A Case of Enterolithiasis in a Grant's Zebra (Equus burchelli boehmi) and Analysis of the Enterolith

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Abstract: We describe a case of enterolithiasis in an eight-year-old male Grant's zebra (Equus burchelli boehmi) that died after a 10-day history of depression, anorexia, dehydration and colic. On necropsy, an enterolith was discovered at the conjunction of the descending colon and the caecum. The spherical enterolith weighed 1,660 g and was 13.5 cm × 8 cm in size. According to scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS), the nidus consisted primarily of SiO2 with outer layers of magnesium and phosphate. The formation of enteroliths is closely related to diet. We suggest that this captive zebra's diet, which consisted primarily of alfalfa hay with mineral supplements, was the cause of enterolithiasis in this case. This is the first report of enterolithiasis in a captive equid in Korea. Our findings provide information valuable for the development of dietary guidelines to prevent enterolithiasis in captive wild equids.

Key words: enterolithiasis, Grant's zebra (Equus burchelli boehmi), alfalfa hay, SEM.

Introduction

Equine enterolithiasis is a disease characterized by pathologic mineral concretions in the gastrointestinal tract that are typically composed of struvite (magnesium ammonium phosphate). Obstruction of the colon and death may result from the aboral movements of enteroliths that form in the right dorsal colon and migrate to the narrow transverse or small colon (4,7,8,9). Clinical signs of enterolithiasis include colic, anorexia, depression, and absence of defecation due to partial or complete obstruction of the lumen. A number of factors are associated with enterolith formation, including the presence of nidi, diet, intestinal luminal pH, soil type, age, and breed (4,7,9).

Definitive diagnoses of enterolithiasis are made via abdominal radiography, exploratory celiotomy, necropsy or rectal palpation (1,4,7,9). The use of abdominal radiography is limited by the size of the patient and the capacity of the radiographic equipment (7). On rare occasions, one may palpate an enterolith per rectum, particularly if it is present in the distal small colon (8). There are no reliable diagnostic predictors of enterolithiasis (5,7). Surgery is the only option for removal of an impacted enterolith in the large colon, with prognosis determined at the time of surgery. If surgery is performed during the early stages of disease, the prognosis is typically excellent. However, if colon rupture has already occurred, gross peritoneal contamination will occur and in these instances, euthanasia is recommended (9).

Although equine enterolithiasis has been reported in domestic horses since the 1800s, it has only recently been reported in zebras, including Hartmann’s mountain zebra (Equus zebra hartmannae) (3) and Grant’s zebra (Equus burchelli boehmi) (6). We describe a case of enterolithiasis in a male Grant’s zebra that was raised in a zoo, including clinical signs, pathologic findings and the results of analysis of the enterolith.

Case

An eight-year-old intact Grant’s zebra stallion (E. burchelli boehmi) presented with watery diarrhea, depression, anorexia, dysastasia, and muscle tremors. The zebra was born and raised in captivity, on soil footing outdoors and concrete footing indoors. At presentation, the zebra’s body weight was 200 kg. The zebra was maintained on 7 kg of alfalfa hay per day with tap water provided for drinking water.

Tentatively, the zebra was diagnosed with colic and was treated with flunixin (Flunixin®, 1.1 mg/kg, Bomac Laboratories, New Zealand) by dart. The zebra initially ate a small amount of its regular diet and appeared to be recovering, but then began to bloat again and exhibit symptoms of extreme pain including that stamping and bared teeth. To relieve the pain, the zebra was again treated with flunixin by dart and exhibited a temporary recovery, but clinical signs including bloating, anorexia, unwillingness to move and biting his cage bars soon returned. We diagnosed a partial obstruction of the intestinal tract and ileus. The zebra was treated with metoclo-
Fig 1. A smooth-surfaced enterolith found in the colon of an eight-year-old Grant’s zebra stallion (width 13.5 cm, length 8 cm, weight 1.66 kg).

Fig 2. The cut surface of the enterolith reveals concentric rings (A, white line, nidus of enterolith; B, yellow line, second layer; C, red line, third layer; D, blue line, fourth layer).

Fig 3. Quantitative analysis of the nidus (layer A) by SEM and EDS, the Si and O peaks are predominant.

Fig 4. Quantitative analysis of layer B by SEM and EDS, with Mg and P peaks predominant.

Fig 5. Quantitative analysis of layer C by SEM and EDS, with Mg and P peaks predominant.

Fig 6. Quantitative analysis of layer D by SEM and EDS, with Mg and P peaks predominant.

therapy.

Postmortem examination revealed a great deal of ascites in the abdominal cavity as well as a spherical enterolith (weight 1.66 kg, size 13.5 cm × 8 cm) with a smooth greenish surface at the junction of the descending colon and rectum (Fig 1). We observed a hemorrhagic necrotic region 10 cm in diameter where the colon had been occluded by the enterolith. We cut and divided the enterolith into four sections (A,B,C,D) by layer for quantitative analysis by scanning electron microscope (SEM; JSM-6700F, Jeol, Japan) and energy dispersive X-ray spectrometer (EDS; INCA, Oxford, England) (Fig 2). Layer A consisted primarily of silicon and oxygen (SiO₂) (Fig 3), while the other layers (B, C, and D) were made up of magnesium (Mg) and phosphorus (P) (Fig 4, 5, and 6).