A simple obstruction of the intestinal tract involves a luminal obstruction with no vascular occlusion, the cause of which is usually categorized either as luminal, mural or extraluminal in nature. Examples of luminal obstructions include impactions caused by feed, sand, fibrous foreign bodies, or enteroliths. Mural abscesses, granulomas or tumors can lead to a simple obstruction by protruding into the lumen or by causing constriction of the lumen. Extramural causes include such things as an adhesion or a nonstrangulating displacement that causes kinking of the intestinal segment, resulting in obstruction of the lumen. The clinical signs, clinicopathologic findings, and the results of ancillary diagnostic tests for horses with simple obstructions of the cecum and large and small colon are often nonspecific. Horses with suspected simple luminal obstructions of the cecum and large and small colon initially should be treated medically unless the magnitude of pain is moderate to severe, there is marked cecal/colonic distention, or there are abnormalities detected on abdominal fluid analysis and cytology, in which case a ventral midline exploratory celiotomy should be performed. Likewise, horses not responding to medical treatment and those with worsening clinical signs or abdominal fluid alterations should undergo exploratory celiotomy. The purpose of this paper is to review treatment options for horses with selected diseases of the cecum and large and small colon.

CECAL IMPACTION

Cecal impaction is diagnosed in approximately 5% of horses with colic. There are two types of cecal impaction. Horses with cecal impactions most commonly present with a cecum filled with a dehydrated mass of feed material that accumulates within the cecum. The cecum is often distended and stretched tightly over the feed material, but there is often enough space or compliance for fluid and gas to pass over the mass. The second type of cecal impaction can be termed cecal dysfunction or cecal stasis, which is characterized by marked cecal distention with ingesta of a soft, fluidy consistency. Cecal rupture or perforation can occur concurrent with or shortly after a diagnosis of cecal impaction is made. Although some horses present with cecal impaction or perforation with no other medical problems, several horses develop cecal impaction/rupture during hospitalization for an unrelated disease. Cecal impactions are relatively common in horses hospitalized for musculoskeletal disease; this may
be associated with exercise restriction, reduced food or water intake associated with pain, or the administration of NSAIDs, especially phenylbutazone.

There are no specific causes of cecal impaction or cecal dysfunction known; these diseases can occur in horses of any signalment and on any type of diet. However, cecal impaction/dysfunction probably occur more commonly in middle-aged horses. Cecal impaction/perforation also occurs relatively commonly in peripartum broodmares. Ingestion of fibrous feeds, decreased water intake, disruption of cecal motility, tapeworm infestation, and nonstrangulating infarction have all been implicated as possible contributing factors to the development of cecal impaction/dysfunction. Because cecal impactions appear to occur more commonly in certain geographic areas, it has been postulated that the ingestion of certain feeds (Bermuda grass hay) may contribute to the development of cecal impactions. Once the cecum becomes distended with feed material, fluid, and gas it can lead to mural ischemia. This can contribute to ileus, peritonitis, and toxemia and predisposes to cecal perforation.

Horses with cecal impactions often demonstrate low-grade, persistent, but intermittent abdominal pain; however, pain can become severe. They often have normal to scant amounts of normal to soft feces, which may contain increased fibrous material. Horses with cecal impaction often have normal vital signs and occasionally a mildly increased heart rate. Auscultation and percussion of the abdomen of horses with cecal impaction often reveals decreased to absent borborygmi and possibly a high-pitched ping in the right dorsal quadrant (gas cap in cecal base). Rectal examination usually confirms the diagnosis. Normally the ventral cecal band can be palpated per rectum by sweeping a cupped hand backward through the right caudal abdomen. The band is thin and curves ventrally, cranially, and slightly medially from the dorsal origin on the right body wall. The medial cecal band is infrequently palpable cranial and medial to the ventral band. The cecum usually feels empty, but soft ingesta may be present in the cecal body. Increased tension on the ventral cecal band may be the earliest evidence of a cecal impaction. As the impaction progresses, cecal body sacculations and a rounded cecal base become apparent, and the ventral cecal band becomes flattened and taut. Eventually, the sacculations of the cecal body disappear, the ventral band courses sharply cranioventrally and medially, and firm ingesta can be palpated within the cecal base. If cecal perforation is impending, gaseous crepitus may be palpable along the dorsolateral aspect of cecal base. Rectal examination usually reveals the impaction palpable in the cecal base as a firm, but indentable mass.

Blood work may reflect dehydration. Peritoneal fluid analysis usually is normal, but may have increased total protein in long standing cases. With cecal dysfunction, the magnitude of abdominal pain may be mild to moderate initially, but usually progresses to marked pain with massive cecal distention. The cecal base often becomes distended with gas, which can be detected by auscultation and percussion of the right paralumbar fossa. The heart rate may be normal initially, but as the horse becomes more dehydrated and develops shock it will increase. Gastrointestinal borborygmi are reduced to absent. Horses with cecal dysfunction often develop signs consistent with endotoxemia more frequently than those with a dry, firm cecal impaction. Rectal examination usually feels similar to cecal tympany, except that the cecum is pulled cranioventrally owing to the weight of the ingesta and fluid. Peritoneal fluid analysis varies depending upon the stage of the disease; peritoneal fluid in horses with prolonged cecal dysfunction may become serosanguinous with increased protein concentration, leukocytes, and red blood cells.

The goals of medical treatment of horses with cecal impaction are to soften the ingesta to aid in its evacuation. Many horses with cecal impaction respond to medical management, but surgical treatment may be necessary. Medical treatment includes administration of laxatives via nasogastric tube, fluid therapy, and analgesic medications. Magnesium sulfate,
mineral oil and/or psyllium are often administered to horses with cecal impactions. Fluid therapy can be administered orally, via nasogastric intubation, or intravenously. Flunixin meglumine or small quantities of xylazine are usually all that is required to control abdominal pain. Horses that do not respond to aggressive medical therapy, but do not have a surgical option may benefit from the promotility drug neostigmine; however, it is important to be aware that this could result in cecal rupture and should only be used in cases that are refractory to medical management. In horses with impaction of the cecal base that do not respond to aggressive medical management or in horses that develop persistent or more severe abdominal pain, surgical intervention is indicated. Surgery usually involves evacuating the cecum through an enterotomy at the cecal apex combined with luminal lavage.

In horses with impaction of the cecal base that do not respond to aggressive medical treatment or in horses with persistent or more severe abdominal pain surgical intervention is indicated. Surgery is often more needed for horses with cecal dysfunction; if the cecal wall becomes tightly distended pain becomes more intense and perforation is likely. Evacuation of cecal contents via an enterotomy in the cecal apex is indicated. Caution should be used when exteriorizing the cecum, because if the wall is compromised it can rupture easily during manipulation. Cecal dysfunction may recur after cecal evacuation, especially if the cecum is discolored, has petechial hemorrhage, or mural thickening. Therefore, horses should be held off feed for a few days after surgery and resumption of feeding should be slow and gradual. Numerous surgical techniques with variable success have been developed to attempt to prevent recurrence of cecal impaction.

Dietary management in the postoperative period should be designed to try to prevent a recurrence of cecal impaction. Horses should probably be allowed to graze pasture or should be fed a complete pellet feed. The addition of bran to the feed may also help prevent recurrence. Horses should be encouraged to consume adequate water; providing fresh water and a salt block may increase water consumption.

A recent retrospective study by Plummer et al, evaluated the outcome of cecal impactions after medical and surgical treatment. Out of 114 cases 54 were treated medically and 49 treated surgically. Cecal rupture did occur in both surgical and medically managed cases. Short-term prognosis, as described by hospital discharge, was 81% of medically managed cases and 95% for the surgically managed cases that were allowed to recover from surgery. In the surgically managed cases 34 out of 37 were treated with typhlotomy without a bypass procedure and 2 of the 37 were treated with a cecal bypass of which neither case survived long term. Long-term prognosis (alive at least one year from treatment) was 95% in medically managed cases and 89% in surgically managed cases.

LARGE COLON IMPACTION

Obstruction of the large colon accounted for ~20% of all horses admitted to a referral center for colic. Impaction with feed material is a common cause of simple obstruction of the large colon, accounting for ~13.4% of horses admitted to a referral hospital for colic. Other potential causes of colonic obstruction include fibrous foreign bodies, sand, hair, and enteroliths. Large colon feed impactions can occur in horses of any signalment, but reportedly occur more commonly in mares and middle-aged horses. The exact cause of colonic impaction is unknown, but several etiologic factors have been postulated to contribute to their development. Inadequate water intake and lack of exercise (stall confinement) have been reported to be the most common contributing factors. Although parasitic infestation has been postulated to be a cause, there is little evidence of a causal relationship. Coarse roughage and poor dentition may also contribute to formation of impactions. Recent (< 2 weeks) management changes are common, preceding the onset of impaction colic. One of the most
common changes is a sudden decrease in exercise, often owing to some type of musculoskeletal injury requiring hospitalization or exercise restriction. Reduced postoperative fecal output in mature (> 5 years) horses undergoing surgery for conditions other than colic has been shown to be associated with ongoing orthopedic surgical procedures taking longer than one hour and horses that did not receive phenylbutazone.

Impaction of the large colon with feed material usually results in clinical signs of intermittent, mild to moderate abdominal pain; however, the pain can become severe and continuous. The heart rate is often normal or only slightly increased. Horses with large colon impaction usually have normal hydration status; normal mucous membranes and packed cell volume and total plasma protein concentration are usually normal. Gastrointestinal borborygmi can be normal, decreased, or absent. Net gastric reflux is obtained in approximately 10% of horses with large colon impaction; this may be secondary to the impacted colon obstructing the small intestine. Colonic impaction is usually diagnosed by rectal examination as a firm to doughy mass in the pelvic flexure; however, the impaction often extends into the dorsal and ventral colons. In some horses, colonic and/or cecal gas distention may limit rectal examination. The impacted material may not be palpable if it is located in the right dorsal or transverse colon or if the impaction is accompanied by a large colon displacement. Peritoneal fluid analysis is usually normal. A diagnosis of sand impaction is often made based on clinical signs, history of access to sand, rectal palpation, abdominal auscultation, and the presence of sand in feces. Sand can sometimes be seen in the ventral portion of the abdomen on radiographs or ultrasound.

Most horses with large colon impaction respond to medical management, including restriction of all feed, controlled exercise, administration of visceral analgesic drugs, fluid therapy, and laxatives. Oral intake of feed material should be restricted until the impaction has resolved and the horse is passing large quantities of soft feces. Horses should be hand walked for short periods several times daily. Horses with mild and intermittent abdominal pain may not require administration of analgesics drugs; however, horses with persistent or moderate to severe abdominal pain often benefit from analgesics. Some clinicians have reported the most successful analgesic therapy for horses with large colon impaction to be a combination of flunixin meglumine and xylazine. Both of these drugs are believed to reduce intestinal smooth muscle spasm. Fluid therapy can be achieved by administering water or an electrolyte solution via a nasogastric tube or by administering a balanced electrolyte solution IV. Administering IV fluids at a rate 2 to 4 times maintenance needs appears to be efficacious in hydrating the impaction and stimulating intestinal motility. However, a series of recent studies have shown that administration of an enteral balanced electrolyte solution is probably more effective and safer than IV fluids, enteral water or enteral saline cathartics to promote hydration of right dorsal colon contents and feces without causing electrolyte disturbances.

Numerous types of laxatives can be administered to horses via nasogastric tube to either soften or lubricate the intestinal contents. The most commonly used laxatives include sodium sulfate (NaSO₃), magnesium sulfate (MgSO₄), diocetyl sodium succinate (DSS), mineral oil, and bulk laxatives such as psyllium hydrophilic muciloid. The author prefers to administer a combination of enteral electrolyte solution, MgSO₄ and mineral oil. The enteral fluids and MgSO₄ help to soften the impaction and the mineral oil lubricates the impaction to help facilitate its evacuation.

Most horses with large colon feed impactions will resolve within 48 hours after initiating medical treatment; however, some impactions may not resolve for several days and others do not resolve with medical therapy. Large colon impactions for prolonged periods can lead to pressure-related mural compromise and colonic perforation. Perforation can occur spontaneously in medically managed horses or subsequent to colonic manipulation during
abdominal exploration. Horses with impactions resistant to routine medical management must either be treated with intestinal motility stimulants or undergo surgical exploration. Care should be exercised when using motility stimulants in horses with large colon impactions, and only used in non-painful horses in which the impacted material is adequately softened but resistant to passage, especially if surgery is not an option.

Numerous motility stimulants have been anecdotally reported to be beneficial; however, erythromycin lactobionate (2.2 mg/kg IV QID) and/or lidocaine (1.3 mg/kg IV bolus followed by a continuous rate infusion at 0.05 mg/kg/min for 24-36 hours) may be useful to stimulate progressive colonic motility. Although erythromycin, a macrolide antibiotic, enhances gastric emptying, it has a more profound effect on large intestinal motility where it has been shown to hasten cecal emptying and induce MMC-like activity throughout the colon in normal horses. This activity is believed to be due to stimulation of intestinal smooth muscle motilin receptors. The most common side effect is abdominal pain, which usually resolves with slowing or discontinuing the infusion. Erythromycin can induce diarrhea in horses, so caution should be taken and the horse carefully monitored. Lidocaine has a number of potential mechanisms by which it could stimulate motility, including reducing the concentration of circulating catecholamines by inhibiting sympathoadrenal responses; suppressing primary afferent neuron activity involved in reflex inhibition of intestinal motility; and directly stimulating intestinal smooth muscle activity. Lidocaine also appears to decrease inflammation in the intestinal wall through decreased prostaglandin synthesis, inhibition of granulocyte migration and subsequent lysosomal enzyme release, and inhibition of free radical production. It is important for clinicians to be aware that it can provide visceral analgesia in horses with colic, and thus these horses should be monitored closely, especially if they are receiving other analgesic medications. Side effects of lidocaine infusion are typically related to an overdose caused by too large of dose or too rapid rate of administration, and are characterized by muscle fasiculations, weakness, collapse, recumbency and extreme bradycardia. As lidocaine is highly protein bound, the toxic dose can be quickly reached in horses with hypoproteinemia and the presence of side effects should be closely monitored in these horses. It is also important to closely observe the horse and monitor the heart rate during slow (over 5 minutes) administration of the bolus dose.

Indications for exploratory celiotomy include persistent, severe, or uncontrollable abdominal pain, deterioration in cardiovascular status, or abnormalities in peritoneal fluid indicative of bowel compromise. The colon should be handled carefully because it can be easily perforated, especially those with sand impaction. Once the colon is exteriorized it should be evacuated using a pelvic flexure enterotomy and luminal lavage. A large volume of warm water should be used to lavage the colonic lumen to facilitate evacuation of colonic contents, particularly if it contains sand. Horses with sand impaction frequently have other abnormalities. In one study, 26 of 48 horses with a sand impaction treated surgically had either a large colon volvulus or displacement.

Because of the relatively high frequency of diarrhea and positive fecal Salmonella culture in horses with large colon impaction or other conditions affecting the large colon, administration of di-tri-octahedral smectite (Biosponge®) either directly into the large colon through the enterotomy site after evacuation or via a nasogastric tube postoperatively may be useful in reducing the likelihood of postoperative enterocolitis. A study evaluating the effect of administration of 1 pound/1,000 pound horse in 4 liters of water every 24 hours for 3 days postoperatively to horses undergoing surgery for large colon disease had a significant reduction in the prevalence of diarrhea and other clinical signs characteristic of endotoxemia. The first dose (1 to 3 pounds/1,000 pound horse) can be administered through the enterotomy and subsequent doses (1 pound) administered via nasogastric tube.

The overall prognosis for survival of horses with large colon feed impactions is good. A
significant difference was found between survivors and nonsurvivors of large colon impaction for heart rate, respiratory rate, peripheral WBC count, blood lactate, and peritoneal fluid protein concentration at hospital admission. The long-term survival of horses with large colon impaction was 95% for those treated medically, and 58% for those treated surgically. Approximately 30% to 40% of horses that recover from a large colon impaction have at least one future episode of colic, which suggests that these horses may be predisposed to impaction or that the impaction may have damaged the colon rendering it more susceptible to re-impaction. Horses with sand impaction treated surgically have a good to excellent prognosis (44 of 48 were discharged from the hospital).

Management changes should be implemented to decrease the recurrence and prevent additional horses from developing large colon impactions. Some of these management practices include maintaining adequate dental care; implementing a stringent anthelmintic program; avoiding excessively fibrous feeds; providing salt and minerals to prevent pica and increase water intake; removing sand from the environment, preventing horses from eating off the ground, not allowing horses to graze pastures with excessively short grass on sandy soils; and removing foreign materials such as nylon, rubber, baling twine and other foreign bodies from the horses’ environment. Ensuring adequate exercise and water consumption are probably two of the more important factors in preventing colonic impactions. Horses in which there has been a sudden halt to exercise, which is typical following a musculoskeletal injury requiring stall confinement, it is particularly important to monitor fecal output, and at the first hint of a change in frequency, consistency or amount of manure passed, preventive measures including providing a more laxative diet and/or administering a laxative should be considered. On average, adult horses should pass 6 to 8 piles of manure per day. More importantly, owners or caretakers should be instructed to monitor them closely for even subtle changes in fecal output, feed intake and attitude.

NONSTRANGULATING DISPLACEMENTS OF THE LARGE COLON

Because of the anatomy and mobility of the large colon it is predisposed to displacement. The three types of colon displacements that occur include left dorsal displacement (LDD), right dorsal displacement (RDD), and pelvic flexure retroflexion (PFR). In horses with LDD of the large colon, the left ventral and dorsal colon are oriented correctly, but migrate between the spleen and body wall becoming entrapped dorsally over the nephrosplenic ligament. In horses with RDD of large colon, the pelvic flexure and left colon either fold on themselves and pass between the cecum and right body wall in a cranial to caudal direction, or less commonly, the left colon may encircle the base of the cecum and pass between the cecum and body wall in a caudal to cranial direction. In horses with a PFR, the pelvic flexure and left colon retroflex forward to lie near the diaphragm. Horses with colonic displacements often have other accompanying abnormalities (volvulus, enterolith, and/or impaction); in one study of LDD, 7.5% of horses had other intestinal lesions. All types of colon displacements can cause signs of mild to severe abdominal pain depending on the degree of luminal obstruction, mesenteric tension, and colonic distention. The vital parameters can vary from normal to mildly increase. Horses with displacements usually have normal hydration status, but may become mildly dehydrated in longstanding cases. Blood work results are usually unremarkable; however, horses may have mild to moderate increases in GGT with RDD secondary to colonic compression resulting in extrahepatic bile duct obstruction. The diagnosis is usually made based upon physical examination and rectal examination findings. Rectal examination usually reveals gas distended large colon with all types of displacements.

With a LDD, the colon can often be palpated rectally in the nephrosplenic space between the spleen and left kidney; this was diagnostic in 72% of cases in one study. With a
RDD, the colon may be palpated coursing lateral to the cecum and with a pelvic flexure retroflexion the pelvic flexure is often not palpable. Transabdominal ultrasonography may be helpful to diagnosis LDD of the large colon and confirm nonsurgical correction. In the normal horse, the left kidney can be imaged deep to the spleen, and the presence of the large colon in the nephrosplenic space interferes with the ability to image the kidney because of the presence of gas in the large colon. Although the presence of gas-filled large colon dorsal to the spleen is consistent with LDD, this finding can also occur with other types of colonic disease. Thus, an inability to image the left kidney alone is not diagnostic of LDD.

Surgical correction is necessary for most horses with large colon displacement. All horses with RDD and PFR and many with LDD of the large colon require surgical correction; however, some horses with LDD can be effectively treated by a nonsurgical rolling procedure. The horse is anesthetized with IV anesthetics (preferably not barbiturates because they cause splenic congestion) and placed in right lateral recumbency. The hind limbs are then hobbled, the horse is rolled onto its back, and then the hind limbs are raised by a hoist until the horse’s rump and back are suspended off the ground. The horse is kept suspended for approximately two minutes, during which time the abdomen is vigorously balloted. The horse is lowered into left lateral recumbency, and then rolled into sternal and then right lateral recumbency. Although it can be difficult to determine in a recumbent horse, rectal examination can be repeated at this time to determine if the colon has been released. Transabdominal ultrasound can also be used to confirm correction of the LDD. The reported success rate for nonsurgical correction of LDD is approximately 74%. Case selection is crucial for successful outcome of horses with LDD treated by rolling. Some clinicians recommend administering phenylephrine (20 - 40 mg/kg diluted in 60 ml of 0.9% NaCl and administered IV over 5 minutes) prior to anesthetic induction or lunging to cause splenic contraction and decrease the size of the spleen. When used alone, nonsurgical rolling had a 90% success. Other complications, including splenic vessel rupture, gastric or colonic rupture, and inability to correct concurrent conditions such as small intestinal volvulus can occur with nonsurgical rolling. Furthermore, this procedure is not helpful in correcting RDD or PFR. Administering phenylephrine immediately prior to lunging the horse seems to allow shifting of the large colon from the nephrosplenic space and facilitates correction of LDD in some horses. Although based on only 5 cases, there was a 100% success rate for correction following phenylephrine administration and jogging. It is believed by some that decompression of the distended colon via percutaneous trocharization prior to exercise is helpful to facilitate correction of LDD; however, appropriate precautions must be taken to minimize the potential for peritonitis or other complications. The large colon may lie between the spleen and body wall but not migrate dorsally into the nephrosplenic space; these horses usually respond to conservative medical treatment including IV fluids and withholding feed until the colon repositions itself. In one study, 9 of 9 horses responded to this treatment.

The overall prognosis for life and for return to use for horses with large colon displacement is good; approximately 93% of horses treated medically or surgically survived to hospital discharge. There is a potential recurrence of the colonic displacements and a recurrence rates for LDD has been reported to be as high as 7.5%. Diets high in grain may increase the risk of tympany and displacements, therefore increasing fiber in the diet may help prevent recurrence. Techniques for prevention have been developed and include large colon resection, colopexy and more recently ablation of the nephrosplenic space performed either via a flank laparotomy or laparoscopy. Although important, the indications, contraindications, advantages, disadvantages, success rate and complications associated with these techniques are beyond the scope of this discussion.
SMALL COLON IMPACTION

Small colon impaction accounted for ~2.5% of horses admitted to a referral center for colic. Accumulation of firm digesta in the small colon can lead to clinical signs of simple luminal obstruction. The majority (73%) of small colon impactions occur in the fall and winter. Some studies have indicated breed, sex and age predispositions whereas others have not. Small colon impaction may occur owing to decreased water consumption, luminal obstruction with inspissated feces (fecalith), concretions of plant material (phytobezoar), and secondary to dysfunction of the small colon. Other risk factors include decreased access to water and other causes of intestinal stasis. A relatively high percentage of horses with small colon impaction, especially those requiring surgical intervention, have positive fecal cultures for *Salmonella*, which might indicate that horses with overt or impending enterocolitis might be predisposed to development of small colon impaction.

Horses with small colon impaction typically exhibit signs of mild, intermittent abdominal pain. Because of the location of the impaction in the distal intestinal tract, these horses rarely become profoundly dehydrated. These horses may pass scant amounts of dry, mucus covered feces. One report found that horses with small colon impactions were 10.8 times more likely to have diarrhea on presentation compared to horses with large colon impactions. Rectal examination may enable one to palpate the impacted area as a round, tubular structure with a single, wide band on its antimesenteric border. However, rectal examination may be unrewarding because the mobility of the small colon may preclude one from extending the arm a sufficient length into the abdomen to identify the area of obstruction. Seventy-five percent of horses with small colon impaction were diagnosed via rectal examination, whereas the remaining ones were diagnosed at the time of exploratory celiotomy. The vital parameters are often within normal limits, and usually are reflective of the magnitude of pain and dehydration. With sufficient time following complete luminal obstruction of the small colon, horses can develop marked fluid and gas distention of the cecum and large colon, which causes profound abdominal distention, marked pain and cardiorespiratory compromise. Abdominal distension was the only factor in one report that was associated with surgical vs. medical treatment as these horses were 5.2 times more likely to need surgical correction if present. In one study, horses treated surgically were more likely to demonstrate moderate abdominal pain, gross abdominal distention and positive fecal *Salmonella* sp. cultures.

Horses with small colon impaction may respond to medical treatment or may require surgical intervention. Medical therapy includes the administration of IV fluids, enteral fluids, enteral laxatives and analgesics. Horses should be treated with either enteral or IV balanced electrolyte solution at a rate of 2-4 times maintenance needs to rehydrate and soften ingesta as well as stimulating colonic motility. Magnesium sulfate (1 gram/kg once daily or once every other day) and mineral oil (2-4 liters daily) are the most common laxative agents used for the medical treatment of small colon impactions. Motility stimulants are rarely used. However, neostigmine (0.0044 mg/kg IV or SQ every 30 to 60 minutes) is used by some clinicians to stimulate evacuation of small colon impactions that are softened with medical treatment but resistant to resolution, particularly if the horse is not painful and/or surgical intervention is not an option. This dose can be increased in 2-mg increments if there is no response and the horse is not demonstrating signs of abdominal pain up to a total of 10 mg per treatment. Some clinicians administer enemas with appropriate physical and chemical restraint, including instillation of lidocaine into the rectum; however, because of the extensive length and firmness of the impaction in typical cases, this is usually not very successful. Additionally, because of the risks of perforation and the difficulty in resolving these during surgery with an enema and manual massage, the author does not recommend performing enemas in standing conscious adult horses for the treatment of small colon impactions.
Indications for surgical intervention include abdominal pain that is progressing in intensity and/or frequency, progressive abdominal distention, and lack of response to medical management. Because some of these impactions may be secondary to an obstruction owing to fibrous foreign body ingestion, enterolith formation and other obstructions, medical management may not be successful. Although a flank incision can be used, the author believes a suspected or confirmed small colon impaction should be approached through a ventral midline incision because it offers greater exposure and allows a more thorough examination of the intestinal tract. Once identified at surgery, the impacted mass can be infused with fluid via a needle placed through the wall of the small colon and manually massaged. An enema can be administered by gentle lavage with a nasogastric tube carefully passed and advanced up the rectum by a non-sterile assistant as the surgeon or assistant guides it along the small colon. If the mass cannot be softened sufficiently and resolved by local fluid administration or gentle lavage and manual massage, then the material should be evacuated via an enterotomy through the antimesenteric taenia. Enterotomies in the antimesenteric taenia are easier to perform, result in less hemorrhage and inflammation, heal with more strength, and maintain a larger diameter than those performed in the sacculated portion of the colon. Careful manipulation during surgery is necessary when managing small colon disease because mesocolonic tears can occur and adhesions can result from serosal irritation caused by excessively rough handling. It is important to keep the serosal surface moist during manipulation; application of carboxymethylcellulose to the serosal surface prior to handling and manipulation is often used to provide lubrication and decrease irritation.

In a study of 28 horses with small colon impaction, all horses treated medically and approximately 78% of horses treated surgically were discharged from the hospital. Long-term survival was significantly greater for medically treated (100%) than for surgically treated (47%) horses, whereas in two other studies there was no apparent difference in long-term survival and use between horses treated medically (72% and 91%) and surgically (75% and 95%). Some horses treated medically and surgically had recurrent episodes of abdominal pain after hospital discharge. Complications that develop in horses with small colon impaction include diarrhea, jugular vein thrombophlebitis, recurrent colic, fever and laminitis. Approximately 69% of horses treated surgically developed fever and diarrhea postoperatively in one study. Approximately 36% to 43% of horses cultured positive for Salmonella, especially those requiring surgical intervention. The mean duration of hospitalization was shorter for horses treated medically. There were no predisposing anatomical or pathological factors identified in the majority of these horses. Early, aggressive medical management of horses with small colon feed impactions is recommended; however, one should not hesitate to intervene surgically if the impaction is resistant to resolution with medical therapy or the signs of pain, or abdominal or intestinal distention increase or if abnormal peritoneal fluid is present.

REFERENCES
References are available upon request.