Treatment of Large Colon Impaction with Enteral Fluid Therapy

Marco A. F. Lopes, MS; Gabriela S. Moura, DVM; and Jose D. Filho, MS

Enteral fluid therapy can be used in horses with large colon impaction. It corrects dehydration, stimulates colonic motility, hydrates the impacted mass and is cheaper than IV fluid therapy. Further studies are needed to determine the ideal composition and tonicity of fluids for enteral use in horses with impaction. Authors’ addresses: Marion duPont Scott Equine Medical Center, Virginia–Maryland Regional College of Veterinary Medicine, Virginia Polytechnic Institute and State University, Leesburg, VA 20177 (Lopes) and Departamento de Veterinária, Universidade Federal de Viçosa, Viçosa, MG, CEP 36571-000, Brazil (Moura and Filho). © 1999 AAEP.

1. Introduction
Colic is the most common clinical disorder and the leading cause of horse death. Among diseases that cause colic, large colon impaction is the most frequent. Administration of large volumes of intravenous fluids, laxatives and analgesics is the standard treatment for large colon impaction, but this medical treatment is not always efficient, and surgery and euthanasia are not uncommon outcomes. Relatively few authors cite enteral fluid therapy as an alternative for horses with large intestine impaction, and a greater emphasis is always given to IV administration of fluids. However, rapid transit of fluids from the stomach to the large intestine, which occurs in horses, and the influence that gastric filling has on colonic motility through the gastrocolic reflex make the enteral route theoretically more advantageous. The lower cost of enteral fluid therapy should also be considered. The objective of this research was to evaluate the efficiency of enteral fluid therapy in equids with large colon impaction.

2. Materials and Methods
Fourteen equids (12 horses and 2 mules) with large colon impaction were treated with enteral fluid therapy. Diagnosis was based on anamnesis and clinical examination. Signs of abdominal discomfort, abdominal volume, mucous membranes color, capillary refill time, skin tent, rectal temperature, pulse, and respiratory rate were recorded. Nasogastric intubation, transrectal palpation and abdominal auscultation were also performed. Feces removed from the rectum while performing rectal palpation were inspected. The presence of sand was checked by mixing feces in water and looking for sand sedimentation. Patients’ hydration status was estimated by evaluating the presence of sunken eyes, dry mucous membranes, reduced skin turgor, prolonged capillary refill time, increased pulse rate and dry feces. Warm tap water (temperature around 35°C) was administered into the stomach by gravity flow through a nasogastric tube with an external diameter of 1.6 cm. The maximum volume administered at each time was 10 l, and the minimal interval...
between doses was 30 minutes. Dipyrone (25 mg/kg IV), dipyrone/hyoscine (25 mg/kg/0.2 mg/kg IV), or flunixin meglumine (1.1 mg/kg IV) was administered as needed. Analgesics were not administered to animals with mild colic that could be controlled by hand walking. Animals that did not need analgesics for 12 hours were allowed to eat a grain meal (1 kg) and mineral supplement (50 g) in the morning and at night with the nasogastric tube temporarily removed. Physical examination was repeated every 12 hours, and treatment was terminated when none of the following signs were found: signs of abdominal pain, tachycardia, anorexia, dry mucous membranes, prolonged capillary refill time, sunken eyes, reduced skin turgor, dry feces, impacted mass in large intestine. Surgery would have been considered if colic signs or a firm impacted mass persisted for more than 48 hours after initiation of fluid therapy or if severe tympany had developed during treatment.

3. Results
Animal ages ranged from 2 to 20 years old (Table 1). All animals were fed a highly fibrous mature grass (Pennisetum purpureum Schumach). One animal was sprayed with amitraz 2 days before presenting colic but did not show any other clinical sign of amitraz intoxication such as ataxia, muscular weakness or depression. Before arriving at the hospital, some animals were medicated with analgesics. Six animals were admitted to the hospital on the day abdominal pain was observed, five animals were admitted 1 day after presenting the first signs, one animal 3 days later, one animal 4 days later, and one animal 6 days later. When admitted, all animals presented mild to moderate intermittent colic, reduced skin elasticity, sunken eyes, dry mucous membranes and dry feces covered with mucus. In no case was sand observed in feces. Eight animals had marked abdominal distention when admitted, but tympany was not present. The first urine observed at the hospital was dark yellow and turbid. Reflux of gastric contents through the nasogastric tube was not obtained in any case. Most animals had anorexia on admission day. Several animals demonstrated signs of abdominal pain just after fluid therapy, on the first day of treatment. Discomfort was observed even when small volumes (less than 5 l) were used. In most cases, pain subsided in a few minutes without treatment. When rectal palpation revealed the impaction softening, pain just after fluid therapy was no longer observed. By the second day of treatment, signs of dehydration were no longer observed. The urine gradually became colorless, and after the second day of treatment, all animals presented polyuria. Gradual softening of feces and reduction of abdominal size was observed in all cases. Most animals developed diarrhea characterized by soft feces or even watery feces on the second day of treatment, but in no case were feces malodorous or discolored or did signs of endotoxemia develop. In all cases, feces regained normal consistence 1 day after treatment ended. Eleven animals were treated at least once with analgesic at the hospital (four with dipyrone, three with dipyrone-hyoscine, and four with flunixin meglumine), and three animals did not need analgesics. When pain was no longer observed, all animals had normal appetite. Feeding of a grain meal had no adverse effects. The total volume of water administered ranged from 60 to 223 l (mean, 119.14 l) (Table 1). The volume administered daily ranged from 20 to 72 l (mean 47.76 l/d). Considering the weight of the animals, the volume administered daily ranged from 84.91 to 208.33 ml/kg (mean 142.16 ml/kg/d). The duration of treatment was 1 to 5 days (mean 2.57 d), and enteral fluid therapy was effective for all

### Table 1. Duration of Treatment and Volume of Water Administered by Enteral Route to Equids with Large Colon Impaction.

<table>
<thead>
<tr>
<th>Species</th>
<th>Gender</th>
<th>Age (yr)</th>
<th>Weight (kg)</th>
<th>Duration of Treatment (d)</th>
<th>Volume of Water Administered (l/animal)</th>
<th>Daily Mean (l/animal)</th>
<th>Daily Mean (ml/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equine</td>
<td>M</td>
<td>3</td>
<td>322</td>
<td>3</td>
<td>100</td>
<td>33.33</td>
<td>103.51</td>
</tr>
<tr>
<td>Mule</td>
<td>M</td>
<td>16</td>
<td>355</td>
<td>3</td>
<td>105</td>
<td>35.00</td>
<td>98.59</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>3</td>
<td>405</td>
<td>3</td>
<td>120</td>
<td>40.00</td>
<td>98.77</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>3</td>
<td>401</td>
<td>2</td>
<td>70</td>
<td>35.00</td>
<td>87.28</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>5</td>
<td>346</td>
<td>5</td>
<td>210</td>
<td>42.00</td>
<td>121.39</td>
</tr>
<tr>
<td>Equine</td>
<td>M</td>
<td>2</td>
<td>337</td>
<td>2</td>
<td>90</td>
<td>45.00</td>
<td>133.53</td>
</tr>
<tr>
<td>Equine</td>
<td>M</td>
<td>9</td>
<td>320</td>
<td>1</td>
<td>60</td>
<td>60.00</td>
<td>187.50</td>
</tr>
<tr>
<td>Equine</td>
<td>M</td>
<td>7</td>
<td>375</td>
<td>4</td>
<td>223</td>
<td>55.75</td>
<td>148.67</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>20</td>
<td>254</td>
<td>2</td>
<td>100</td>
<td>50.00</td>
<td>196.85</td>
</tr>
<tr>
<td>Mule</td>
<td>F</td>
<td>17</td>
<td>309</td>
<td>2</td>
<td>122</td>
<td>61.00</td>
<td>197.41</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>2</td>
<td>318</td>
<td>2</td>
<td>95</td>
<td>47.50</td>
<td>149.37</td>
</tr>
<tr>
<td>Equine</td>
<td>M</td>
<td>5</td>
<td>310</td>
<td>2</td>
<td>108</td>
<td>54.00</td>
<td>174.19</td>
</tr>
<tr>
<td>Equine</td>
<td>F</td>
<td>7</td>
<td>530</td>
<td>3</td>
<td>135</td>
<td>45.00</td>
<td>84.91</td>
</tr>
<tr>
<td>Equine</td>
<td>M</td>
<td>5</td>
<td>312</td>
<td>2</td>
<td>130</td>
<td>65.00</td>
<td>208.33</td>
</tr>
<tr>
<td>Means</td>
<td>—</td>
<td>7.43</td>
<td>349.57</td>
<td>2.57</td>
<td>119.14</td>
<td>47.76</td>
<td>142.16</td>
</tr>
</tbody>
</table>

*aAnimal sprayed with amitraz.*
14 cases. No complications associated with enteral fluid therapy were observed in any animal.

4. Discussion
The wide range of ages observed in these animals is in agreement with previous observations that large colon impaction occurs in animals of any age. The ingestion of a highly fibrous grass might have contributed to the development of impaction in all cases. Ingestion of coarse indigestible fiber has previously been reported as a predisposing factor for large intestine impaction in horses. However, in one animal amitraz was sprayed, which could have also contributed to impaction formation. Amitraz is known to have an \( \alpha_2 \)-agonist action, reducing intestinal motility and producing large colon impaction. Horses that were not admitted on the first day of colic possibly had worsening of the impaction and could perhaps have recovered faster if treatment had been initiated sooner. The mild to moderate intermittent colic, anorexia, dehydration, dry feces covered with mucus and absence of gastric reflux observed in these animals are common findings in horses with large colon impaction. Abdominal distention, observed in eight animals on admittance, is commonly seen in horses with impaction and results from distention of the colon with digesta. In agreement with the previous report that tympany is an uncommon finding in horses with large colon impaction, it was not seen in any case. The worsening of abdominal pain after fluid therapy on the first day of treatment did not seem to be the result of gastric distention because it was seen even when small volumes were used. The maximum volume of 10 l of fluid administered every 30 minutes is similar to volumes used previously and these authors did not report abdominal discomfort. Stimulation of colonic motility through the gastrocolic reflex, resulting in intestinal wall contraction around the impacted mass, explains the pain after fluid therapy. Worsening of abdominal discomfort was also observed in one horse with large colon impaction when intestinal motility was stimulated by cisapride injection. The remission of signs of dehydration observed on the second day of treatment suggests that enteral fluid therapy was efficient in restoring hydration. Polyuria and urine dilution are normally expected when large volumes of fluids are administered. The fecal softening and diarrhea observed in all animals receiving enteral fluids suggest that this method was highly efficient in increasing hydration of colonic digesta. Because diarrhea spontaneously subsided after termination of fluid therapy, it seems a normal response to enteral overhydration. Diarrhea was also observed in 20 (16.3%) of 123 horses with large colon impaction treated with IV fluid therapy and laxative drugs. Ingestion of grains did not appear to be harmful for any animal in this experiment. Despite the current recommendation to fast horses with large intestine impaction, it seems logical that only fiber should be avoided. Because grains have a low fiber content, they would partially nourish animals with impaction but would not increase the impacted mass. Ingestion of grain may also be advantageous in contributing to increase intestinal motility.

The volume of water administered daily, ranging from 84.91 to 208.33 ml/kg (mean 142.16 ml/kg), was smaller than the previously reported volumes of 196.8 to 343.2 ml/kg administered IV to treat horses with large colon impaction. This difference suggests that enteral fluid therapy is more efficient and is in agreement with a previous study. An increase in fecal hydration was observed when a single dose of 12.5 ml/kg was given by nasogastric tube to normal horses. The duration of treatment, ranging from 1 to 5 days (mean 2.57 days), is similar to that of 1 to 6 days (mean, 2 days) observed in horses with impaction treated by IV route. Enteral fluid therapy was successful in all 14 cases, but the reported failure of IV fluid therapy was 24 (16.3%) out of 147 horses. Because horses have rapid gastric emptying and rapid transit through small intestine, the fluids rapidly reach the large intestine when the enteral route is used. When fluids are administered by the IV route, an expansion in plasma volume followed by an increase in colonic secretion is expected, but no study measuring this effect has been reported. After administration of enteral fluids, colonic motility is stimulated through the gastrocolic reflex, thereby contributing to resolution of the impaction. However, one horse with impaction treated with IV fluids needed cisapride to stimulate motility. In the present study, laxatives were not used and enteral fluids alone were efficient to resolve the impaction. Administration of laxative drugs is part of the standard treatment for large intestine impaction, but there are reports of failure of mineral oil, dioctyl sodium sulfosuccinate and low doses of magnesium sulfate to produce a laxative effect in horses. The enteral route for fluid therapy could be used because no animal had gastric reflux. The absence of gastric reflux, which is rarely seen in horses with large colon impaction, is a primary condition for enteral fluid administration. Because sterile solutions are not required for use of the enteral route, tap water was used, making treatment cheaper than the standard IV overhydration. Water was administered warm, but it is possible that warming was not necessary because rapid gastric emptying, good absorption and no complications were observed in horses receiving cold fluids (5°C) by nasogastric tube. Although complications were not observed in this experiment, nasogastric intubation is not risk free and careful placement is recommended. On the other hand, IV fluid therapy was associated with thrombophlebitis in 30 (24.4%) of 147 horses with impaction. Enteral administration of water, which is hypotonic, was previously described and had similar results to enteral administration of isotonic fluids in horses subjected to heavy exercise.
well described in animals that drink or are treated with large volume of hypotonic fluids, but these complications rarely occur in animals with normal kidney function.\textsuperscript{16,17} However, considering the large volumes used and the prolonged treatment that is required in some cases, administration of electrolyte solutions instead of water may be advisable.

5. Conclusions

Enteral fluid therapy associated with the administration of analgesics was an efficient, safe and inexpensive method to treat large colon impaction in equids. However, further studies are needed to determine the ideal fluid composition, tonicity, temperature and volume before it can be generally recommended.

6. Summary

Fourteen equids (12 horses and 2 mules) with large colon impaction were treated with enteral fluid therapy. The age of the animals ranged from 2 to 20 years, and all equids had been fed a highly fibrous grass (\textit{Pennisetum purpureum} Schumach). The first colic signs were observed on the day of hospitalization in six cases, 1 day before in five cases, 3 days before in one case, 4 days before in one case and 6 days before in one case. One horse was sprayed with amitraz 2 days before the first colic signs. At hospitalization, all animals showed dehydration, mild to moderate intermittent pain, dry feces and an impacted mass in the large colon. Eleven animals were medicated with analgesics, and water was administered by nasogastric tube to all animals. The maximum volume administered at each time was 10 l, and the minimum interval between administrations was 30 minutes. The total volume administered daily ranged from 84.91 to 208.33 ml/kg (mean 142.16 ml/kg). During treatment, when pain was not seen for 12 hours, animals were fed a grain meal with mineral supplement. Two physical examinations were done each day, and all equids showed polyuria, gradual abdominal volume reduction, feces softening and regression of dehydration signs. Duration of treatment was from 1 to 6 days (mean 2.57 days), and at the end of fluid therapy, no animal showed abdominal pain or large intestine impaction. We concluded that enteral fluid therapy was an efficient method to treat large colon impaction in equids.

References and Footnotes


\textsuperscript{a}Sonda Nasogástrica, Provar Comercial Ltda., R. Tripui, 82, São Paulo, SP 03147-000, Brazil.
\textsuperscript{b}D 500, Hoechst Química e Farmacêutica, S. A. R. Lauro Mülller, 116, Rio de Janeiro, RJ 22299-900, Brazil.
\textsuperscript{c}Buscopan Composto, Boehringer-De Angeli Química e Farmacêutica Ltda., Av. Maria Coelho Aguiar, 215, São Paulo, SP 05804-970, Brazil.