

Case Report

Diagnostic investigation and surgical management of an oesophageal mural inclusion cyst in a pony yearling

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Summary

The purpose of this paper is to provide a concise illustrative description of the diagnostic techniques and surgical treatment of an oesophageal mural inclusion cyst in a pony.

Introduction

Dysphagia is a common presenting syndrome in equine practice. The diagnostic work-up for dysphagia is well described (Stick 1982, 2006; Greet 1989; Hillyer 1995). There is a wide list of differential diagnoses. Initially in the diagnostic work-up the differentiation between oral dysphagia including disorders of prehension, pharyngeal dysphagia and oesophageal dysphagia must be established. History, clinical examination, radiography, ultrasonography and endoscopy are the conventional ancillary diagnostic aids that further reduce the differential list and in more complex cases computed tomography and magnetic resonance imaging might play an important role.

When the lesion involves the oesophagus and requires surgery then the surgical principles for operating on the oesophagus and the limitations of tolerance that the oesophagus displays must be understood (Craig *et al.* 1989). Fortunately many of these diagnostic and surgical principles have been described by a large contribution to the literature from Stick (1982, 2006). The object of this paper is to describe in detail the diagnostics and surgical management of an oesophageal inclusion cyst in a yearling.

Case details

Case history and clinical findings

A 1-year-old Dartmoor filly was referred with a 9 week history of nasal reflux of food material. Initially this had been infrequent; however, the bouts became more and more



Fig 1: Subtle external swelling visible on right hand side in cranial cervical area (the clipped area).

frequent during this period. The owners also stated that they had noticed a 'thickening' of the tissues around the throat during the last 4 weeks. Clinical evaluation revealed the vital signs to be within normal limits and the pony was bright and alert in demeanour and reportedly had a good appetite. The body condition was normal for the type and age of pony. A poorly delineated swelling was visible in the ventral pharyngeal/cranioventral cervical region and with deep palpation its borders could just be demarcated. The swelling was centred to the right of midline and was around 12–14 cm from craniodorsal to caudoventral (**Fig 1**). The submandibular lymph nodes were of normal size. A nasogastric tube was passed and no obstruction was found. During nasogastric intubation it was noticed that the filly had a right sided oesophagus.

Diagnostic evaluation

Resting endoscopy without sedation revealed a normal nasopharynx but the most cranial portion of the

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Fig 2: Plain cranial cervical radiograph showing the mass protruding ventrally ventral to the third and fourth cervical vertebrae. The cranial limit of the mass is also visible.

oesophagus was abnormal in that the normal longitudinal striations were absent and had been replaced with transverse crimped striations such as are seen in cases of oesophageal diverticulum (Freeman 2005). It was difficult to convincingly demonstrate narrowing within the oesophagus at the site of the mass. The pony was then grazed for 5 min and endoscopy was repeated. Masticated grass could be seen refluxing from the oesophagus into the nasopharynx and occupying both piriform recesses. Ingesta was visible within the lumen of the cranial oesophagus and the assumption was made that this was being refluxed as a result of cranial oesophageal obstruction. Plain radiographs showed a well defined mass at the cranial ventral cervical region (**Fig 2**). The pony was placed in a stable with a wet feed; however, having been in the stable for just 1 h she developed choke. She was starved overnight and the following day ultrasonography was performed on the mass (**Fig 3**). The pony was also fed during the ultrasound examination to see if any ingesta entered the mass; however, this was not observed. A liquid barium swallow was performed and subsequently a barium meal was fed, the latter showed the true extent of the filling defect created by the cervical mass (**Fig 4**). The filling defect was very similar to a previously published radiograph (Stick 2006).

As a result of the diagnostic work-up we believed that this was an oesophageal inclusion cyst and advised surgical exploration and excision. Also, for this reason, it was elected not to aspirate or biopsy the mass.

Surgical evaluation and treatment

The pony was starved overnight and a nasogastric tube placed immediately before induction and anaesthetised using a routine protocol. The pony was placed in dorsal recumbency and a 15 cm midline skin incision was made. The *sternohyoideus* muscle was split in routine fashion. The fascia on the right side of the trachea was bluntly

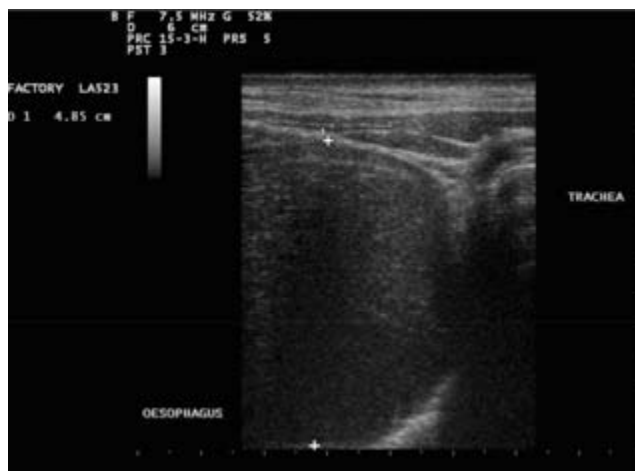


Fig 3: Ultrasonogram taken from the ventral aspect of the cranial cervical region. The cyst is on the left side of the image and has been demarcated between the 2 crosses and measured. The trachea is on the right side of the image.

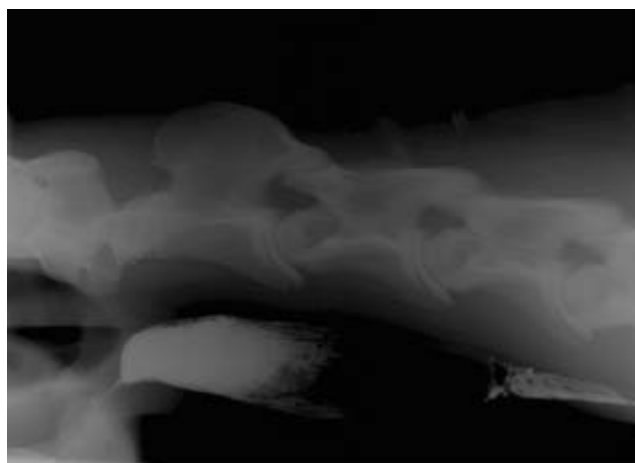


Fig 4: Contrast study using a barium meal fed to the pony. The mass is now more clearly outlined by the large filling defect ventral to the third cervical vertebra.

separated and with the aid of palpation of the nasogastric tube proximal and distal to the mass, and the presence of the mass itself, the oesophagus was identified and an appropriate plane of dissection established (**Fig 5**). The trachea was retracted to the left side. The muscular layer of the oesophagus was sharply incised over the mass and the cream coloured tissue of the mass became visible (**Fig 6**). This was quite thin and all sharp dissection was stopped at this point and the cyst bluntly dissected out. The caudal part of the mass was enveloped in a bright white fibrous layer, which the authors (N.S.W. and L.K.M.) believed to be one of the fibrous layers previously described (Robertson 2007); however, in reality, this was a large pouch of oesophageal mucosa which had enveloped the caudal border of the mass and had extended to the ventral aspect of the mass. Dissection passed through this layer and, therefore, inadvertently into

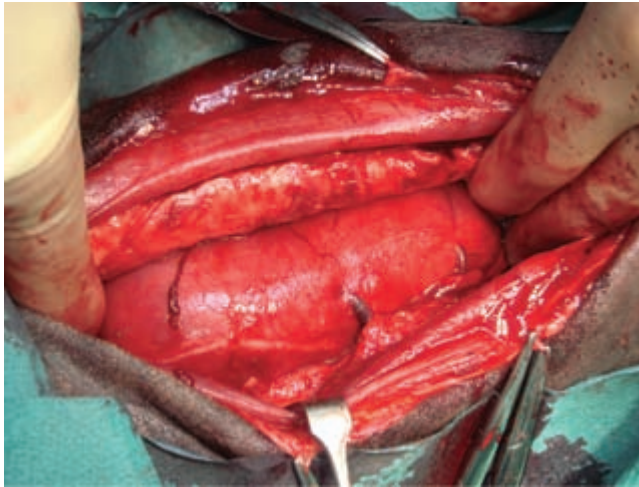


Fig 5: Sternohyoideus muscle has been divided, trachea retracted to the top of the figure. The oesophageal musculature is exposed and bulges up into the surgical field due to the presence of the cyst.

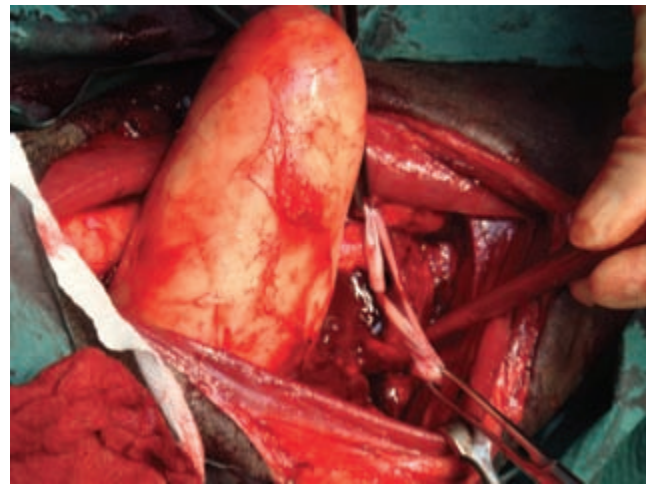


Fig 7: The cyst is being removed. Note the opened oesophageal mucosa to the right of the figure held in the Allis tissue forceps.

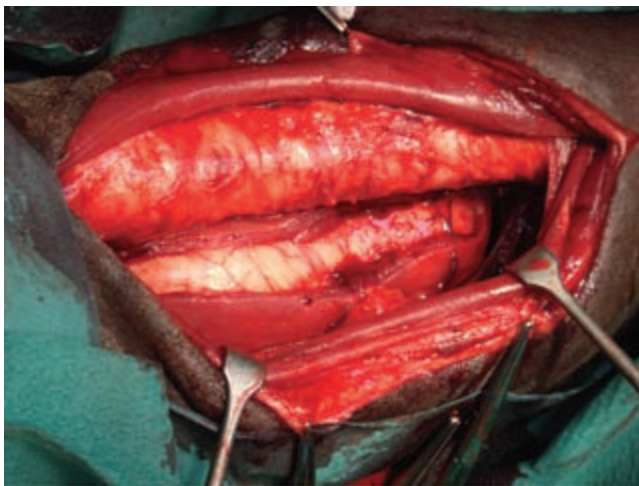


Fig 6: A longitudinal incision has been made through the oesophageal musculature and the cream coloured wall of the cyst has been exposed.



Fig 8: The excised inclusion cyst.

the oesophageal lumen. This was repaired with an inverting suture using 3/0 PDS and finishing with an Aberdeen loop to lie the knot within the oesophageal lumen and the surgical site lavaged assiduously. Blunt dissection of the mass proceeded easily and the cyst could then be removed from the oesophageal musculature without encountering any further mucosa (**Figs 7 and 8**). The oesophageal musculature was closed with 3/0 PDS using interrupted cruciate sutures and the same material was used, in a simple continuous manner to re-appose the sternohyoid muscle. The subcutaneous tissues and the skin were closed in routine fashion and a Primapore dressing¹ applied.

The cyst was incised after surgery (**Fig 9**). Samples were sent for histopathology, which revealed normal oesophageal squamous epithelium over a lamina propria,

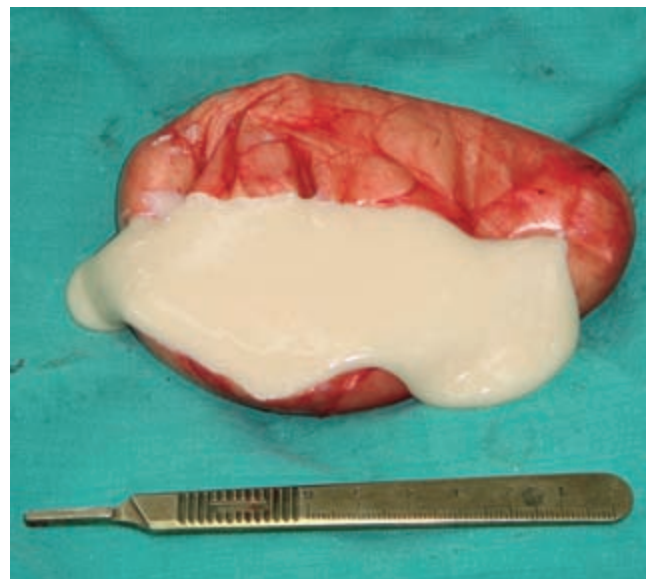


Fig 9: The contents of the inclusion cyst.

and a deeper *muscularis* layer; there was marked thinning of the tissues in one area.

Post operative regime

The oesophagus can be a difficult structure to manage surgically and therefore a strict management plan was implemented. The pony was starved for 48 h and then fed every 2–3 h with soaked high fibre low energy complete cubes (Economy Cubes)² for one week. She was then fed 4 times a day with the same feed for 6 weeks. Throughout this period she was fed at shoulder height, fibre feeds such as hay were not permitted and she was kept away from all edible bedding. No turnout was permitted until 6 weeks post operatively. The pony received 6.6 mg/kg bwt of Gentamicin³ i.v. once daily and 22000 iu/kg bwt of Benzyl Penicillin⁴ i.m. twice daily starting 45 min before surgery. Both antibiotics were continued for 4 days after surgery. The filly also received 2.2 mg/kg bwt of phenylbutazone⁵ i.v. twice daily for 3 days commencing on the day of surgery.

Follow-up

The follow-up period after the surgery is 18 months. The incision healed by first intention and the cosmetic outcome was good. Clinically oesophageal function was normal immediately post operatively and the owner and attending practitioner report the pony to be clinically normal. The subject has grown well and competed successfully in show classes.

Discussion

The largest case series of oesophageal inclusion cysts describes 3 cases (Sams *et al.* 1993). Yearlings predominate in this short series. Three further cases were identified by Stick (2006). Individual case reports are also described (Scott *et al.* 1977; Stick *et al.* 1977). Grossly and histologically the cysts resemble an isolated pouch of oesophageal mucosa, which may occur during the embryological development of the alimentary tract. The heritability of this condition has not been studied.

Important differential diagnoses for this condition are the group of cystic lesions that have been described adjacent to the equine nasopharynx and a comprehensive review of these has recently been described (Robertson 2007). Isolated cases describing branchial cysts (Hance *et al.* 1992; David *et al.* 2008) oesophageal/tracheal duplication cyst (Peek *et al.* 1995) and a thyroglossal duct cyst (Kelmer *et al.* 2007) have also been reported.

Surgical techniques of the cervical oesophagus are usually most effectively performed via a ventral midline approach. Although a left ventrolateral approach just ventral to the left jugular vein is useful for oesophagostomy and approaching the caudal quadrant of the cervical

oesophagus because of the increasing ventral muscle bulk at this site. Insertion of a nasogastric tube prior to anaesthetic induction is important as insertion can be particularly difficult after induction. The oesophagus readily separates into 2 layers and the mucosal/submucosal layer provides the greater tensile strength and most holding power during closure. Resection techniques are difficult and a limit of 4 cm has been put on the length of oesophagus that may be resected (Stick 1982).

Thoracic imaging to define the presence and degree of aspiration pneumonia was not undertaken. However, the authors recommend that such diagnostic investigations be undertaken particularly to assist in the preanaesthetic assessment.

Alternative treatment options described for cystic lesions in the nasopharyngeal region are marsupialisation, iodine sclerotherapy (Slovis *et al.* 2001) and OK-432 injections (David *et al.* 2008).

Sams *et al.* (1993) were concerned with some of the complications of excision as a surgical treatment. They encountered one case of iatrogenic recurrent laryngeal nerve damage, where they entered one cyst inadvertently and also entered the oesophageal lumen in one horse. They also felt that marsupialisation was a good technique and avoided some of these complications although they also felt that cyst rupture during iodine sclerotherapy as part of marsupialisation could also cause damage to the adjacent neurovascular structures. We noticed that the cyst was very thin walled and switching to blunt dissection as soon as the cream surface of the cyst was encountered was important. This was assisted by the easy nature with which the cyst could be shelled out and therefore made surgical excision more attractive to the authors than marsupialisation. Also taking note that there may be no layers of fibrous tissue as described by Robertson (2007), rather that these layers may be pouches of oesophageal mucosa/submucosa, may reduce inadvertent entry into the oesophagus. If entry does occur within such a pouch it may be worth bearing in mind when decision making about the closure and surgical management of such a pouch that horses tolerate wide necked diverticula considerably better than a stricture. Stick (2006) describes the options of diverticulectomy or inversion to manage the redundant mucosa. The authors (N.S.W. and L.K.M.) chose inversion. There was some excess mucosa, so inversion was felt to be less likely to predispose to stricture formation than mucosal resection and reconstruction.

In conclusion, the authors hope to provide an illustrated approach that has its foundation supplied by drawing information from the major sources within the literature that may prove successful in managing cases of mural oesophageal inclusion cysts.

Manufacturers' addresses

¹Smith and Nephew, London, UK.

²Baileys Horse Feeds, Braintree, Essex, UK.

- ³CP-Pharma Handelsges, Burgdorf, Germany.
⁴Intervet, Milton Keynes, Buckinghamshire, UK.
⁵Arnolds Veterinary Products, Shrewsbury, Shropshire, UK.

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as this serve to demonstrate that the possibility of successful treatment exists'.

We all need to think a little more about killing tumours and perhaps less about giving up and killing horses. Another teachable moment for us all.

Reference

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nearest the barrel is at the appropriate notch. Rotate the plunger ring 1/4 turn to lock it in place and ensure it is locked. Make sure the horse's mouth contains no food. Remove the cover from the tip of the syringe, and insert the syringe into the horse's mouth at the interdental space. Depress the plunger until stopped by the knurled ring. The dose should be deposited on the back of the tongue or deep into the cheek pouch. Care should be taken to ensure that the horse consumes the complete dose. Treated animals should be observed briefly after administration to ensure that part of the dose is not lost or rejected. If any of the dose is lost, redosing is recommended.

*If, after dosing, the syringe is not completely empty, it may be reused on following days until emptied. Replace the cap after each use.

Warning
Do not use in horses intended for human consumption. Keep this and all drugs out of the reach of children. In case of ingestion, contact a physician. Physicians may contact a poison control center for advice concerning accidental ingestion.

Adverse Reactions
In efficacy trials, when the drug was administered at 1.8 mg omeprazole/lb (4 mg/kg) body weight daily for 28 days and 0.9 mg omeprazole/lb (2 mg/kg) body weight daily for 30 additional days, no adverse reactions were observed.

Precautions
The safety of GASTROGARD Paste has not been determined in pregnant or lactating mares.

Clinical Pharmacology
Mechanism of Action: Omeprazole is a gastric acid pump inhibitor that regulates the final step in hydrogen ion production and blocks gastric acid secretion regardless of the stimulus. Omeprazole irreversibly binds to the gastric parietal cell H₂K⁺ ATPase enzyme which pumps hydrogen ions into the lumen of the stomach in exchange for potassium ions. Since omeprazole accumulates in the cell carboxyl and is irreversibly bound to the effect site, the plasma concentration at steady state is not directly related to the amount that is bound to the enzyme. The relationship between omeprazole action and plasma concentration is a function of the rate-limiting process of H₂K⁺ ATPase activity/turnover. Once all of the enzyme becomes bound, acid secretion resumes only after new H₂K⁺ ATPase is synthesized in the parietal cell (i.e. the rate of new enzyme synthesis exceeds the rate of inhibition).

Pharmacodynamics: In a study of pharmacodynamic effects using horses with gastric carcinoma, secretion of gastric acid was inhibited in horses given 4 mg omeprazole/kg/day. After the expected maximum suppression of gastric acid secretion was reached (5 days), the actual secretion of gastric acid was reduced by 99%, 95% and 90% at 1, 16, and 24 hours, respectively.

Pharmacokinetics: In a pharmacokinetic study involving thirteen healthy, mixed breed horses (8 female, 5 male) receiving multiple doses of omeprazole paste (1.8 mg/lb once daily for fifteen days) in either a fast or fasted state, there was no evidence of drug accumulation in the plasma when comparing the extent of systemic exposure (AUC₀₋₂₄, C_{max}, and T_{max} measurements) across the study days; there was great inter- and intrasubject variability in the rate and extent of product absorption. Also, the extent of omeprazole absorption in horses was reduced by approximately 67% in the presence of food. This is evidenced by the observation that the mean AUC₀₋₂₄ values measured during the fifth day of omeprazole therapy when the animals were fasted for 24 hours was approximately three times greater than the AUC estimated after the first and fifteenth doses when the horses were fed hay ad libitum and sweet feed (grain) twice daily. Prandial status did not affect the rate of drug elimination. The terminal half-life estimates (t_{1/2β}) ranged from approximately one-half to eight hours.

Efficacy
Dose Confirmation: GASTROGARD® (omeprazole) Paste, administered to provide omeprazole at 1.8 mg/lb (4 mg/kg) daily for 28 days, effectively healed or reduced the severity of gastric ulcers in 92% of omeprazole-treated horses. In comparison, 32% of controls exhibited healed or less severe ulcers. Horses enrolled in this study were healthy animals confirmed to have gastric ulcers by gastroscopy. Subsequent daily administration of GASTROGARD Paste to provide omeprazole at 0.9 mg/lb (2 mg/kg) for 30 days prevented recurrence of gastric ulcers in 84% of treated horses; whereas ulcers recurred or became more severe in horses removed from omeprazole treatment.

Clinical Field Trials: GASTROGARD Paste administered at 1.8 mg/lb (4 mg/kg) daily for 28 days healed or reduced the severity of gastric ulcers in 99% of omeprazole-treated horses. In comparison, 32.4% of control horses had healed ulcers or ulcers which were reduced in severity. These trials included horses of various breeds and under different management conditions, and included horses in race or show training, pleasure horses, and foals as young as one month. Horses enrolled in the efficacy trials were healthy animals confirmed to have gastric ulcers by gastroscopy. In these field trials, horses readily accepted GASTROGARD Paste. There were no drug related adverse reactions. In the clinical trials, GASTROGARD Paste was used concomitantly with other therapies, which included: anthelmintics, antibiotics, non-steroidal and steroidal anti-inflammatory agents, diuretics, tranquilizers and vaccines.

Diagnostic and Management Considerations: The following clinical signs may be associated with gastric ulceration in adult horses: inappetence or depressed appetite, recurrent colic, intermittent loose stools or chronic diarrhea, poor hair coat, poor body condition, or poor performance. Clinical signs in foals may include: bruxism (grinding of teeth), excessive salivation, colic, cranial abdominal tenderness, anorexia, diarrhea, sternal recumbency or weakness. A more accurate diagnosis of gastric ulceration in horses and foals may be made if ulcers are visualized directly by endoscopic examination of the gastric mucosa.

Gastric ulcers may recur in horses if therapy to prevent recurrence is not administered after the initial treatment is completed. Use GASTROGARD Paste at 0.9 mg omeprazole/lb body weight (2 mg/kg) for control of gastric ulcers following treatment. The safety of administration of GASTROGARD Paste for longer than 91 days has not been determined.

Maximal acid suppression occurs after three to five days of treatment with omeprazole.


Safety
• GASTROGARD Paste was well tolerated in the following controlled efficacy and safety studies.
• In field trials involving 139 horses, including foals as young as one month of age, no adverse reactions attributable to omeprazole treatment were noted.
• In a placebo controlled adult horse safety study, horses received 20 mg/kg/day omeprazole (5x the recommended dose) for 90 days. No treatment related adverse effects were observed.
• In a placebo controlled tolerance study, adult horses were treated with GASTROGARD Paste at a dosage of 40 mg/kg/day (10x the recommended dose) for 21 days. No treatment related adverse effects were observed.
• A placebo controlled foal safety study evaluated the safety of omeprazole at doses of 4, 12 or 20 mg/kg (1, 3 or 5x) once daily for 91 days. Foals ranged in age from 66 to 110 days at study initiation. Gamma glutamyltransferase (GGT) levels were significantly elevated in horses treated at exaggerated doses of 20 mg/kg (5x the recommended dose). Mean stomach to body weight ratio was higher for foals in the 3x and 5x groups than for controls; however, no abnormalities of the stomach were evident on histological examination.

Reproductive Safety
In a male reproductive safety study, 10 stallions received GastroGard Paste at 12 mg/kg/day (3x the recommended dose) for 70 days. No treatment related adverse effects on semen quality or breeding behavior were observed. A safety study in breeding mares has not been conducted.

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