Dysuria in a Cat: Could It Be More?

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History

Miss Kitty, a 9-month-old, intact, female domestic short-haired cat, presented with lethargy, vocalizing in the litter box, and bloody vaginal discharge of 3 days' duration. The owners adopted Miss Kitty when she was 9 weeks of age. The kitten had not been vaccinated or dewormed, nor was she on any parasite preventive. Questioning revealed that, in addition to the presenting signs, Miss Kitty had been anorexic and vomiting for 3 days. She has been fed a dry over-the-counter cat food, and she had not been outside since adoption.

Physical Examination

The cat was bright, alert, and responsive on initial evaluation. Her temperature was 99.8°F, heart rate 180 beats/min, and respiratory rate 60 breaths/min, with a body condition score of 4/9. Mucous membranes were pale with a capillary refill time of 3 seconds. Flea comb examination revealed the presence of adult *Ctenocephalides felis* as well as flea frass. Cestode proglottids were present in the perineal region. A clear-to-pink vaginal discharge was noted. Abdominal palpation revealed cranial abdominal pain as well as a mildly enlarged and painful urinary bladder that was difficult to express.

Table 1. Significant Laboratory Results

Variable	*On Presentation*	*3 Days after Surgery*	*6 Weeks after Surgery*	*Reference Range*
Monocytes (/µL)	1,300	NP	NP	40–530
Neutrophils (/µL)	15,200	NP	NP	2,620–15,170
Blood urea nitrogen (mg/dL)	140	35	30	10–30
Creatinine (mg/dL)	5.4	0.7	1.2	0.2–2.1
Glucose (mg/dL)	179	141	183	70–150
Urine specific gravity	1.040	NP	NP	usual, 1.020–1.050
RBCs (results of urinalysis)	Too numerous to count	NP	NP	0–5

NP = not performed.

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Laboratory Diagnostics

Tests for FIV and FeLV were negative. CBC revealed a mild monocytosis and neutrophilia. A serum chemistry panel revealed azotemia and mild hyperglycemia (**Table 1**). Urinalysis via cystocentesis revealed concentrated urine with RBCs too numerous to count and mucus strands. The remainder of the urinalysis was within normal limits. No bacteria were seen. Urine culture was negative. Survey radiographs revealed a gas pattern in the GI tract, an enlarged bladder, and ileus throughout the small bowel (**Figure 1**). No stones were visible in the kidneys, ureters, bladder, or urethra.

Ask Yourself

1. How do cats acquire *Taenia taeniaeformis* tapeworms?
2. What are the current detection methods for *T taeniaeformis* in cats?
3. What are the treatment options for tapeworms in cats?

Diagnosis

Jejunal tapeworm bezoar

Preliminary Diagnosis

Given the patient's history and physical examination, the diagnostic differentials in this case included a functional urethral obstruction or bladder atony, lower urinary tract disease, GI foreign body, cestode infection, and flea infestation.

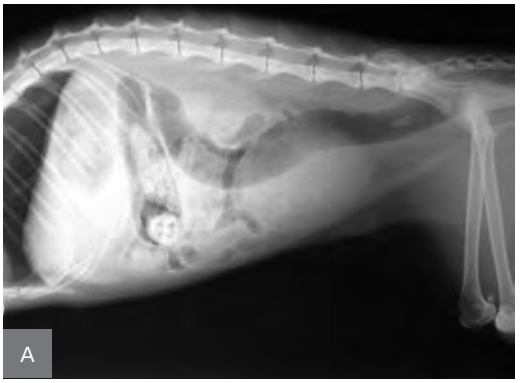
The owners declined additional diagnostics but did agree to an exploratory laparotomy based on concerns about GI foreign body and urinary tract disease.

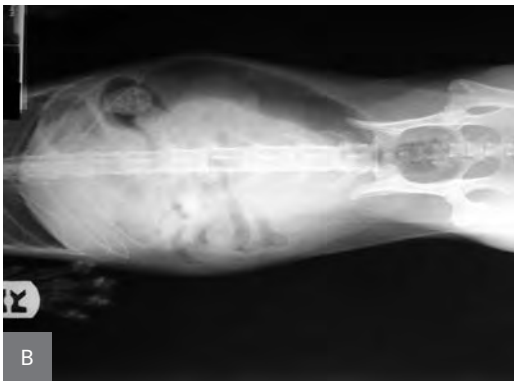
Surgical Diagnostics

The patient was premedicated with dexmedetomidine (40 µg/kg), ketamine (5 mg/kg), and butorphanol (0.2 mg/kg), all given IM. She was induced with IV propofol to effect and maintained on inhalant 1% isoflurane for the duration of the procedure.

The urinary bladder was enlarged, discolored, and thickened. A catheter passed from the lumen of the bladder to the external urethra revealed no evidence of uroliths or mechanical obstruction. Tissue was obtained for histopathologic examination. The stomach was firm, and foreign material was suspected. Gastrostomy revealed a trichobezoar measuring 7.5 × 15.25 cm. Plication was noted in the mid-jejunal region. An enterotomy was performed, and a large mass of tapeworms—later identified as *T taeniaeformis*—was removed (**Figure 2**).

1 **Lateral (A) and ventrodorsal (B) radiographs showed a distended urinary bladder, ileus, and a GI obstructive pattern with possible gastric and small bowel foreign bodies.**





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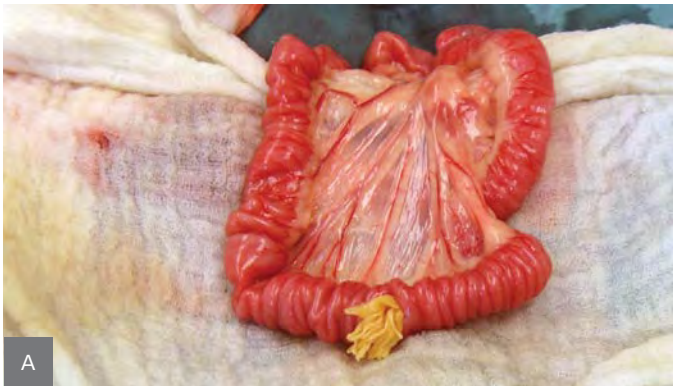
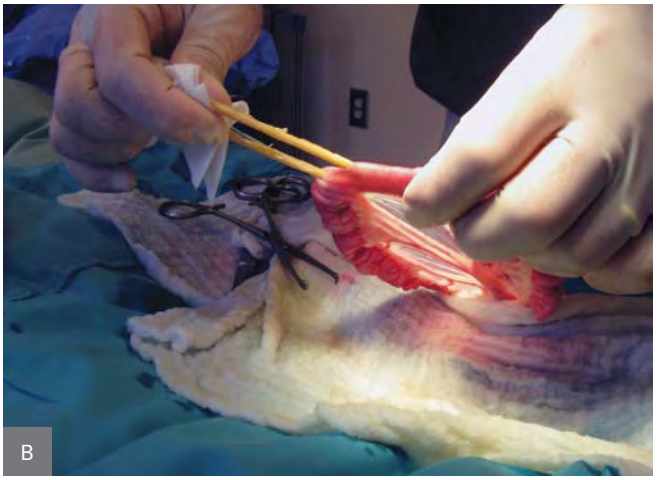
Treatment & Outcome

After surgery, topical praziquantel–emodepside (12 mg/kg and 3 mg/kg, respectively) was administered, along with phenoxybenzamine (2.5 mg q24h PO). A recheck serum chemistry panel 3 days after surgery showed resolving azotemia. At 6 weeks postoperatively, Miss Kitty had complete resolution of both urinary and GI clinical signs. In addition, the azotemia had fully resolved.

Feline lower urinary tract disease is a common clinical disorder.[1] The urinary bladder enlargement and dysuria in this case could be secondary to failure of bladder contraction, functional urethral obstruction, or a combination of both. Both neurogenic and nonneurogenic causes are possible, including spinal lesions, detrusor atony, detrusor-urethral dyssynergia, overdistension of the bladder, and idiopathic causes.[5] The cause was not identified definitively in this patient.

2 **(A and B) A large mass of *T taeniaeformis* was found and removed during an enterotomy.**





Did You Answer?

1. Cats are infected with *T taeniaeformis* when they eat a mouse that is infected with a tapeworm metacestode, in this case a strobilocercus. The strobilocercus develops to an adult in the cat's GI tract and begins to produce proglottids in 34–80 days.[2] Those proglottids release eggs containing hexacanth embryos into the environment, where they are consumed by a mouse.
2. Fecal flotation and proglottid detection are available techniques to detect tapeworms. Centrifugal flotation is more sensitive than passive flotation,[3] although both methods have an overall low sensitivity for detecting tapeworms.[4] Proglottid detection is also poorly sensitive because proglottids are only shed intermittently. Microscopic identification of the eggs in the proglottids is important, as this will allow the differentiation of *Taenia* spp from *D caninum*—an important distinction when it comes to how the tapeworm was acquired and how best to treat and prevent reinfection.
3. Treatment for *T taeniaeformis* is provided with fenbendazole, epsiprantel, or praziquantel (**Table 2**). Because these medications only are effective against adult tapeworms present at the time of treatment, risk factors need to be evaluated and proper treatment protocols implemented. Surgical removal may be required in some cases.

Table 2. Medical Treatment Options for Tapeworm Infection in Cats

Medication	*Dosage*
Fenbendazole	50 mg/kg q24h PO for 5 days
Epsiprantel	2.75 mg/kg PO once
Praziquantel	5 mg/kg PO once
Praziquantel–pyrantel pamoate	5 mg/kg (praziquantel) and 20.2 mg/kg (pyrantel pamoate) PO once
Praziquantel–emodepside	12 mg/kg (praziquantel) and 3 mg/kg (emodepside) topically once

Infection with *T taeniaeformis* is prevalent in cats.[6,7] However, current detection methods overlook 87% to 90% of infections.[8] It is likely that this patient acquired the tapeworm infection via predation prior to adoption. *T taeniaeformis* has been shown to live in a feline host for up to 34 months.[2] Tapeworm-infected mice will come indoors, so the potential for predation and infection exists even in cats that never go outside.

Despite the low sensitivity of detection methods, fecal flotation and broad-spectrum deworming should be considered part of the workup and treatment for any cat that presents with GI signs. Surgical removal may be required for some tapeworm infections.[9]

Dipylidium caninum proglottids were not identified on the cat despite the presence of fleas. It is possible that these fleas did not harbor the metacestode for *D caninum*, or that flea infestation was recently acquired and within the 2- to 3-week prepatent period. ■ cb

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NexGard®
(afoxolaner) Chewables

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Description:
NEXGARD® (afoxolaner) is available in four sizes of beef-flavored, soft chewables for oral administration to dogs and puppies according to their weight. Each chewable is formulated to provide a minimum afoxolaner dosage of 1.14 mg/lb (2.5 mg/kg). Afoxolaner has the chemical composition 1-Naphthalenecarboxamide, 4-[5- [3-chloro-5-(trifluoromethyl)-phenyl]-4, 5-dihydro-5-(trifluoromethyl)-3-isoxazolyl]-N-[2-oxo-2-[(2,2,2-trifluoroethyl)amino]ethyl.

Indications:
NEXGARD kills adult fleas and is indicated for the treatment and prevention of flea infestations *(Ctenocephalides felis),* and the treatment and control of Black-legged tick *(Ixodes scapularis),* American Dog tick *(Dermacentor variabilis),* and Lone Star tick *(Amblyomma americanum)* infestations in dogs and puppies 8 weeks of age and older, weighing 4 pounds of body weight or greater, for one month.

Dosage and Administration:
NEXGARD is given orally once a month, at the minimum dosage of 1.14 mg/lb (2.5 mg/kg).

Dosing Schedule:

Body Weight	Afoxolaner Per Chewable (mg)	Chewables Administered
4.0 to 10.0 lbs.	11.3	One
10.1 to 24.0 lbs.	28.3	One
24.1 to 60.0 lbs.	68	One
60.1 to 121.0 lbs.	136	One
Over 121.0 lbs.	Administer the appropriate combination of chewables	

NEXGARD can be administered with or without food. Care should be taken that the dog consumes the complete dose, and treated animals should be observed for a few minutes to ensure that part of the dose is not lost or refused. If it is suspected that any of the dose has been lost or if vomiting occurs within two hours of administration, redose with another full dose. If a dose is missed, administer NEXGARD and resume a monthly dosing schedule.

Flea Treatment and Prevention:
Treatment with NEXGARD may begin at any time of the year. In areas where fleas are common year-round, monthly treatment with NEXGARD should continue the entire year without interruption.

To minimize the likelihood of flea reinfestation, it is important to treat all animals within a household with an approved flea control product.

Tick Treatment and Control:
Treatment with NEXGARD may begin at any time of the year (see **Effectiveness**).

Contraindications:
There are no known contraindications for the use of NEXGARD.

Warnings:
Not for use in humans. Keep this and all drugs out of the reach of children. In case of accidental ingestion, contact a physician immediately.

Precautions:
The safe use of NEXGARD in breeding, pregnant or lactating dogs has not been evaluated. Use with caution in dogs with a history of seizures (see **Adverse Reactions**).

Adverse Reactions:
In a well-controlled US field study, which included a total of 333 households and 615 treated dogs (415 administered afoxolaner; 200 administered active control), no serious adverse reactions were observed with NEXGARD.

Over the 90-day study period, all observations of potential adverse reactions were recorded. The most frequent reactions reported at an incidence of > 1% within any of the three months of observations are presented in the following table. The most frequently reported adverse reaction was vomiting. The occurrence of vomiting was generally self-limiting and of short duration and tended to decrease with subsequent doses in both groups. Five treated dogs experienced anorexia during the study, and two of those dogs experienced anorexia with the first dose but not subsequent doses.

Table 1: Dogs With Adverse Reactions.

	Treatment Group			
	Afoxolaner		Oral active control	
	N[1]	% (n=415)	N[2]	% (n=200)
Vomiting (with and without blood)	17	4.1	25	12.5
Dry/Flaky Skin	13	3.1	2	1.0
Diarrhea (with and without blood)	13	3.1	7	3.5
Lethargy	7	1.7	4	2.0
Anorexia	5	1.2	9	4.5

[1]Number of dogs in the afoxolaner treatment group with the identified abnormality.
[2]Number of dogs in the control group with the identified abnormality.

In the US field study, one dog with a history of seizures experienced a seizure on the same day after receiving the first dose and on the same day after receiving the second dose of NEXGARD. This dog experienced a third seizure one week after receiving the third dose. The dog remained enrolled and completed the study. Another dog with a history of seizures had a seizure 19 days after the third dose of NEXGARD. The dog remained enrolled and completed the study. A third dog with a history of seizures received NEXGARD and experienced no seizures throughout the study.

To report suspected adverse events, for technical assistance or to obtain a copy of the MSDS, contact Merial at 1-888-637-4251 or www.merial.com/nexgard. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

Mode of Action:
Afoxolaner is a member of the isoxazoline family, shown to bind at a binding site to inhibit insect and acarine ligand-gated chloride channels, in particular those gated by the neurotransmitter gamma-aminobutyric acid (GABA), thereby blocking pre- and post-synaptic transfer of chloride ions across cell membranes. Prolonged afoxolaner-induced hyperexcitation results in uncontrolled activity of the central nervous system and death of insects and acarines. The selective toxicity of afoxolaner between insects and acarines and mammals may be inferred by the differential sensitivity of the insects and acarines' GABA receptors versus mammalian GABA receptors.

Effectiveness:
In a well-controlled laboratory study, NEXGARD began to kill fleas four hours after initial administration and demonstrated >99% effectiveness at eight hours. In a separate well-controlled laboratory study, NEXGARD demonstrated 100% effectiveness against adult fleas 24 hours post-infestation for 35 days, and was ≥ 93% effective at 12 hours post-infestation through Day 21, and on Day 35. On Day 28, NEXGARD was 81.1% effective 12 hours post-infestation. Dogs in both the treated and control groups that were infested with fleas on Day -1 generated flea eggs at 12- and 24-hours post-treatment (0-11 eggs and 1-17 eggs in the NEXGARD treated dogs, and 4-90 eggs and 0-118 eggs in the control dogs, at 12- and 24-hours, respectively). At subsequent evaluations post-infestation, fleas from dogs in the treated group were essentially unable to produce any eggs (0-1 eggs) while fleas from dogs in the control group continued to produce eggs (1-141 eggs).

In a 90-day US field study conducted in households with existing flea infestations of varying severity, the effectiveness of NEXGARD against fleas on the Day 30, 60 and 90 visits compared with baseline was 98.0%, 99.7%, and 99.9%, respectively.

Collectively, the data from the three studies (two laboratory and one field) demonstrate that NEXGARD kills fleas before they can lay eggs, thus preventing subsequent flea infestations after the start of treatment of existing flea infestations.

In well-controlled laboratory studies, NEXGARD demonstrated >94% effectiveness against *Dermacentor variabilis* and *Ixodes scapularis*, 48 hours post-infestation, and against *Amblyomma americanum* 72 hours post-infestation, for 30 days.

Animal Safety:
In a margin of safety study, NEXGARD was administered orally to 8- to 9-week-old Beagle puppies at 1, 3, and 5 times the maximum exposure dose (6.3 mg/kg) for three treatments every 28 days, followed by three treatments every 14 days, for a total of six treatments. Dogs in the control group were sham-dosed. There were no clinically-relevant effects related to treatment on physical examination, body weight, food consumption, clinical pathology (hematology, clinical chemistries, or coagulation tests), gross pathology, histopathology or organ weights. Vomiting occurred throughout the study, with a similar incidence in the treated and control groups, including one dog in the 5x group that vomited four hours after treatment.

In a well-controlled field study, NEXGARD was used concomitantly with other medications, such as vaccines, anthelmintics, antibiotics (including topicals), steroids, NSAIDS, anesthetics, and antihistamines. No adverse reactions were observed from the concomitant use of NEXGARD with other medications.

Storage Information:
Store at or below 30°C (86°F) with excursions permitted up to 40°C (104°F).

How Supplied:
NEXGARD is available in four sizes of beef-flavored soft chewables: 11.3, 28.3, 68 or 136 mg afoxolaner. Each chewable size is available in color-coded packages of 1, 3 or 6 beef-flavored chewables.

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