How to Provide Effective Enteral Nutrition Using Complete Pelleted Feeds Through a Nasogastric Tube

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1. Introduction
A variety of conditions cause anorexia in horses. Clinical complications secondary to decreased caloric intake include delayed healing, ileus, weight loss, hepatic lipidosis, and even death. The use of complete pelleted feeds fed through nasogastric tubes is an easy and affordable technique for providing nutrition and water to those patients that are capable of processing enteral nutrition but are unable or unwilling to eat or drink. Previous publications have described methods requiring calculating, measuring, and mixing various raw materials to force feed anorexic or dysphagic patients. These methods can be time consuming and difficult to maintain. Total parenteral nutrition can be provided; however, it is cost prohibitive in many cases, and it requires special handling. This paper describes the use of a large-bore nasogastric tube, a hand-operated bilge pump, and gruel made of nutritionally complete pelleted feed to provide caloric and water consumption to horses unable to maintain their own nutritional status.

2. Materials and Methods
A nutritionally complete and energy-dense pelleted feed manufactured specifically for horses should be used. The authors have chosen to use Purina Mills Equine Senior. The manufacturers’ recommendations for feeding are used to establish a daily baseline for amount of feed. The horse’s individual needs are also taken into account and changes such as catabolic state, pregnancy, lactation, and overwhelming infection should be accounted for by increasing the amount fed. Purina Mills maintains a website with product information and a feed calculator that is helpful in calculating the amount to feed a specific horse (http://horse.purinamills.com/“feeding calculator”). Additionally, the hydration status and requirements should be calculated. The authors use 2.25 ml water/kg body weight/h as a basic maintenance requirement. The calculated needs for a 450-kg horse would be 11011 l/h or 24 l/day.

The entire daily ration of pelleted feed is weighed and placed into a large bucket. That feed is mixed with enough warm water to cover it, and it is allowed to soak for 1 h to create a soft mash. The volume of water used to create the mash can be subtracted from the daily requirements. After the mash is soft, it is divided into three to four feedings and placed in a sealed container to avoid evaporation. The remaining water necessary to meet the

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daily needs of the horse is used to create a thin gruel at the time of feeding. This is accomplished by mixing a “feeding” of the mash with water before administration. The goal is to keep the gruel thin enough to pump through a nasogastric tube and to limit total volume to ~8–10 l.

In general, the process is easiest when three people are used, but as experience is gained, two people can accomplish the feeding. A large-bore nasogastric tube should be placed into the stomach. The largest bore tube that will comfortably fit is recommended. Lubricating the tube before passage and assuring positioning in the ventral meatus will minimize trauma during placement. The average 450-kg horse can handle a tube ~2.5 cm in diameter. After passing the tube, the horse is first checked for the presence of reflux. If no reflux is present, the gruel can be safely pumped into the stomach. Average stomach pumps used in equine practice are inadequate for pumping the gruel. The authors use a hand-operated bilge pump. A 1-m large-bore (5–7 cm in diameter) tube is placed in the gruel and attached to the intake valve of the bilge pump. The pump is primed, and the nasogastric tube is attached to the outflow side. Gruel is steadily pumped at a moderate pace. The intake tube is used to mix the gruel while pumping to prevent heavier particles from settling. When approximately half the volume has been administered, the pump is detached. The stomach is then checked for excess pressure. This is done by elevating the end of the tube higher than stomach level and allowing the feed to flow in by gravity. If it flows easily, the tube can be reconnected, and the feeding should be completed. The nasogastric tube is cleansed of gruel with water and either removed or secured in place. Leaving the tube in can cause pharyngitis and esophagitis, but it may be necessary in horses refractory to multiple tubings. If the tube is left in place, it should be switched to the opposite nostril every other day. Tube placement should always be checked before administrations of gruel.

The number of feedings over 24 h is dependant on the amount of feed and water required for each individual horse by weight and energy needs. We have found that most horses tolerate four daily feedings of 8–10 l of total volume at a time. Horses should be monitored for signs of discomfort after feeding. If this is experienced, smaller and more frequent feedings may be necessary. Manure production and hydration status should be assessed at least twice daily when horses are being maintained in this manner. Additionally, an accurate weight should be attained every day to make accurate adjustments to the feeding regime. If no scale is available, a weight tape should be used to estimate weight and monitor the horse for appreciable changes in weight.

3. Results

This technique has been used on six patients over 18 mo (Table 1). Four horses were dysphagic, and two horses were anorexic but not dysphagic. Each horse was treated for the primary problem involved. Five of six horses were discharged from the hospital. One horse was euthanized for a problem unrelated to this technique. All but one of the six horses maintained or gained weight while on the protocol. Each of the horses had slightly softer than normal manure. The range of time patients were maintained on this feeding method was 4–10 days. Some patients received oral medications mixed in with the feedings. The feedings were easily administered by veterinarians, technicians, and senior students. All of the horses tolerated the tube well.

4. Discussion

This method of feeding is technically easy and relatively inexpensive. The addition of daily fluid requirements greatly decreased or eliminated the need for IV fluids. Horses administered feed in this manner should be able to appropriately process the feed after it has been administered. For that reason, gastrointestinal blockage as a cause of anorexia should be ruled out before beginning this feeding regimen. Horses treated by the authors were either clearly unable to eat or had prolonged anorexia. The horses tolerated the procedure well. The addition of adequate nutrition enhanced the treatment of the primary complaint as well as eliminated the complications of anorexia. Administration of oral medications was achieved easily even in horses that

<table>
<thead>
<tr>
<th>Signalment</th>
<th>Diagnosis</th>
<th>No. Days Fed by Technique</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>14-yr-old Percheron mare</td>
<td>Tongue abscess</td>
<td>7</td>
<td>Healthy at discharge</td>
</tr>
<tr>
<td>9-yr-old Quarter Horse mare</td>
<td>Thorat latchation, proximal esophageal rupture</td>
<td>10</td>
<td>Healthy at discharge</td>
</tr>
<tr>
<td>12-yr-old Arabian stallion</td>
<td>Tongue abscess</td>
<td>4</td>
<td>Healthy at discharge</td>
</tr>
<tr>
<td>2-yr-old Friesian gelding</td>
<td>Anorexia caused by peritonitis</td>
<td>4</td>
<td>Euthanized because of complications with primary problem</td>
</tr>
<tr>
<td>8-yr-old Quarter Horse mare</td>
<td>Tongue abscess</td>
<td>6</td>
<td>Healthy at discharge</td>
</tr>
<tr>
<td>6-yr-old grade gelding</td>
<td>Tongue abscess</td>
<td>5</td>
<td>Healthy at discharge</td>
</tr>
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</table>
were completely dysphagic. Adjustments to feed and water were easily made to meet the needs of the individual patient. The use of a complete pelleted feed made the system easy to use and standardized; it also saved time. Overall, this method is a practical solution for horses with a primary problem that precludes consumption of adequate nutrition and water.

Reference and Footnotes


aThe Guzzler series 7090, Cole-Palmer, Chicago, IL 60648.
bTygon polyvinyl chloride flexible tubing, 2-in diameter, 3M, St. Paul, MN 55144.