively, any horse with PPID should be tested for ID. It is important to note that horses with PPID, and not ID, rarely develop laminitis; therefore, if a horse with PPID develops laminitis, a diagnosis of ID is very likely.

Clinical Findings

- Horses with EMS typically are obese or overconditioned, with a body condition score of ≥ **7** out of 9 and a cresty neck. However, regional adiposity with fat deposition behind the shoulder and the tailhead are common in horses with EMS even if generalized obesity is not present.
- Geldings with EMS might have increased fat deposition in the prepuce; mares might have increased fat deposition around the mammary glands and show infertility or irregular reproductive cycles.

Equine metabolic syndrome, cresty neck

Clinical Findings

- Horses with EMS that are brought in for evaluation with no known history of laminitis often show evidence of prior episodes, such as abnormal hoof growth rings and radiographic evidence of third phalanx rotation or pedal osteitis.

Equine metabolic syndrome, growth rings

Diagnosis

- Diagnostic testing for equine metabolic syndrome should focus on documenting insulin dysregulation.
- A careful dietary history and physical examination are essential.
- Establishing baseline body condition and neck scoring enables assessment of the patient's response to treatment for EMS.
- Because many factors, including diet, pain, and stress, can affect blood glucose and insulin concentrations, diagnostic testing for EMS should be performed in a controlled manner in a low-stress environment.

Oral sugar test (OST) or Oral glucose test (OGT)

- If the baseline insulin concentration is normal, the patient's physiological response to glucose should be evaluated. Because some horses with EMS are normal in all aspects except the ability to handle an oral carbohydrate load.
  - The **OST** is performed by fasting the horse for 3–6 hours and then administering an oral dose of corn syrup at 0.15–0.45 mL/kg. Blood should be collected at 60 or 90 minutes after administration of the corn syrup to determine the insulin concentration. A concentration ≥ 45 mIU/mL is consistent with ID.
  - The **OGT** is performed by giving a fasted horse 0.75 g/kg of dextrose powder mixed with chaff. An insulin concentration ≥ 65 mIU/mL in a blood sample collected 2 hours later is consistent with ID.

Diagnosis

- Blood insulin concentration **≤ 50 mIU/mL** indicates an acceptable response to current management and a low risk of laminitis.
- Blood insulin concentration **≥ 100 mIU/mL** indicates inadequate management and a high risk of laminitis.
- Blood insulin concentrations between **50** and **100 mIU/mL**, the risk of laminitis is unclear.
- Detection of PPID is important because PPID is thought to exacerbate ID in horses also affected by EMS.

Treatment

- Diet is the most important element in the management of equine metabolic syndrome, and dietary adjustment is sufficient to manage most cases. For all patients with EMS, whether obese or not, grazing, grains, and treats should be eliminated.
- Hay that is low in nonstructural carbohydrates (10%, as determined by feed analysis) should be provided in a slow feeder or divided into multiple small meals (ideally, 4–6) for a daily total of 2% of body weight when the body condition score of the horse or pony is 5/9.
- In obese horses, the daily total can be decreased to 1.5% of body weight; however, severe restrictions can be detrimental and increase the risk of hyperlipemia. In any case the amount of non-structural carbohydrates should not exceed 0.1 g/kg per meal.

Treatment

- Hoof care by a skilled farrier is essential in all EMS cases, even in the absence of acute laminitis. HAL can occur without inducing obvious lameness, and radiography is recommended to detect hoof distortion. In at-risk cases, regular hoof trimming every 4 weeks by an experienced farrier is highly recommended.
- If laminitis has resolved, exercise helps to improve insulin sensitivity by building muscle mass and decreasing fat mass. All levels of exercise are beneficial, and 5 minutes of walking followed by 15 minutes of brisk trotting followed by 5 minutes of walking 5 days a week improves insulin regulation.

Treatment

- **Sodium-glucose cotransporter 2 (SGLT2) inhibitors** have shown promising results in managing hyperinsulinemia. These drugs can be used when dietary management fails and in cases of acute onset of HAL.
  - The following SGLT2 inhibitors, as needed, may be administered long-term, depending on clinical response:
    - **velagliflozin:** 0.3 mg/kg, PO, every 24 hours
    - **canagliflozin:** 0.2–0.6 mg/kg, PO, every 24 hours
    - **ertugliflozin:** 0.02–0.06 mg/kg, PO, every 24 hours
    - **empagliflozin:** 0.02–0.06 mg/kg, PO, every 24 hours

Prevention

- Prevention of equine metabolic syndrome should focus on providing an adequate diet and maintaining normal weight in horses, particularly in high-risk breeds.
- Because horses with EMS use ingested calories more efficiently than other horses, it is imperative to feed patients appropriately to maintain an ideal condition score and not to use arbitrary feeding guidelines.
- Particular care should be exercised when turning horses on pasture during times of high-soluble carbohydrate content (spring and autumn). Horses with EMS always require severe grazing restriction.

Key points:

- Insulin dysregulation is the key problem in cases of equine metabolic syndrome.
- High blood insulin concentrations lead to laminitis, which can result in devastating lameness, loss of use, and death.
- In EMS management and prevention, it is important to feed an amount that maintains a normal body condition for each individual horse.
- Dietary management (feeding low-carbohydrate hay) is important to prevent laminitis.

Reference

- Bertin, F.-R. (2025, August). Equine Metabolic Syndrome. MSD Veterinary Manual. https://www.msdvetmanual.com/metabolic-disorders/equine-metabolic-syndrome/equine-metabolic-syndrome?query=equine%20metabolic%20syndrome#Treatment_v3282356

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Thank You So Much!

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