Successful use of albendazole and fenbendazole therapy in a cat with persistent diarrhea due *Enterocytozoon bieneusi*

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ABSTRACT. *Enterocytozoon bieneusi*, also known as microsporidia, is an obligate, opportunistic, and neglected intracellular pathogen that causes diarrhea in humans. Although identified in the cat feces by epidemiological studies, no association with diarrhea has been demonstrated. We demonstrated a case of chronic enteritis by *E. bieneusi* in a 1-year-old male Maine Coon cat, neutered with diarrhea for nine months, by histopathological analysis of gastrointestinal biopsies and PCR of feces. The treatment with albendazole (10 days) followed by fenbendazole (5 days) proved to be effective and safe after diagnosis. This description highlights the need to investigate these pathogens in cases of diarrhea due to their importance in public health since they are zoonotic agents.

KEYWORDS: albendazole, enteritis, lymphoplasmacytic enteritis, microsporidiosis

Enterocytozoon bieneusi is an obligate, intracellular opportunistic pathogen of the phylum Microsporidia and categorized as a sister clade of fungi [4, 10]. These pathogens have spores as an infective form (with 2 to 5 µm), which are resistant in the environment and transmitted by the oro-fecal route [4, 6]. Epidemiological studies indicate that the prevalence of these microsporidia in the feces of dogs and cats varies from 0.8 to 6.7% [1, 11, 13], but a recent study revealed a prevalence of 20.3% among cats living in poor conditions [16]. Here, a case of feline diarrhea caused by *E. bieneusi* that was effectively treated with albendazole and fenbendazole is reported.

The patient was a 1-year-old male Maine Coon, neutered with a history of chronic diarrhea for nine months accompanied by weight loss and thinness, with eventual hematochezia, polyphagia, and prostration. The patient has previously been treated with antimicrobials, prednisolone, diet changes, and deworming without success. The patient was 6.5 kg and body score of 3/9.

Several hematologic examinations, such as complete blood count, serum biochemical profile, electrolyte analysis, FeLV/FIV, trypsinogen (trypsin-like immunoreactivity; TLI), cobalamin (vitamin B 12), thyroxine (T-4 total), were unremarkable, excluding vitamin B-12 deficiency. Moreover, research on *Toxoplama gondii* (ELISA serology) and *Campylobacter jejuni*, feline enteric coronavirus, *Cryptosporidium* sp., *Giardia* sp., feline parvovirus, *Salmonella* sp., and *Tritrichomonas fetus* by PCR, were unremarkable.

The patient underwent upper digestive endoscopy and colonoscopy followed by histopathological analysis of biopsies from the stomach, duodenum, ileum, and colon. The presence of lymphoplasmacytic infiltrate was observed in the lamina propria of all segments. Additionally, Giemsa staining revealed intracellular structures in enterocytes indicative of microsporidia in the duodenum (Fig. 1). After that, PCR from feces was carried out for *E. bieneusi*, *Encephalitozoon cuniculi*, and *E. intestinalis* [9, 15], and the result was positive for *E. bieneusi* as confirmed by sequencing. The sequence obtained in this study was submitted to the GenBank database under the accession number: OM305003. The cat was treated with albendazole (orally, 25 mg/kg once daily for 14 days), and after a 21-day interval, with fenbendazole (orally, 25 mg/kg once daily for five days). Gradually, diarrhea improved throughout the treatment, and the cat maintained regular feces elimination since the end of the treatment. Blood counts done every five days during treatment showed no changes, although albendazole has myelotoxic potential in cats. After three months of treatment, the patient remained PCR negative for microsporidia and was considered cured.

In humans, enteritis due to *E. bieneusi* is the primary clinical microsporidiosis, whether immunosuppressed or not, resulting in diarrhea, dehydration, malabsorption syndrome, and weight loss [2, 7]. The prevalence of *E. bieneusi* in diarrheal dogs and cats are

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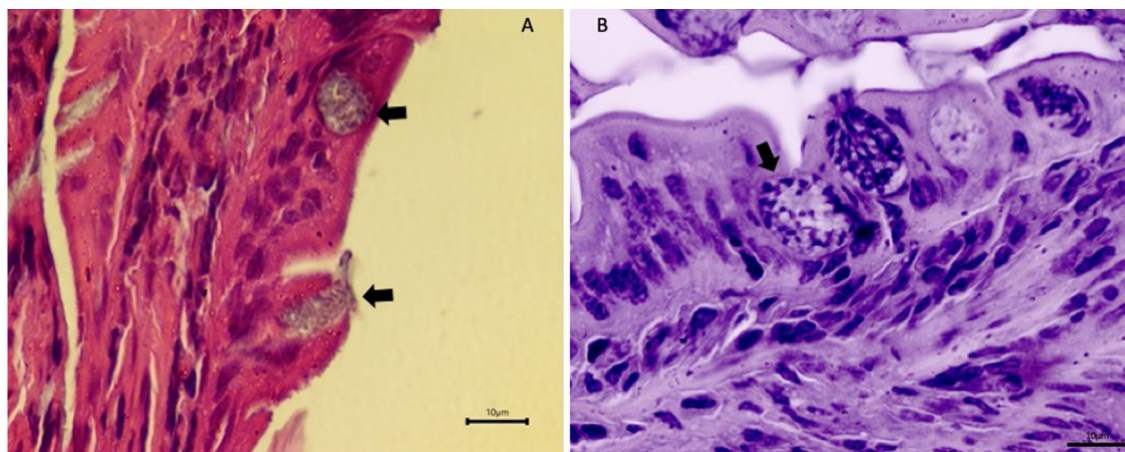
Fig. 1. Histological section photomicrograph of the ileum showing spore collections (arrows) in the epithelium. **A)** Hematoxylin and eosin stain. **B)** Giemsa stain.

similar to the other epidemiological outcomes (0.6–6.7%), suggesting a weak association between infection and the occurrence of clinical signs and symptoms in pets [3, 12, 13]. To date, enteritis caused by the microsporidia, *E. bieneusi* had never been reported, so this study places microsporidia among the potential causative agents of lymphoplasmacytic enteritis and chronic diarrhea. As opportunistic pathogens, microsporidioses are associated with immunosuppression [2, 5]. All factors commonly associated with immunodeficiencies were evaluated, especially those of viral infections, such as leukemia and feline viral immunodeficiency, and drug treatment. Other congenital immune deficiencies, such as defects in macrophage phagocytosis, are a challenge for the feline medicine, although they may be present and constitute predisposing factors.

A major challenge in diagnosing intestinal microsporidiosis lies in the fact that the spores are extremely small (2–5 µm) and cannot be detected by conventional techniques of fecal examinations. The histopathological analysis of intestinal biopsies was crucial to guide the diagnosis, as they discovered the presence of microsporidia in enterocytes. The H&E technique is not the best technique for identifying these pathogens; however, the pathologist's experience provided important clues, and a PCR test confirmed the diagnosis, a sensitive and specific method, which is still hardly available in conventional laboratories [8, 14, 15].

In human microsporidiosis, albendazole and fumagillin are the most commonly used therapeutic agents [5]. Albendazole, targeting β-tubulin, is effective against *Encephalitozoon* spp.; however, it is ineffective against *E. bieneusi*. The effectiveness of Fumagillin has a much broader range against microsporidia, comprising both *Encephalitozoon* spp. and *E. bieneusi* [5]. In contrast to what is observed in human patients with enterocytozoonosis, in this report, treatment with albendazole followed by fenbendazole was absolutely effective in eliminating the pathogen, and the patient was considered cured, with no recurrence of the infection. Albendazole has high toxicity depending on the time of use, for this reason it was used for 14 days. Although not commonly used for microsporidiosis, fenbendazole is a benzimidazole widely used in clinical practice for cats, with rare side effects. Considering that the time of use was short for the cure of enterocytozoonosis, we complemented the treatment with fenbendazole, corroborating the satisfactory results observed in turtles [4].

In pets, microsporidia are neglected and poorly studied zoonotic agents, causing infection. Our study demonstrated a case of chronic enteritis caused by microsporidia *E. bieneusi* in cats, reinforcing the need to investigate these pathogens in cases of diarrhea due to their importance to public health. Additionally, albendazole and fenbendazole have been demonstrated to be safe and effective therapeutic options for cats.

POTENTIAL CONFLICT OF INTEREST. The authors have nothing to disclose.

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