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FERRETS

Epizootic Catarrhal Enteritis

BASIC INFORMATION



DEFINITION

Epizootic catarrhal enteritis (ECE) is an enteric viral disease of ferrets that is caused by a novel coronavirus, designated as ferret enteric coronavirus (FECV). In naïve ferrets, infection results in profuse greenish, mucoid diarrhea with high morbidity and low mortality.

SYNONYMS

Green diarrhea, greenies, green slime, ferret enteric coronavirus infection

SPECIAL SPECIES CONSIDERATIONS

FECV has been implicated anecdotally in diarrheal outbreaks in other Mustelid species.

EPIDEMIOLOGY

SPECIES, AGE, SEX

- Ferrets of all ages may be infected with FECV.
- Older animals may have more severe lesions caused by concomitant inflammatory bowel disease or other systemic illness.

RISK FACTORS

- Animals in facilities that routinely introduce new animals, such as shelters, are at risk.
- Older animals with concomitant disease, especially preexistent gastric *Helicobacter mustelae* infection, are at risk for more significant disease.

CONTAGION AND ZOOZOSIS As with other group A coronaviruses, FECV is extremely contagious. The virus is spread easily in feces but may be spread mechanically by contaminated clothing, shoes, examination tables, and instruments.

GEOGRAPHY AND SEASONALITY

- Because of the immunity generated by previous infection, as well as production of maternal antibodies from jills on many breeding farms, true outbreaks of ECE are extremely rare in the United States.
- Most cases of ECE arise outside of the United States as a result of previously unexposed populations and importation of animals from North America for the pet trade.
- There is no seasonality.

ASSOCIATED CONDITIONS AND DISORDERS

- Acutely ill ferrets may develop gastric ulcers owing to the stress of illness and/or treatment.

- Affected animals may develop inflammatory bowel disease as a sequela of infection by FECV.

CLINICAL PRESENTATION

HISTORY, CHIEF COMPLAINT In most cases, the patient history will indicate recent introduction of a clinically normal ferret (often a kit from a pet store) into the house or facility within the last 48 to 72 hours. Naïve ferrets will subsequently develop profuse greenish diarrhea that quickly turns mucoid, ultimately exhibiting a “birdseed-like” consistency. Owners will report various degrees of anorexia in affected animals, with the suspect carrier showing no clinical signs.

PHYSICAL EXAM FINDINGS

- Clinical signs and physical findings are dependent on the duration of illness before presentation, as well as the age of the animal and the presence of concurrent illness.
- Young animals may exhibit no clinical signs besides mucoid diarrhea.
- Older animals may exhibit varying degrees of dehydration and anorexia.
- Clinical signs associated with gastric ulcers may be seen in animals that have been ill for several days.

ETIOLOGY AND PATHOPHYSIOLOGY

- A novel ferret group A coronavirus closely related to feline enteric coronavirus, canine coronavirus, and transmissible gastroenteritis of pigs causes ECE.
 - The virus infects mature enterocytes at villous tips, resulting in villous blunting and fusion.
 - Diarrhea results primarily from significant loss of absorptive surface in the gut, as well as from loss of digestive enzymes normally present in mature villous enteric epithelial cells.

DIAGNOSIS



DIFFERENTIAL DIAGNOSIS

- The differential diagnosis includes other infectious and noninfectious causes of diarrhea:
 - Coccidiosis
 - Campylobacteriosis
 - Rotavirus infection
 - Cryptosporidiosis
 - Salmonellosis
 - Lymphocytic and eosinophilic forms of inflammatory bowel disease

INITIAL DATABASE

- Clinicopathologic changes are not specific for ECE.
- Persistent lymphocytosis, hypoalbuminemia, and mild elevations in globulins suggest bowel inflammation but are not specific for this condition.
- Acutely ill animals may show an elevated alanine aminotransferase and rarely alkaline phosphatase as a result of inanition, starvation, and mobilization of fat stores to the liver.
- Rarely, acutely affected animals may exhibit hemoconcentration and mild electrolyte abnormalities, including hypernatremia, hypochloremia, and an increased anion gap.

ADVANCED OR CONFIRMATORY TESTING

- Definitive diagnosis requires biopsy of the intestine and evaluation for characteristic histopathologic lesions.
- Immunohistochemistry for coronavirus antigen in intestinal biopsy
- PCR on fecal samples or intestinal biopsy

TREATMENT



THERAPEUTIC GOALS

- The overall therapeutic goal is to combat dehydration and maldigestion/malabsorption, while preventing secondary bacterial infection.
- In chronic cases, amelioration of the effects of inflammatory bowel disease is required.

ACUTE GENERAL TREATMENT

- In dehydrated animals, volume replacement with up to 90 mL/kg/d of lactated Ringer's solution may be required.
- Broad-spectrum antibiotics (e.g., enrofloxacin 5 mg/kg bid PO or SC), although not helpful against coronavirus infection itself, are generally recommended to prevent secondary bacterial infection.
- Highly absorbable bland diets, such as Carnivore Care (Oxbow Foods, Inc., Murdock, NE) and Hill's products (Hill's Pet Nutrition, Inc., Topeka, KS), or meat-flavored baby foods, should be administered frequently in small amounts.
- If clinical signs of gastric ulcers are noted, palliative therapy is indicated:
 - Sucralfate 75 mg PO 10 min before meals

- Omeprazole 4 mg/kg PO q 24 h or
- Cimetidine 10 mg/kg PO q 8 h or
- Ranitidine bismuth citrate 24 mg/kg PO q 8 h
- Antibiotic therapy specific for *Helicobacter mustelae*

CHRONIC TREATMENT

- Animals that have recovered from epizootic catarrhal enteritis may develop “inflammatory bowel disease” after several months.
- These animals will often benefit from a bland diet and 0.5 mg/kg oral prednisone daily.
- Lifelong treatment may be required.

PROGNOSIS AND OUTCOME

- Most young, healthy animals will recover within 21 days.



- Older animals, especially those with other chronic illness, often experience more severe clinical signs and a longer disease course.

PEARLS & CONSIDERATIONS



COMMENTS

- Treatment success should be predicated on improvement of stool character over a period of weeks.
- Stools may vary significantly from day to day.

PREVENTION

Owing to prolonged shedding of the virus by carriers (up to 8 months), isolation of new arrivals is rarely beneficial in preventing epizootic catarrhal enteritis.

SUGGESTED READINGS

Williams BH, et al: Retrospective study: coronavirus-associated epizootic catarrhal enteritis (ECE) in ferrets (*Mustela putorius furo*): 119 cases (1993-1998), J Am Vet Med Assoc 217:526-530, 2000.

Wise AG, et al: Molecular characterization of a novel coronavirus associated with epizootic catarrhal enteritis (ECE) in ferrets, Virology 349:164-174, 2006.

CROSS-REFERENCES TO OTHER SECTIONS

Campylobacter spp. Infection
Endoparasites

Helicobacter mustelae-Associated Gastritis and Ulcers

Inflammatory Bowel Disease

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