Article

Medical and behavioral evaluation of 8 cats presenting with fabric ingestion: An exploratory pilot study

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Abstract — The aims of this pilot study were to: i) conduct a thorough behavioral and medical evaluation of cats presenting for chronic fabric ingestion; and ii) implement specific treatments for conditions identified and evaluate the outcome of treatment on fabric ingestion. Eight cats which ingested fabric at least weekly were recruited. Cat owners recorded daily baseline frequency of pica and gastrointestinal signs for 1 month prior to the behavioral and medical investigation and again during a follow-up period. Diagnoses were made and response to treatment was monitored and modified as needed. Abnormalities included mild hypercholesterolemia (n = 7), gastric or intestinal eosinophilic infiltrates (n = 6), suspected delayed gastric emptying (n = 4), suspected gastric reflux (n = 1), and *Giardia* spp. (n = 1). Four of the eight cats responded partially to treatments. Treatment of fabric ingestion in cats remains a challenge and further investigation is needed.

Résumé — Évaluation médicale et comportementale de huit chats ingérant des tissus: une étude pilote. Les objectifs de cette étude pilote étaient: i) d'entreprendre une évaluation médicale et comportementale chez des chats présentant un comportement chronique d'ingestion de tissus; et ii) de mettre en place des traitements spécifiques pour les conditions identifiées et d'évaluer les résultats sur le comportement d'ingestion de tissus. Huit chats qui ingéraient hebdomadairement du tissu furent recrutés. Les propriétaires compilèrent la fréquence quotidienne de pica et les autres signes digestifs pendant un mois avant le début de l'étude puis de nouveau lors du suivi. À la suite du diagnostic posé, la réponse aux traitements de chaque chat fut suivie et les traitements étaient modifiés au besoin. Les changements observés incluaient une légère hypercholestérolémie (n = 7), une infiltration gastrique ou intestinale éosinophilique (n = 6), une suspicion de retard de vidange gastrique (n = 4), une suspicion de reflux gastrique (n = 1) et la présence de *Giardia* spp. (n = 1). La moitié des chats ont répondu partiellement aux traitements instaurés. Le traitement d'ingestion de tissus demeure un défi et de la recherche future s'avère nécessaire.

(Traduit par les auteurs)

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Introduction

Pica in cats is defined as ingestion of non-nutritive substances such as fabric, plastic, rubber, paper, cardboard, soil, string, and plants (1). Most behavioral studies on pica published to date do not discriminate between actual ingestion and chewing or sucking on an item (1,2). Several behavioral hypotheses have been formulated regarding the potential causes or contributing factors such as boredom, lack of social contact, redirected hunting behavior, genetic predisposition, early weaning, fasting, craving for fiber, or compulsive disorder (3,4). In a recently published study on pica in cats, the behavior did not seem to be the consequence of a suboptimal environment or early weaning (5). Cats with pica vomited more often and were fed *ad libitum* less commonly than were healthy cats (5). Another study also reported an abnormally intense appetite in affected cats (2).

Medical causes in which pica in cats has been documented include pyruvate kinase deficiencies, immune-mediated hemolytic anemia, and feline infectious peritonitis (6–9). In these studies, limited or no information is available on the type of items ingested or characterization of the pica behavior (6–9). Interestingly, in rats (a species without emetic reflex), pica is documented following administration of cisplatin, an emetogenic chemotherapeutic drug, and other emetogenic drugs (10,11). This suggests that pica in rats is comparable to vomiting in other species (11). In dogs, pica can occur with gastric dysmotility, small intestinal disease, and hookworm infection (12–14).

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To date, there have been no specific studies evaluating possible underlying or contributing medical conditions in cats exhibiting pica. Anecdotally, fabric ingestion is considered a potential sign of a gastrointestinal disorder. Therefore, the aims of this pilot study were to i) conduct a thorough behavioral and medical evaluation of affected cats including complete gastrointestinal evaluation; and ii) implement specific treatments for medical conditions identified and evaluate the outcome of these treatments on fabric ingestion.

Materials and methods

In this study, the term pica refers to the actual ingestion of inedible items with a focus on fabric ingestion. Ten cats were recruited at the Veterinary Teaching Hospital (VTH) between March 2013 and April 2015. An advertisement was sent to veterinarians in private practice and was published both on the website and in the electronic newsletter of the Faculty of Veterinary Medicine, University of Montreal. Cats were eligible for the study if they ingested fabric at least once a week and received no medication for pica. Cats were not eligible if they were diagnosed with a concurrent medical disorder that would increase their anesthetic risk. Owners were asked to provide the individual cat's preferred fabric for up to 1 h daily for 1 mo at a time to measure frequency of pica. Owners supervised their pet and fabric was removed as soon as the cat started chewing the material. Cats were excluded if the only fabric they ingested consisted of shoelaces or threads since these items were considered too dangerous to offer even under supervision. Owners did not modify how they were managing access to fabric in their home. They were asked to log naturally occurring pica episodes (which item and circumstances) as well as the test results with the preferred fabric. For the latter, owners recorded the date and time, presence or absence of pica, offered item, length of the time the item was provided (up to a maximum of 1 h), time of last meal, and whether the item was chewed without ingestion. Owners recorded baseline frequency of pica during 1 mo before the behavioral and medical investigation and again during the follow-up period. Owners also included concurrent gastrointestinal signs such as vomiting or diarrhea and any other abnormal medical or behavioral sign in their monthly logbooks. Response to treatment was defined as 50% or more reduction in frequency of pica during monthly follow-up testing compared to baseline. All owners gave informed consent for enrollment of their cats in the study. This study was conducted in accordance with the ethical principles of the animal care and use committee of the University of Montreal.

Behavior was evaluated using a standardized general questionnaire (questionnaire from the behavioral medicine service of the VTH) and a more specific questionnaire on pica. Both questionnaires included closed-ended and open-ended questions as well as a section in each questionnaire for additional comments from owners. Questionnaires are available upon request to the corresponding author. Information about fabric ingestion included the preferred item, age of onset of the pica behavior, frequency, duration of an episode, changes in frequency and duration since onset, time of the day when pica occurred and circumstances in which it occurred. Owners were also asked how serious they considered the fabric ingestion behavior to be, what had been tried so far to manage the problem, and if the cat had health issues and/or required medical attention because of fabric eating.

A complete medical history was obtained for each cat. Pica was considered a potential sign of a gastrointestinal disorder so specific questions related to presence of potential additional gastrointestinal signs such as vomiting, diarrhea, constipation, flatulence, borborygmus, eructation, increased salivation, or repetitive swallowing were asked. A physical examination by a Board-certified internist (MCB) and a neurological examination by a Board-certified neurologist were conducted. Cats were then hospitalized. Complete blood (cell) count (CBC), serum chemistry panel, total thyroxine, fasted ammonia and urinalysis were obtained for each individual. Cats were also screened for feline immunodeficiency virus and feline leukemia virus by an enzyme-linked immunosorbent assay (ELISA). Feline specific pancreatic lipase immunoreactivity, cobalamin, and folate were measured. Fecal examination using a zinc-sulfate centrifugation technique was also done. A Board-certified radiologist conducted abdominal ultrasonography. Then, the cats were hospitalized and offered a meal of their regular diet available until 8 pm before being fasted again overnight.

The cats were anesthetized the following morning. A Board-certified internist (MCB) performed the oral examination and standard upper gastrointestinal endoscopy. A minimum of 2 mucosal samples were taken from each of the following 5 gastric locations: greater curvature and fundus, lesser curvature, pyloric antrum, pylorus, and cardia when possible. Full-thickness biopsies of the distal duodenum, jejunum, and ileum were subsequently obtained by laparotomy. Tissue samples were fixed by immersion in 10% neutral-buffered formalin, routinely processed, embedded, sectioned, and stained with hematoxylin, eosin, phloxine, and saffron. Sections were evaluated by a Board-certified pathologist (PH) based on the guidelines published by the World Small Animal Veterinary Association Gastrointestinal Standardization Group (15).

Based on clinical presentation, physical examination, neurological examination, laboratory results, and gastrointestinal evaluation, tentative diagnoses were made and specific treatments prescribed. Response to treatment was monitored and treatments were modified as needed. Cats were followed for a minimum period of 6 mo during which the owners were asked to offer the preferred fabric on a daily basis for 1 mo and record the current frequency of pica and gastrointestinal signs. Most cats (based on tentative diagnosis) received sequential treatments and owners were requested to submit these monthly logbooks once treatments had been implemented for at least 2 to 4 wk. Hence, logbooks were requested at least once during the follow-up period and, in some cases, 2 to 3 times, depending on each treatment set in a given cat.

Results

Of the 10 cats recruited, 8 cats were enrolled in the study. One cat was excluded because of chronic kidney disease and hypercalcemia and the other had a partially obstructive ureterolith with azotemia. Three owners were referred to the behavioral medicine service by their local veterinarians. One owner found

Table 1. Age of onset of pica, prior attempted management/treatment strategies, and behavioral findings in cats with pica.

Cat	Breed	Age of cat at onset of pica	Prior attempted treatments or strategies	Aggression towards people (P) or cats (C)	Thunderstorm fear or phobia/ other fears	Other behavioral problems	Environmental enrichment/ outdoor access	Items chewed (C) sucked (S) ingested (I)	Owner comments and feeding frequency
1	DSH	Present at adoption: 5 mo	None	No	No	No	Cat tree, hiding places, food distributors. No outdoor access.	Fabric (I) Laces and threads (I) Wood (C) Plastic (C) Paper (C)	Pica has increased in frequency over time. Two meals daily.
2	Birman	Sucking: 3 mo Pica: 2 y	Sucralfate, famotidine, fluoxetine prior to study.	C: To other cat in home	No	Masturbates on other cat in home	Cat tree, hiding places. No outdoor access.	Fabric (I) (S) Laces and threads (I)	Required medical care as a result of pica. *Ad libitum* feeding.
3	DLH	6 to 8 mo	None	P: May hiss if petted or approached by unfamiliar people.	No	No	Cat tree, hiding places, food distributors. Outdoor access.	Fabric (I) Laces and threads (I) Wood (C) Plastic (C) Rubber (C) (I)	Will eat any food available (increased appetite). Two meals daily.
4	DSH	8 mo	Prevent access to items and rooms.	No	No	No	Cat tree, hiding places. No outdoor access.	Fabric (I) Laces and threads (I) Paper (C) (I) Rubber (I) Leather (I) Destroyed dog toys (I)	Increased appetite. Surgical removal of fabric (pieces of destroyed dog toy). Two meals daily.
5	Siamese	6 mo	Hide preferred fabrics and items.	No	No	No	Hiding places, food distributors, cat training. No outdoor access.	Fabric (I) (S) Plastic (C) (I) Laces and threads (I)	Very sociable cat, vocal, likes to cuddle. *Ad libitum* feeding.
6	DSH	12 mo	Fluoxetine prior to study, more interactive play time, preventing access to items.	No	No	No	Cat tree, hiding places, food distributors, cat training. Outdoor access.	Fabric (I) (S) Laces and threads (I) Paper (C) (I) Rubber (C) (I)	Great cat, sociable, very vocal. Licks "Body Shop" soap. Three meals daily.
7	DSH	At time of foster home adoption: 8 mo	Preventing access to fabric.	No	No	No	Cat tree, hiding places, food distributors, cat training. No outdoor access.	Fabric (I) Laces and threads (I) Plastic (C) (I) Paper (C) Rubber (C) Destroyed dog toys (I)	"Hyperactive cat." Three meals daily.
8	DLH	6 mo	Zylkene Z/D diet	No	No	No	Hiding places. No outdoor access.	Fabric (I) Plastic (C) (I) Rubber (C)	Cat relinquished to shelter because of fabric ingestion. Cat will be euthanized if pica is not resolved. Two meals daily.

DSH — Domestic shorthair; DLH — Domestic longhair.

Table 2. Demographic characteristics, gastrointestinal signs, medical findings of cats with pica.

Cat	Breed	Gender	Current age (mo)	Other GI signs aside from pica	Other signs	ALT[a]	Cholesterol[b] Triglycerides[c]	Histopathology and other findings
1	DSH	NM	18	Vomiting 1×/month, Licking floor, Abdominal discomfort	Licks self, more than normal as per owner	39	C: **5.21** T: 0.89	Mild multifocal LPE, GER suspected: gastroesophageal junction erythematous (approx. 1/3 of the pseudosphincter surface) and possible fibrin associated.
2	Birman	NM	79	Vomiting hairballs 3×/month	None	58	C: **5.69** T: **0.46**	Moderate EE, mild diffuse gastric fibrosis, intestinal fibrosis. Trichobezoar in esophagus (0.5 cm × 0.2 cm) and in jejunum.
3	DLH	NM	41	Vomiting 1×/month, Intermittent decreased appetite, Occasional diarrhea	Licks blanket and floor	**93**	C: **7.71** T: 0.58	DGE suspected, mild intestinal fibrosis. Trichobezoar in pyloric antrum without mechanical obstruction.
4	DSH	NM	43	Vomiting 3×/month concomitant apathy	Licks the sofa	41	C: **4.11** T: 0.89	EE, EG, DGE suspected, mild intestinal fibrosis. Mix of fabric, food and hair intertwined in the stomach.
5	Siamese	NM	41	Vomiting 1×/month	Sucks body parts Licks plastic	**108**	C: **5.03** T: **0.36**	Mild multifocal EE, DGE suspected. Trichobezoar in pyloric antrum and pylorus causing partial mechanical obstruction.
6	DSH	NM	54	None	Licks soap daily	**83**	C: **4.4** T: 0.68	Moderate to severe EE, mild EG[g], fabric in ileum, possible pancreatitis.
7	DSH	SF	11	Vomiting 8×/month	None	46	C: **4.35** T: missing	DGE[h], mild focal EE.
8	DLH	SF	23	None	None	47	C: 1.87 T: missing	Moderate EE, intestinal fibrosis, Giardiasis.

[a] ALT: Alanine aminotransferase values of cats with pica [reference interval (RI): 16.00 to 63.00 U/L].
[b] RI for cholesterol: 1.81 to 3.88 mmol/L.
[c] Mean cholesterol level: 3.12 mmol/L. Median cholesterol level: 2.65 mmol/L. RI for triglycerides: 0.57 to 1.14 mmol/L. Values outside the reference range are in bold.
DSH — Domestic shorthair; DLH — Domestic longhair; NM — neutered male; SF — spayed female; LPE — lymphoplasmacytic enteriti; EE — Eosinophilic enteritis; EG — Eosinophilic gastritis; DGE — Delayed gastric emptying; GER — Gastroeosophageal reflux.

information about the study on the VTH's website. Two cats belonged to veterinary students and 2 cats were currently from 2 different shelters (1 in a temporary foster home) but unavailable for adoption because of the fabric ingestion behavior. One cat was to be euthanized if the fabric ingestion was not resolved.

Behavioral findings

Results from the general questionnaire are summarized in Table 1. The preferred fabric ingested varied among cats and included polar fleece, carpet, wool, cotton, socks, and clothes. Fabric ingestion was never associated with a meal, a particular event, time of day, the presence of a person or a particular location. Seven owners answered that fabric ingestion occurred during presence or absence of the owner and one said it occurred during her absence. Four owners felt the problem had remained unchanged over time, 2 felt the problem had worsened (more frequent), and 1 said the frequency had decreased over time. Duration of fabric eating events was difficult to establish as most owners interrupted the behavior or had no idea (events not witnessed). Six cats were described as being self-absorbed while eating fabric. Six cat owners were able to interrupt the behavior either by calling or talking to the cat, yelling, making noise, or touching the cat. No other behavioral changes were noted in any cat concurrent with, or after the onset of pica. Owners reported

Figure 1. Trichobezoar removed during endoscopy in 1 cat.

that 5 cats had previously experienced loss of appetite, vomiting, or diarrhea following an episode of fabric eating (Table 2). One cat had surgery to remove a foreign body and another cat had been hospitalized and treated with fluids because of fabric ingestion. Seven cat owners qualified the pica as being serious or very serious. One owner had considered euthanasia.

Table 3. Frequency of pica, tentative diagnoses, and treatment of cats with pica.

Cat	Pica monthly frequency baseline	Pica monthly frequency end of study	Tentative diagnoses	Treatments
1	11	2	Mild hypercholesterolemia Mild multifocal LPE GER suspected	Fenbendazole, metronidazole, hypoallergenic diet, prednisolone, famotidine, cisapride
2	6	3	Mild hypercholesterolemia Moderate EE Trichobezoar	Fenbendazole, hypoallergenic diet, prednisolone, omeprazole
3	17	2	Mild hypercholesterolemia DGE suspected Fibrosis Trichobezoar	Metronidazole, hypoallergenic diet, small frequent meals, omeprazole, metoclopramide, cisapride
4	30	28	Mild hypercholesterolemia EE EG DGE suspected	Fenbendazole, hypoallergenic diet, prednisolone, small frequent meals, omeprazole, cisapride
5	7	5	Mild hypercholesterolemia Mild multifocal EE DGE suspected Trichobezoar	Fenbendazole, hypoallergenic diet, prednisolone, small frequent meals, omeprazole, cisapride
6	24	18	Mild hypercholesterolemia Moderate to severe EE Mild EG Possible pancreatitis	Fenbendazole, metronidazole, hypoallergenic diet, prednisolone, small frequent meals, omeprazole
7	22	19	Mild hypercholesterolemia DGE Mild focal EE	Fenbendazole, hypoallergenic diet, prednisolone, small frequent meals, omeprazole, metoclopramide, cisapride
8	5	1	Giardiasis Moderate EE	Fenbendazole

LPE — lymphoplasmacytic enteritis; GER — Gastroeosophageal reflux; EE — Eosinophilic enteritis; DGE — Delayed gastric emptying; EG — Eosinophilic gastritis.

Medical findings

Physical examination was within normal limits except for cat 1 (mesenteric lymphadenomegaly), cat 8 (mild bilateral conjunctivitis), and cat 2 (left-sided parasternal grade II/VI systolic heart murmur). A cardiac evaluation of cat 2 was therefore conducted and revealed a mitral valve dysplasia with mild regurgitation. No treatment was prescribed but a follow-up was recommended. Neurological examination was within normal limits except for cat 4 (vestibular ataxia present since adoption as a kitten) and cat 5 (genetic pendular nystagmus).

Other than a stress leukogram in 3 cats, the CBCs were within normal limits. Total thyroxine was within normal limits in all cats. Fasted ammonia was within normal limits except for cat 3 [98.00 μmol/L, reference interval (RI): 0 to 95.00 μmol/L]. Fasting and post-prandial bile acid concentrations were unremarkable.

Serum chemistry panels were considered unremarkable except in 3 cats [elevated alanine aminotransferase (ALT) but below a 2-fold increase of the upper normal limit] (Table 2). When rechecked at least 3 mo later, the values were either within normal limits or marginally elevated. Cholesterol levels were marginally elevated in 7 of the 8 cats (Table 2).

Cat 6 had a mildly increased serum specific pancreatic lipase (3.9 μg/L, RI: 0 to 3.5 μg/L) which may suggest pancreatitis. The pancreas was unremarkable upon abdominal ultrasound. The serum specific pancreatic lipase was re-evaluated 1 mo later and was within normal limits. All other cats had a serum specific pancreatic lipase within normal limits. Folate was elevated in 5 cats. No cats showed hypocobalaminemia.

All cats were negative for feline immunodeficiency virus and feline leukemia virus. Urinalysis was unremarkable in all cats. Fecal examination was unremarkable in all except 1 cat (positive for *Giardia* spp).

Except for presence of dental tartar in some cats, oral examination was within normal limits in all animals. All cats had abnormalities of the gastrointestinal tract (Table 2). Three cats had large trichobezoars that were removed during endoscopy or laparotomy (Figure 1). Cat 6 had a foreign body (fabric in the ileum) that was removed by enterotomy. Cat 7 had a mild abdominal modified transudate surrounding the liver.

Frequency of pica during 1-month baseline and 1-month follow-up are shown in Table 3. Tentative diagnoses and treatments are also shown in Table 3. None of the cats had complete resolution of pica.

Discussion

This study represents a preliminary and exploratory collection of data on cats which eat fabric.

Pica in the behavioral literature is listed as a possible manifestation of obsessive-compulsive or compulsive disorders in cats (3,4). As a result, these patients are generally referred to behavioral medicine services rather than internal medicine or neurology services. To the authors' knowledge, there are no publications on medical investigation of cats which eat fabric, even though this behavior was reported in the literature as early as 1967 (16). The commonly accepted definition of compulsive disorders states that the behavior appears in a situation of stress or conflict and then emanates from that situation (3). The current literature also reports that onset of compulsive disorders in cats is usually around social maturity (17), although the age of social maturity is not defined in any publication. Obsessive-compulsive or compulsive disorders are considered a subset of anxiety disorders (17). In the present exploratory study, fabric ingestion was not associated with an event, person, or location. The cat's age at onset of fabric ingestion ranged from 5 to 12 mo in 7 cats and appeared later in only 1 cat at 24 mo of age. These 2 observations raise the question as to whether pica truly represents a compulsive disorder. According to the behavioral questionnaires, except for cat 2 (inter-cat aggression), none of the other cats showed signs of anxiety/fear or other behavioral problems in the home environment. Cat 2 had been treated with a psychotropic medication (fluoxetine) before the study with only partial improvement noted (according to the owner). Cat 6 had also previously received fluoxetine to treat the pica, without improvement.

Six cats enrolled in this study were domestic short- or longhair and only 2 were purebred, a Birman and a Siamese. In a recent retrospective study (5) most of the cats that were presented with pica were also domestic short- or longhair cats (n = 55) rather than purebred cats (n = 28). These results indicate that pica is not restricted to oriental breeds.

Only 3 of the 8 cats ingesting fabrics were also sucking on fabrics. These 2 behaviors may not be linked as it was previously thought and, as now suggested by some authors, they might reflect different motivations (18).

Delayed gastric emptying was suspected in 4 cats based on the presence of food material in the stomach after more than 12 h of fasting. A definitive diagnosis was not obtained as scintigraphy was not available at the VTH at the time of this study. The most common sign of delayed gastric emptying is chronic vomiting of food more than 8 h after a meal (14,19–21). Other signs include anorexia, eructation, pica, polydipsia, and weight loss (20). Abdominal discomfort may also be present (14). A motility disorder may also result in gastric formation of trichobezoars in some cats (20). There are, however, no published data on prevalence of trichobezoars or delayed gastric emptying in cats. Further investigation is thus warranted.

Gastric reflux was suspected in 1 cat because of an erythematous region at the gastro-esophageal junction. As is often the case, a definitive diagnosis was not obtained because it would have required continuous measurement of the distal esophageal sphincter pressure and intraluminal esophageal pH (22–26). Potential causes of gastroesophageal reflux include chronic vomiting, gastric motility disorders, a hiatal hernia, and decreased pressure of the distal esophageal sphincter following anesthesia (23,24,26). Clinical signs of gastric reflux can include salivation, licking lips, odynophagia, extending of the neck during swallowing, anorexia, vomiting, regurgitation, halitosis, severe vocalization following a meal, and hesitation to move or lie down (22–28). Episodes of gastric reflux are more frequent on an empty stomach (25). In a recent study (5), cats without pica were fed meals more frequently or *ad libitum* compared to cats with pica. Perhaps, as is reported in infants with symptomatic gastroesophageal reflux, fasting may exacerbate the incidence of gastric reflux in cats as well (29). The possibility of gastric reflux in cats either going unnoticed or not easily diagnosed, motivated the decision to try omeprazole as a treatment option in these study cats. Many cats showed improvement of the pica behavior after omeprazole was added to the treatment protocol. A future trial of omeprazole at various doses in a larger sample of fabric eating cats may be warranted.

Gastroesophageal reflux disease, esophagitis, gastritis, inflammatory bowel disease, and side effects from medication can all cause upper abdominal pain or discomfort also referred to as dyspepsia in humans (30). Dyspepsia is described as organic if an underlying disorder is confirmed, and as functional if no underlying condition is identified. The mechanism of functional dyspepsia remains obscure, but gastric inflammation or hyperacidity, motor disorder, or visceral hypersensitivity all have been hypothesized (30). To date, there is no information about the existence of functional dyspepsia in cats. Functional gastroesophageal reflux is common in infants and manifests as episodes of regurgitation or vomiting. During the last few decades, the role of intestinal microflora in health and disease has gained interest and there are strong indications that diet can influence the relative number of microbial species in the gastrointestinal flora. One study (31) showed that probiotic supplementation *(Lactobacillus reuteri)* significantly accelerated gastric emptying and significantly decreased regurgitation in infants. Further research on motility disorders, gastric reflux, and treatments in cats is necessary.

Interestingly, all cats had abnormalities of the gastrointestinal tract, although it is not possible to ascertain that these changes were associated with fabric ingestion. No cat had clinical signs or laboratory findings suggestive of disease in another system. It was surprising that 6 cats from this study had gastric or enteric eosinophilic infiltrates, because lymphoplasmacytic gastrointestinal infiltration is more prevalent in cats (32–35). Cats with eosinophilic inflammation of the gastrointestinal tract seem to be more refractory to conventional treatments (34). In a case series of human patients diagnosed with eosinophilic gastroenteritis (considered a rare disease) all had mucosal disease and were presented with dyspepsia (36). Another study found that duodenal eosinophilia may characterize a subset of human adults with functional dyspepsia (37). If cats which eat fabric suffer from dyspepsia, confirming this possibility and offering treatment options will improve the welfare of these cats. Future studies are warranted.

Mild hypercholesterolemia was found in 7 cats. The median and mean cholesterol values of the cats with pica were higher than the upper limit of the reference range but less than 10 mmol/L, so these may be not clinically significant. As

triglyceride levels were within normal limits or lower, no further investigations were conducted. However, waxing-and-waning vomiting, diarrhea, and abdominal discomfort or pain are common clinical signs of hyperlipidemia (38). Primary hypercholesterolemia is rare in cats (39). Low-density and high-density lipoproteins are primarily involved in cholesterol metabolism (38). Further investigation in the production and clearance of these lipoproteins could be warranted in cats with fabric ingestion.

There were limitations in this pilot study. The sample size was small and there was no matched control group with GI signs without pica. The choice of not having a control group was based on the invasive medical procedures (i.e., laparotomy and full-thickness biopsies). The owners of cats that participated in the study were fully aware of the risks associated with general anesthesia and surgery. They were hoping to obtain answers on the underlying causes and potential treatments for their cats. And in 1 case, the cat if not successfully treated, would be euthanized. All the researchers made it a priority to monitor the cat's well-being during the entire study. Special attention was given to post-operative pain management and none of the cats had any complications associated with the procedures. Initially, the plan was to evaluate 20 cats. But as time progressed, and response to treatment seemed variable for the first 8 cats, the decision was made to discontinue the planned complete medical investigation on additional cats.

In conclusion, fabric ingestion in cats, a specific form of pica, remains a diagnostic challenge. Complete resolution and, in some cases, even improvement with current proposed treatment plans seems difficult to achieve. These preliminary observations are meant as a starting point for future studies to determine more precisely what is happening medically and behaviorally in this sub-group of cats which eat fabric.

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Answers to Quiz Corner
Les réponses du test éclair

1. **C)** This is due to the liver's close association with the diaphragm. The stomach, small intestine, and spleen are also found with fair regularity in a diaphragmatic hernia, but less commonly than the liver. Kidneys are fairly firmly attached to the retroperitoneal space and are only rarely displaced into the thorax with a diaphragmatic hernia.

C) Ceci est dû à la proximité du foie et du diaphragme. L'estomac, le petit intestin et la rate peuvent aussi faire hernie régulièrement lors de hernie diaphragmatique, mais moins communément que le foie. Les reins sont rattachés assez fermement à l'espace rétropéritonéal et sont seulement rarement déplacés dans le thorax lors de hernie diaphragmatique.

2. **C)** Young cats are most commonly afflicted with this disease, which arises from the tympanic bulla.

C) Les jeunes chats sont plus communément affligés par cette maladie qui provient de la bulle tympanique.

3. **A)** Microscopic examination of urine sediment is helpful in distinguishing glomerular from nonglomerular hemorrhage. The hallmark of glomerular bleeding is red blood cell dysmorphism.

A) L'examen microscopique de sédiment d'urine est utile pour distinguer une hémorragie glomérulaire d'une hémorragie non glomérulaire. Le signe cardinal du saignement glomérulaire est la dysmorphie des globules rouges.

4. **D)** Polio is believed to be caused by a thiamine deficiency and has not been associated with BVD virus. All other syndromes have been associated with either acute or persistent infection with BVD virus.

D) On croit que la polio est causée par une carence en thiamine et n'est pas associée au virus de la diarrhée virale bovine. Tous les autres syndromes ont été associés à une infection soit aiguë, soit persistante avec le virus de la diarrhée virale bovine.

5. **A)** Because raw hamburger is low in vitamin A, a vitamin A deficiency is possible.

A) Comme le bœuf haché cru a une faible teneur en vitamine A, une carence en vitamine A est possible.