Managing Obesity in Pasture-Based Horses

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Abstract: Obesity—a common problem in pasture-based horses—warrants intervention because it is associated with an increased risk for development of laminitis. Treating obesity in pasture-based horses is relatively simple and generally involves reducing caloric intake by using grazing muzzles and/or increasing caloric expenditure through exercise. To prevent recurrence of obesity after weight loss, clients should be educated on how to monitor body condition and to adjust feeding and management programs to maintain proper body condition.

Obesity (excess accumulation of adipose tissue) generally results from an imbalance between energy intake and expenditure. Obesity in equids has been linked to various health concerns, most notably insulin resistance and increased risk of pasture-associated laminitis, the latter having great economic and welfare implications and accounting for ~50% of laminitis cases. Of particular interest is that obesity predisposes animals to development of insulin resistance and that obese animals are more likely to develop pasture-associated laminitis if they have insulin resistance. The method(s) by which insulin resistance increases susceptibility to pasture-associated laminitis has not yet been clarified. Insulin resistance is the inability of a normal plasma insulin concentration to produce an adequate response from target tissues. Hyperinsulinemia is a compensatory response that may temporarily maintain insulin-mediated responses and is commonly used in the clinical setting as an indicator of insulin resistance.

The Connection to Insulin Resistance and Hyperinsulinemia

There is strong sentiment among equine practitioners that the prevalence of obesity, insulin resistance, and hyperinsulinemia is increasing in the general equine population. A 2008 study of 300 randomly selected horses from southwest Virginia found that 19% of the horses were obese, 32% were overconditioned (TABLE 1), and 10% had elevated blood insulin levels. A strong positive association was made between hyperinsulinemia and adiposity, as 18% of the overconditioned or obese horses had hyperinsulinemia versus only 1.4% of optimally conditioned or underconditioned horses. Most of the horses in the study were kept at pasture and were not fed grain or other concentrate feeds. Most of the horses were classified as having little or no exercise. Based on the published prevalence of obesity and hyperinsulinemia in this study, many horses may be at risk for pasture-associated laminitis. Carter et al. published a study that supports the importance of monitoring and reducing hyperinsulinemia and treating generalized obesity (increased adiposity that is evenly distributed throughout all areas of the body) and regional obesity (increased adiposity in specific locations [e.g., a cresty neck; fat pads close to the tail head, behind the shoulders, or in the prepuce or the mammary gland region]) to reduce the risk of laminitis. In this study, clinical predictors of laminitis and their specific cutoff values included a plasma insulin concentration of >32 μU/mL and a body condition score (BCS) of ≥7/9. In appreciating the clear link between obesity, hyperinsulinemia, and laminitis, clinicians should strive to prevent and treat obesity as a strategy for preventing laminitis.

The Role of the Pasture

Pastures have a dual purpose for horses, providing feed as well as space for exercise. When properly managed, pastures offer the most natural and healthy environment for equids. Unfortunately, unrestricted grazing may lead to excess body weight, particularly when horses are not exercised. For example, in one study, mature horses on pasture for 24 h/d consumed 0.41 kg/h of fescue dry matter or 0.38 kg/h of orchard grass dry matter. An average grass pasture has ~2 Mcal/kg of digestible energy dry matter, but it may be as high as 2.7 Mcal/kg dry matter in some cases. Therefore, depending on the energy density of the pasture, a 500-kg horse

Table 1. Equine Body Condition Scoring

<table>
<thead>
<tr>
<th>Body condition score</th>
<th>Classification</th>
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<tbody>
<tr>
<td>1–3</td>
<td>Underconditioned</td>
</tr>
<tr>
<td>4–6</td>
<td>Optimally conditioned</td>
</tr>
<tr>
<td>7</td>
<td>Overconditioned</td>
</tr>
<tr>
<td>8–9</td>
<td>Obese</td>
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with a maintenance energy requirement of 16.4 Mcal/d that has the opportunity to graze fescue pasture for 24 hours would consume calories at an average rate of 0.8 to 1.1 Mcal/h, which would provide excess calories in the range of 1.2 to 1.6 times the maintenance energy requirement (FIGURE 1). The rate of pasture consumption varies somewhat based on pasture quality and palatability but is dramatically affected by the amount of time at pasture. In the same study, when mature horses’ access to pasture was restricted to 3 h/d, they consumed tall fescue grass dry matter at an increased rate of 1.5 kg/h. This suggests that horses can consume calories at a rate as high as 3 to 4.1 Mcal/h, thereby meeting their maintenance energy requirement in 4 to 5.5 hours. Energy in the feed (calories) can be either expended or used for anabolism and storage. This is why an adult horse with unrestricted pasture access that gets no exercise is predisposed to excess weight gain and obesity. In general, when a horse has unrestricted access to quality pasture, light exercise is the minimum level of physical activity needed to prevent overweight and obesity. Light exercise of a 500-kg horse increases the daily energy requirement to ~20.5 Mcal/d (1.25 times the maintenance energy requirement), which would expend the energy surplus due to unlimited pasture intake (FIGURE 2).

**Weight Loss**

The goal of any weight loss program is to achieve and maintain a moderate body condition. The program that we use for pasture-based horses is practical and simple and involves obtaining a health, diet, and exercise history; performing a complete physical examination; determining the horse’s starting body condition and weight; screening for hyperinsulinemia; setting goals for weight loss; using a grazing muzzle to reduce pasture intake; increasing exercise when possible; and regularly monitoring progress. The presence of hyperinsulinemia does not change the protocol but emphasizes, for the client, the consequences of overweight and obesity, including the risk of laminitis. In our experience, hyperinsulinemia in an overweight or obese horse almost always resolves with weight loss. If pituitary pars intermedia dysfunction (equine Cushing disease) is suspected, it should be confirmed through diagnostic testing (e.g., testing concentrations of plasma adrenocorticotropic hormone, blood glucose, corticotropin, or dextrose; dexamethasone suppression test).

A number of body condition scoring systems have been developed for horses. A system developed by Henneke et al. has been widely used for many years and is appropriate for use by veterinarians, horse owners, and caregivers. This system scores horses on fat cover—visually and by palpation—at several locations on the horse’s body, with a score of 1 applied to an emaciated horse on fat cover and 9 applied to a very fat horse (FIGURE 3A; FIGURE 3B). Generally, horses with BCs of 1 to 3 are considered underconditioned; 4 to 6, optimally conditioned; 7, overconditioned; and 8 to 9, obese. Body weight can be determined using a scale or estimated using a weight tape calibrated for horses. When weight tapes are used, it is important to use the same brand of tape for each measurement and to apply the tape in a consistent manner. To obtain consistent results, we recommend positioning the tape immediately behind the elbows and at the highest point of the withers.

Hyperinsulinemia, as defined by the reference range of the specific laboratory used, is detected by measuring the resting cortisol, corticotropin hormone, blood glucose, corticotropin, or dextrose; dexamethasone suppression test).

Obesity or overweight in horses increases the risk for developing insulin resistance and laminitis. Resolution of obesity or overweight normalizes insulin sensitivity and prevents pasture-associated laminitis in almost all cases. Efficient weight loss in pasture-based horses can be achieved using grazing muzzles and/or by increasing exercise. Pasture-based rations should be balanced with essential vitamins and minerals.

A horse’s weight loss can be facilitated with oral administration of levothyroxine sodium.

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**Key Points**

- Obesity or overweight in horses increases the risk for developing insulin resistance and laminitis.
- Resolution of obesity or overweight normalizes insulin sensitivity and prevents pasture-associated laminitis in almost all cases.
- Efficient weight loss in pasture-based horses can be achieved using grazing muzzles and/or by increasing exercise. Pasture-based rations should be balanced with essential vitamins and minerals.
- A horse’s weight loss can be facilitated with oral administration of levothyroxine sodium.
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Body Condition Scoring

1. Poor: Horse is extremely emaciated. Backbone, ribs, hipbones, and tailhead project prominently. Bone structure of the withers, shoulders, and neck are prominent. No fatty tissues can be felt.
2. Very Thin: Horse is emaciated. Slight fat covering over vertebrae. Backbone, ribs, tailhead, and hipbones are prominent. Withers, shoulders, and neck structures are discernible.
3. Thin: Fat built up about halfway on vertebrae. Slight fat layer can be felt over ribs, but ribs easily seen. The tailhead is prominent, but individual vertebrae cannot be seen. The hipbones, withers, shoulders, and neck structures are faintly discernible.
4. Moderately Thin: Slight ridge along back. Faint outline of ribs can be seen. Fat around tailhead beginning to feel spongy. Withers are rounded and shoulders and neck blend smoothly into the body.
5. Moderate: Back is level. Ribs can be easily felt, but not seen. Fat around tailhead beginning to feel spongy. Withers are rounded and shoulders and neck blend smoothly into the body.
6. Moderately Fleshy: May have a slight crease down the back. Fat around the tailhead feels soft. Fat over the ribs feels spongy. Fat beginning to be deposited along the sides of the withers, behind the shoulders, and in the crest of the neck.
7. Fleshy: May have a crease down the back. Individual ribs can be felt, but noticeable fat deposition over the ribs. Fat around tailhead is soft. Noticeable fat deposited along the withers, behind the shoulders, and in the crest of the neck.
8. Fat: Crease down the back is prominent. Ribs difficult to feel. Fat around tailhead prominent. Area along withers filled with fat. Area behind shoulders filled with fat. Prominent crest of neck. Fat deposited along the inner buttocks.
9. Extremely Fat: Obvious crease down back. Fat is in patches over rib area, with bulging fat over tailhead, withers, neck, and behind shoulders. Very prominent crest of neck. Fat along inner buttocks may rub together. Flank is filled in flush with the barrel of the body.

Adapted from Henneke, 1983

Figure 3. (A) Fat deposition at six body areas. (B) Description of body condition scores. (Courtesy of Virginia-Maryland Regional College of Veterinary Medicine and Virginia Cooperative Extension, Blacksburg, VA; with permission)

Figure 4. A grazing muzzle. The opening in the bottom restricts pasture intake.

Within 6 hours before blood collection. Likewise, grain or concentrate should be fed for a minimum of 6 hours before blood collection.

Setting goals for weight loss consists of determining the optimal BCS and body weight. In mature, light-breed horses, each incremental change in BCS represents ~18 to 27 kg. Predicted optimal body weight is determined by the following formula:

Predicted optimal body weight (kg) = Starting body weight (kg) – ([Starting BCS – Desired BCS] × 22.5 kg)

For example, an obese horse with a starting BCS of 9, a starting body weight of 550 kg, and a desired BCS of 5 would have a predicted optimal body weight of 460 kg:

550 – (9 – 5) × 22.5 = 460 kg

Grazing muzzles are a safe and effective means of reducing caloric intake in overweight or obese pasture-based horses (FIGURE 4). The use of grazing muzzles has been estimated to reduce grass intake by 25% to 33%. The grazing muzzle should be worn whenever the horse is at pasture, and all grain and concentrate should be eliminated from the diet. Because forage-based rations are not complete or balanced, it is necessary to feed a measured amount of a vitamin-mineral supplement or “balancer pellet.” White salt and free-choice water should be available at all times. In most cases, we also recommend administration of levothyroxine sodium to accelerate weight loss and improve insulin sensitivity. Levothyroxine sodium is administered by mouth or with a small amount of feed at a dosage of 48 mg/d for mature, light-breed horses. Once ideal body condition has been attained, horses are weaned off of levothyroxine sodium by reducing the dosage to 24 mg PO sid for 2 weeks and then 12 mg PO sid for 2 weeks. Exercise also accelerates weight loss, so an exercise regimen should be implemented when possible. Clients should assess body condition and body weight regularly (every 2 to 4 weeks) so that progress can be monitored and the program amended as needed. With this protocol, most horses achieve the desired BCS in 3 to 4 months. If the initial insulin levels were abnormal, they should be evaluated periodically and should follow weight loss trends.

Weight Maintenance

After the desired BCS is achieved, an appropriate weight maintenance program should be established. In many instances, horses

(basal) plasma insulin level. Standardization of sampling procedures is important for reliable interpretation of results. In our practice, we recommend avoiding changes in hay access or pasture turnout periodically and should follow weight loss trends.
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An 11-year-old Paint pony gelding presented with a history of chronic obesity and the “inability” (according to the client) to lose weight. At presentation, the pony had a BCS of 9/9, a weight tape measurement of 523 kg, and a basal plasma insulin concentration of 90 μU/mL (reference range: 10–40 μU/mL) (FIGURE A). The weight loss program included 24 h/d–access to pasture with a grazing muzzle, free-choice EquiMin Horse Mineral (Southern States Cooperative, Inc., Richmond, VA), free-choice water, levothyroxine sodium therapy (48 mg/d), and the introduction of regular, light exercise. The pony achieved a BCS of 5/9 in 4 months and became normoinsulinemic (FIGURE B).

Figure A. An obese (BCS: 9/9) Paint pony at initial presentation.

Figure B. The Paint pony 4 months later with a BCS of 5/9.

can maintain the targeted body condition while wearing the grazing muzzle for 24 h/d. In other instances, horses continue to lose body condition and therefore require short periods (usually 1 to 2 h/d) of grazing without a muzzle to maintain an appropriate body condition. Monthly assessment of body condition is critical to ensuring that the feeding program remains appropriate.

If a horse splits time between pasture and confinement, a calculated amount of hay can be fed during confinement. Typically, a horse requires 2% of its optimal body weight in average-quality hay daily to maintain an appropriate body condition. The amount of hay fed during confinement can be prorated based on the amount of time the horse is confined. For example, if a horse is on pasture for 12 hours (with a grazing muzzle) and in a stall for 12 hours, it should be fed half of its calculated daily requirement of hay during confinement. Clients should be counseled on the importance of weighing the hay to ensure that the appropriate amount is fed. Water, salt, balancer pellet, levothyroxine sodium therapy, and regular BCS assessment should be included as described above.

Acknowledgment

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References