Resolution of Gastric Impaction due to Inappropriate Browse Material in a Black Tailed Prairie Dog *(Cynomys ludovicianus)*

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ABSTRACT

A captive black-tailed prairie dog (*Cynomys ludovicianus*) was presented for clinical examination after showing signs of anorexia, progressive lethargy and absent fecal production. Based on physical examination and radiographic imaging, the prairie dog was diagnosed with gastric impaction after ingesting fresh browse. Fluids, analgesic and prokinetic medications led to the resolution of symptoms within 48 hours. To the best of the authors' knowledge, this is the first reported diagnosis and resolution of gastric impaction in a prairie dog thus offering some diagnostic and medical options for this species. Based on the etiology in this case, it appears that offering large amount of fresh browse should be avoided in this species.

Keywords: Gastric Impaction; Ileus; Rodent; Black–Tailed Prairie Dog; *Cynomys ludovicianus*

INTRODUCTION

Black tailed prairie dogs (*Cynomys ludovicianus*) are a rodent species of the *Sciuridae* family that are native to the plains of western North America (1). This non-hibernating rodent forms colony-style-family groups and inhabits large burrow complexes. Although prairie dogs are used in research, kept as pets, and commonly found in zoological collections, very little is known about their diseases in captivity. Commonly reported health concerns in captive prairie dogs include odontomas, hepatocellular carcinomas, ectoparasites, and dilated cardiomyopathy (2). The diet of wild prairie dogs consists largely of native grass hays, including buffalo grass (*Buchloedactyloides*), grama (*Bouteloua* spp.), prickly pear cactus (*Opuntia* spp.), rabbit brush (*Chrysothamnus* spp.), thistle (*Cirsium* spp.) and wheatgrass (*Agropyron* spp.) (3). In captivity, diet should resemble the wild style diet and consist of free choice grass hay, rabbit pellets (20-40 gr/kg body weight), and some green vegetables (1).

CASE SUMMARY

A 3-year-old, 0.94 kg, wild-caught, female, spayed, black tailed prairie dog presented for two days history of anorexia, progressive lethargy and absent fecal production. The prairie dog was housed in an indoor enclosure as part of an educational collection at a wildlife facility. The prairie dog's diet included timothy hay, rabbit pellets and occasional fresh fruits, nuts and vegetables. Two days prior to the onset of symptoms, the prairie dog was offered a large amount of fresh cottonwood browse (*Populus deltoides*), which was preferentially consumed.

On initial examination, the prairie dog was responsive though displayed marked lethargy and a lack of interest in its surroundings. To facilitate completion of the physical examination and further testing, general anesthesia was induced via chamber induction with 5% isoflurane and 100% oxygen (5L/min). Once induction was completed, the prairie dog was maintained on 2% isoflurane in oxygen (2L/min) delivered via facemask through a non-rebreathing circuit (NRB, Bain).

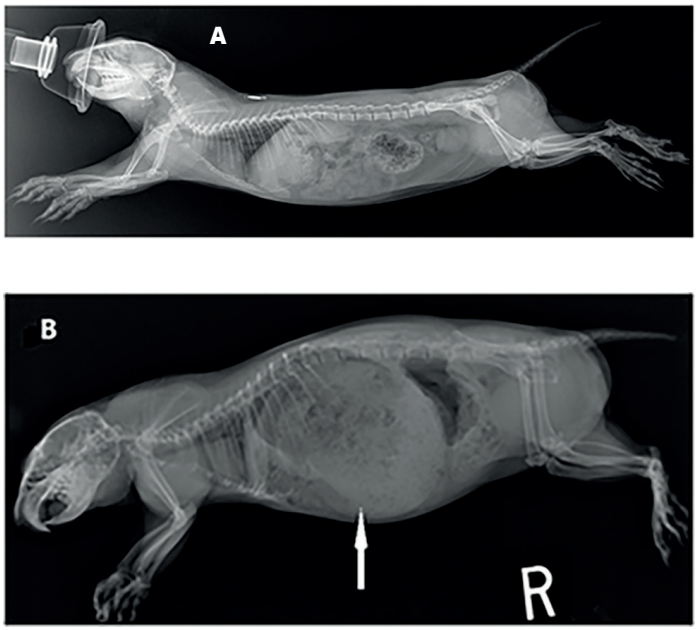

Figure 1. Right lateral views of a normal (A) and an abnormal abdomen of the prairie dog described in this paper (B). The stomach of B is markedly distended by heterogeneously opaque material consistent with ingesta (white arrow). Note the distended gastric silhouette with a halo of gas opacity between the luminal aspect of the stomach wall and the ingesta (purple arrow).

Heart rate and respiratory rate were monitored through the duration of anesthesia and remained between 190-220 bpm and 12-18 rpm respectively. Oxygen saturation was measured and remained at 97-100%. Core body temperature dropped from 37.7 ˚C to 36.1˚C despite the provision of supplemental heat.

On physical examination, the prairie dog weighed 0.94 kg and was over conditioned. No areas of alopecia or evidence of any other external abnormalities were present. Tacky mucous membranes and a prolonged skin tent suggested moderate dehydration, that was estimated at 6-7%. A moderately firm, distended stomach was identified on abdominal palpation. No abnormalities were detected on thoracic auscultation. A 0.9 ml blood sample was collected from the left jugular vein and placed immediately into a lithium heparin-coated blood tube for a complete blood count (CBC) and plasma biochemistry panel (VetScan VS2 analyzer, Abaxis Inc, Union City, CA 94587, USA). The CBC showed profound leukopenia with 1.4 x10^3 WBC/µL (reference range 3.3-10.5 x10^3 WBC/µL) characterized by a left shift and toxic changes in the neutrophils noted on the blood smear (4). The plasma biochemistry profile showed a blood glucose of 222 mg/dL (reference range 138-510 mg/dL), azotemia with a blood urea nitrogen (BUN) of 99 mg/dL (reference range 17-44 mg/dL) and a creatinine of 1.5 mg/dL (reference range 0.3-0.9 mg/dL) (4). While still under gas anesthesia, whole-body radiographs (DV and right lateral) were performed and revealed a gastric silhouette filled with heterogeneously opaque material, suggestive of ingesta, that was markedly distended in comparison to radiographs of a healthy prairie dog (Figs. 1 & 2). No other abnormalities were present on radiographs. Abdominal ultrasonography showed generalized small intestine hypomotility with no evidence of mechanical obstruction. No other abnormalities were noted within the abdominal cavity. The final diagnosis was gastric impaction, likely from ingesta, and functional ileus.

Treatment included Lactated Ringer's solution (LRS; 45 ml/kg twice daily, Hospira, Lake Forest, IL 60045, USA), metoclopramide (0.55 mg/kg twice daily, Parenteral Medicines, Irvine, California 92618, USA), and buprenorphine (0.03 mg/kg twice daily, Par Pharmaceuticals, Spring Valley, NY 10977, USA) all given subcutaneously for the next 48 hours. After recovery from anesthesia, 4 ml of water was administered orally every 4 hours until the prairie dog began drinking normally. Within the first 24 hours after the initiation of therapy, the prairie dog began consuming water independently, eating a small amount of kale and passing feces. These initial feces were abnormally dry and fibrous (Fig 3). In 48 hours after the initiation of therapy, the prairie dog was eating its normal diet, displaying normal behavior and fecal appearance and production.

DISCUSSION

To the best of the authors' knowledge, this is the first description of diagnosis and treatment of gastric impaction in a prairie dog. Gastric impactions are reported to occur in numerous other small exotic mammals kept as pets and in zoological institutions, including guinea pigs, rabbits, sugar gliders and chinchillas. However, descriptions of the presentation or treatment for the gastric impaction in these species are lacking (5,6). A similar condition involving gastric trichobezoars (hair) or phytobezoars (plant) is reported to lead to gastric obstruction in both rabbits and guinea pigs (6-9). Physical examination findings in cases of gastric obstruction include palpably firm to hard gastric contents, cranial

Figure 2. Dorsoventral (DV) views of a normal (A) and an abnormal abdomen of the prairie dog described in this paper (B). The stomach of B is markedly distended by heterogeneously opaque material consistent with ingesta (white arrow).

abdomen pain and marked dehydration. Radiographs often reveal heterogeneously opaque material in the stomach with a build-up of intraluminal gas (6). In rabbits, this intraluminal gas is described as forming a halo around the ingesta causing the obstruction (6). Guinea pigs tend to form a large single compaction of hair or plant material that occupies the majority of the gastric lumen, while rabbits are prone to obstruction with multiple smaller discrete bezoars (8). Recommended therapies for resolution of these conditions differ between rabbits and guinea pigs. Multiple published cases of guinea pigs with trichobezoars were resolved with surgical removal of the obstruction through a gastrotomy (8,9). Rabbits tend to have a poor chance for survival when undergoing enterotomies, and intensive preoperative rehydration is essential for successful surgery in this species. (4,7). Medical therapy, including aggressive parenteral rehydration, enteral fluids and judicial use of pain medications and antibiotics, is recommended to resolve gastric obstructions with bezoars in rabbits (5).

Figure 3. Normal (left) and abnormal feces (right) from this prairie dog, observed after 72hr and 24hr of treatment, respectively. Note the large amounts of plant fiber in the abnormal feces.

Differing from reports in rabbits and guinea pigs, ultrasonography findings suggested a loosely arranged lattice of ingesta within the stomach instead of more densely organized bezoars (6,8). Despite the build-up of intraluminal gas within the stomach, abdominal ultrasonography did not support the presence of obstructive disease. Due to these findings, it was deemed appropriate to treat the intestinal hypomotility with metoclopramide, a dopamine antagonist with prokinetic traits that affects the proximal gastrointestinal tract (6). As no studies regarding the pharmacodynamic effects of metoclopramide in prairie dogs exist, it was hard to determine the degree to which this medication contributed to the resolution of gastric impaction in this case.

Similar to prairie dogs, horses are monogastric hindgut fermenters. They have been reported to frequently suffer from gastric impaction with a similar pathophysiology to the one described in this case (10, 11). Equine gastric impactions consist of plant material arranged in a more disorganized fashion than the bezoars described in rabbits and guinea pigs. Several predisposing factors including dental disease, inadequate available water, rapid ingestion of lush feed and primary gastrointestinal dysmotility are associated with the development of gastric impaction in horses (11). Defined as an excessive accumulation of ingesta despite an appropriate fasting period, diagnosis of this condition in horses depends upon endoscopic visualization of the impaction as well as the lack of any evidence of small intestinal pathology (10). Symptoms in horses include anorexia and acute or recurrent colic. Enteral fluid administration is considered an essential therapy to resolve equine cases of gastric impaction in order to rehydrate and break down the gastric mass allowing passage of the impaction. One retrospective study suggested that the therapy mostly associated with the successful resolution of gastric impaction with feed material in horses was the provision of enteral fluid, with 90% of horses receiving enteral fluid surviving to discharge (10). For this reason, and the potential challenges of maintaining an intravenous fluid line in the prairie dog described in this case, oral and subcutaneous hydration were administered at regular intervals.

As described in cases of gastric impaction in horses (10-12), the gastric impaction in the prairie dog described in this case was caused by the ingestion of a large amount of fresh lush browse. Prairie dogs are browsers that typically eat a variety of grasses and woody shrubs found low to the ground, and rarely ingest large amounts of fresh lush plant matter (1, 3). The large amount of fresh ingesta within the stomach resulted in the impaction and the clinical signs, suggesting, that large amounts of leafy browse should preferably be avoided in this species.

The feces produced by this prairie dog in the first 24 hours after initiation of therapy were drier and contained a greater amount of fibrous material than normal due to the abnormal fermentation. Similarly, abnormal dry feces are initially passed by horses diagnosed with gastric impaction, and subsequently improve with adequate rehydration (10). Rabbits that present with ileus of various etiologies are noted to produce smaller amount of feces that are also dry and misshapen (13). These changes in fecal amount and appearance are the result of the dehydration develops secondary to the anorexia and associated ileus (5,6). Changes in the fecal appearance and production can be a valuable indicator as to an animal's hydration status and intestinal motility.

Buprenorphine was used to relieve pain from the gastric distension in this case. While assessment of pain through abdominal palpation was limited due to patient's temperament, cases involving rabbits and guinea pigs with distension of viscera include abdominal pain as a frequent finding (4,8). Visceral pain is associated with luminal distension of the stomach or intestines.

Marked hyperglycemia is a marker of critical disease in a variety of species (14). In rabbits, values greater than 360 mg/dL are associated with conditions considered life threatening, with one retrospective study finding of a mean blood glucose concentration of 444 mg/dL in rabbits with gastrointestinal obstruction (14). Blood glucose measurements in prairie dogs can vary depending on the origin of the animals, the provided diet and the biochemistry analyzer (4,15,16). Wild prairie dogs presenting without evidence of clinical disease can display a wide range of blood glucose concentrations (138 mg/dL to 510 mg/dL), though it is thought that handling stress may have elevated these values (4). A plasma biochemistry study in prairie dogs that had used a similar analyzer to the one used in this case, had reported a range of 28-84 mg/dL thus suggesting a marked hyperglycemia in this prairie dog on presentation (15). During the last health examination, for which it was determined healthy, a plasma biochemistry panel using the same analyzer had determined its blood glucose concentration to be 144 mg/ dL, a much lower value than

the 222 mg/dL with which this prairie dog presented. This relative increase in blood glucose concentration may be attributed to the pain associated with the gastric distension.

CONCLUSION

There are very few reports of the diagnosis and the medical treatment of acquired disease conditions in captive prairie dogs. This case report describes the diagnosis and medical treatment of browse-related gastric impaction in a black-tailed prairie dog kept for educational purposes in a wildlife facility. The history and the clinical signs were suggestive of gastrointestinal pathology, but the definitive diagnosis was accomplished with radiographs and abdominal ultrasound. Due to a lack of evidence of mechanical obstruction, medical therapy was elected to treat the impaction. The prairie dog's rapid response and the resolution of the afflicting clinical signs indicate that this therapeutic approach may be appropriate in cases of gastric impaction in this species. Although this is a single-animal report, the history and outcome of this case suggests that large amount of fresh browse should not be offered to captive prairie dogs.

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