Treating Feline Pancreatitis:

Recommendations for managing this disease and common concurrent conditions

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Background

Pancreatitis is an elusive disease in cats and consequently has been underdiagnosed.[1,6] Cats with pancreatitis present with vague signs of illness, including lethargy, decreased appetite, dehydration and weight loss. Physical examination and routine laboratory findings are nonspecific, and until recently, there have been limited diagnostic tools for this disease. The Spec fPL™ (feline pancreas-specific lipase) Test is now available to assist in diagnosing and monitoring cats with pancreatitis.

Fluid therapy, pain management and nutritional support are the mainstay of therapy for treating cats with pancreatitis. Many cats with pancreatitis have concurrent illnesses (e.g., diabetes mellitus, hepatic lipidosis, cholangiohepatitis and inflammatory bowel disease).[2–4] Diagnosis and management of both pancreatitis and concurrent conditions are critical to a successful outcome.[5]

Fluid Therapy

Fluid therapy is essential for patient support and to ensure adequate perfusion of the pancreas. In hospitalized patients, fluids should correct dehydration over the first 12–24 hours, while also meeting maintenance needs and replacing ongoing losses. Acid-base and electrolyte abnormalities should be monitored closely and corrected. If hypocalcemia is present, it should be treated with a calcium gluconate infusion of 50–150 mg/kg over 12–24 hours while monitoring serum calcium concentrations. Colloids, such as dextran or hetastarch, can be used to support oncotic pressure, especially in patients that are hypo-albuminemic. Plasma therapy can be used if available when there is evidence of a coagulopathy or disseminated intravascular coagulation (DIC).

Pain Management

Abdominal pain is rarely recognized in cats with pancreatitis. Nonetheless, many cats will show clinical improvement if provided analgesic therapy; therefore pain management should be provided to all cats with acute pancreatitis. Opioid therapy is recommended. One recommended protocol is to provide immediate analgesia with an intravenous narcotic such as buprenorphine and place a fentanyl patch for longer duration of pain control. Cats with chronic pancreatitis may also benefit from pain management, and options for outpatient treatment include a fentanyl patch, sublingual buprenorphine, and oral butorphanol or tramadol.

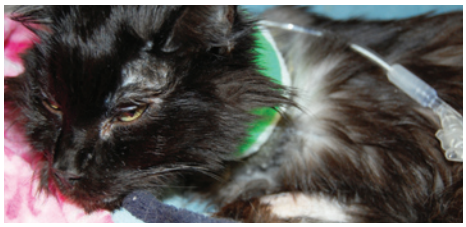
Antiemetic Therapy

Vomiting may be absent or intermittent in cats with pancreatitis. Antiemetic therapy is recommended to control vomiting when present and to treat nausea in the absence of vomiting. There are several antiemetics available. Metoclopramide (Reglan®) remains a popular antiemetic. However, metoclopramide is a dopamine antagonist and inhibits vomiting by blocking the central nervous system (CNS) dopamine receptors in the chemoreceptor trigger zone (CRTZ). It is often ineffective in cats because cats are reported to have few CNS dopamine receptors in the CRTZ. Dolasetron (Anzemet®) and ondansetron (Zofran®) act on the serotonin 5-HT_3 receptors in the CRTZ and are very effective in cats. Maropitant citrate (Cerenia®) acts on the neurokinin (NK) receptors in the vomiting center. It is only labeled for use in dogs, but has become a popular and effective antiemetic in cats.

Nutritional Support

The historical recommendation of nothing per os (NPO) for animals with pancreatitis is no longer accepted. In addition, cats can develop hepatic lipidosis if not provided adequate calories. Enteral nutrition stabilizes the gastrointestinal barrier, improves enterocyte health and immune function, improves gastrointestinal motility, prevents catabolism and decreases morbidity and mortality. Cats with pancreatitis are inappetant; therefore, ingestion of adequate calories is rare. Force feeding is not recommended; it is difficult to achieve adequate caloric intake and can lead to food aversion.[6] Enteral nutrition can be provided by a variety of feeding tubes, including nasogastric, nasoesophageal, esophagostomy, gastrostomy or jejunostomy tubes.

If vomiting cannot be controlled, then partial parenteral nutrition (PPN) or



See page 14 for a case study on Feline Pancreatitis.

total parenteral nutrition (TPN) can be provided. However, parenteral nutrition doesn't nourish the enterocytes. Therefore microenteral nutrition, by trickle feeding through a feeding tube, should be provided concurrently to prevent the complications of NPO.

Diet Selection

There are no studies to support dietary choices for cats with pancreatitis. High-fat foods are not implicated in causing pancreatitis in cats; however, some internists avoid feeding high-fat diets when treating these cats. Liquid diets are required for use in nasogastric, nasoesophageal and jejunostomy tubes. Commercially available CliniCare® Canine/Feline Liquid Diet (Abbott Animal Health) is high in fat but commonly used. Human-formulated liquid diets are too low in protein to be used in cats. Low-residue, low-fat, easy-to-digest blended canned diets can be used in esophagostomy or gastrostomy tubes.

Recommendations for feeding cats with pancreatitis are based upon opinion. Trial and error is often required to find a diet that works for a particular cat. Cats with pancreatitis often have concurrent disease. A low-residue diet might be the diet of choice in a cat that only has pancreatitis, but if concurrent intestinal disease is present, a novel protein diet might be a better choice.

Appetite Stimulants

Appetite stimulants can help to support caloric intake, may reduce the need for feeding tube placement, may decrease dependency on the feeding tube over time and may support the removal of feeding tubes in cats with pancreatitis. Mirtazapine (Remeron®), used off-label, and cyproheptadine are two effective appetite stimulants in cats.

Glucocorticoid Therapy

It is common for cats with pancreatitis to have other concurrent conditions. The term "triaditis" has been used to describe the complex of cholangiohepatitis, inflammatory bowel disease and pancreatitis. Treatment with anti-inflammatory doses of prednisone, prednisolone or dexamethasone is not contraindicated in these cats. Cats with chronic pancreatitis alone may actually benefit from the anti-inflammatory effects of corticosteroids.

Antibiotic Therapy

Pancreatitis is usually a sterile process in cats and antibiotics are rarely indicated. Antibiotics can cause nausea and vomiting in cats, so they should only be used when indicated. Indications for their use include sepsis (may result from bacterial translocation from the gastrointestinal tract), bacterial peritonitis, other infections (e.g., urinary tract infection) and possibly in cases with a suppurative cholangiohepatitis where a suppurative pancreatitis is suspected.

Antacid Therapy

H_2-receptor antagonists (ranitidine or famotidine) or proton-pump inhibitors (pantoprazole) are not routinely recommended but should be considered if there is concern for gastrointestinal ulceration.

Antioxidant Therapy

There is some rationale to consider antioxidant therapy in cats with pancreatitis. Vitamins C and E, silybin, S-Adenosylmethionine (SAMe) and omega-3 fatty acids could be prescribed. Veterinary products, Marin™ (vitamin E and silybin), Denosyl® (SAMe) and Denamarin® (SAMe and silybin), manufactured by Nutramax Laboratories, Inc., are available for cats.

Cobalamin (Vitamin B_{12}) Supplementation

Cobalamin (vitamin B_{12}) is a water-soluble vitamin that is absorbed in the ileum. Reduction in serum cobalamin concentrations can be seen in cats with gastrointestinal disease. Cats with pancreatitis commonly have concurrent inflammatory bowel disease; therefore measuring serum cobalamin concentrations in cats with pancreatitis is recommended. Cobalamin can be supplemented by parenteral injection at a dosage of 250 μg/injection weekly for six weeks, followed by one dose every two weeks for six weeks, then monthly injections.[7]

Insulin Therapy

Cats with acute pancreatitis can become insulin resistant and develop transient diabetes mellitus.[3] Diabetes may resolve or become permanent, especially if chronic pancreatitis persists. Insulin therapy should be tailored to the individual cat. Insulin requirements may vary as a result of waxing and waning of the severity of the pancreatitis.

Monitoring

Hospitalized cats require close monitoring. Body weight and respiratory rate can be monitored to ensure fluids are being tolerated. Blood pressure and urine output should be assessed daily. Repeat laboratory testing should be performed regularly to monitor the patient's progress. The Spec fPL concentration can be repeated every 2–3 days in hospitalized cats to assess pancreatic inflammation.

The frequency with which cats at home should be reassessed will depend upon

(continued on page 16)

Further Resources

ONLINE COURSE, "Advances in Diagnosing and Treating Feline Pancreatitis"
www.idexxlearningcenter.com/felinepancreatitis

Feline Pancreatitis

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Frisky

Patient: Frisky, 16-year-old, spayed female domestic long-haired cat

Presenting complaint: Anorexia

History: Progressive loss of appetite over the last six weeks. No response to appetite stimulants (cyproheptadine, mirtazapine) or antiemetic therapy (metoclopramide). Diagnosed with hyperthyroidism three years earlier; effectively managed with oral methimazole.

Physical examination

Frisky was quiet but responsive. Her heart rate was 192 beats per minute, with normal rate and rhythm. No murmurs were ausculted. She was substantially underweight at 2.5 kg with a body condition score of 2/9. Moderate dental tartar and calculus were noted, but there was no apparent oral pain. Abdominal palpation was within normal limits, although she seemed uncomfortable in the cranial abdomen. A small thyroid nodule was noted in the left cervical region. Frisky appeared moderately dehydrated (7%) based on skin turgor.

Initial assessment

The most likely differentials for the persistent anorexia in this patient included metabolic dysfunction (e.g., renal or hepatic disease), gastrointestinal disease (e.g., inflammatory or infiltrative disease, pancreatitis), occult infection (e.g., pyelonephritis) or occult neoplasia (e.g., intestinal, pulmonary).

Diagnostic plan

The initial plan included a complete blood count (CBC), serum biochemical profile, urine analysis and measurement of serum total thyroxine. Serum cobalamin and folate concentrations were determined to evaluate gastrointestinal function, and a Spec fPL™ Test was performed to identify pancreatic inflammation.

Laboratory findings

HEMATOLOGY	VALUE	UNITS		REF INTERVAL
Plasma Protein	8	TS-g/dL		(6 – 8)
RBC	4.57	M/µL	Low	(5.00 – 10.00)
HCT	18.7	%	Low	(24.0 – 45.0)
HGB	6.70	g/dL	Low	(8.0 – 15.0)
MCV	40.9	fL		(39.0 – 55.0)
MCHC	35.8	g/dL	High	(31.0 – 35.0)
RETIC (%)	<0.2	%	Low	(0.2 – 1.6)
WBC	13.4	K/µL		(5.5 – 19.5)
Neutrophil	11792			(2500 – 12500)
Lymphocyte	938		Low	(1500 – 7000)
Monocyte	402			(0 – 850)
Eosinophil	268			(0 – 1500)
PLT (Automated)	Clumped	/µL		(300 – 800)
PLT (Estimate)	Normal			

SERUM BIOCHEMICAL PROFILE	VALUE	UNITS		REF INTERVAL
Glucose	242	mg/dL	High	(65 – 131)
Blood Urea Nitrogen	22	mg/dL		(19 – 33)
Creatinine	1.3	mg/dL		(0.8 – 1.8)
Phosphorus	5.0	mg/dL		(3.8 – 7.5)
Calcium	8.9	mg/dL		(8.4 – 11.8)
Magnesium	2.4	mg/dL	High	(1.7 – 2.3)
Sodium	153	mmol/L		(144 – 155)
Potassium	4.5	mmol/L		(3.5 – 5.1)
Chloride	122	mmol/L		(113 – 123)
TCO_2	20	mmol/L		(19 – 26)
Anion Gap	16	mmol/L		(12 – 19)
Lactic Acid	16.6	mg/dL	High	(5.4 – 15.3)
Total Protein	7.0	g/dL		(6.1 – 7.7)
Albumin	2.5	g/dL		(2.5 – 3.3)
Globulin	4.5	g/dL	High	(2.3 – 3.8)
ALT	<3	U/L	Low	(26 – 84)
ALKP	27	U/L		(20 – 109)
GGT	6	U/L		(0 – 12)
Total Bilirubin	0.4	mg/dL		(0 – 0.6)
Cholesterol	152	mg/dL		(56 – 161)

URINALYSIS	VALUE	UNITS	
Color/Transparency	Yellow/clear		
Specific Gravity	1.028		
pH	6.5		
Protein	30	mg/dL	High
Glucose	2000	mg/dL	High
Ketones	Negative		
Bilirubin	Negative		
Blood	Moderate		High
Urobilinogen	0.2	mg/dL	
WBC	0–2	/hpf	
RBC	6–10	/hpf	High
Bacteria	None seen	/hpf	

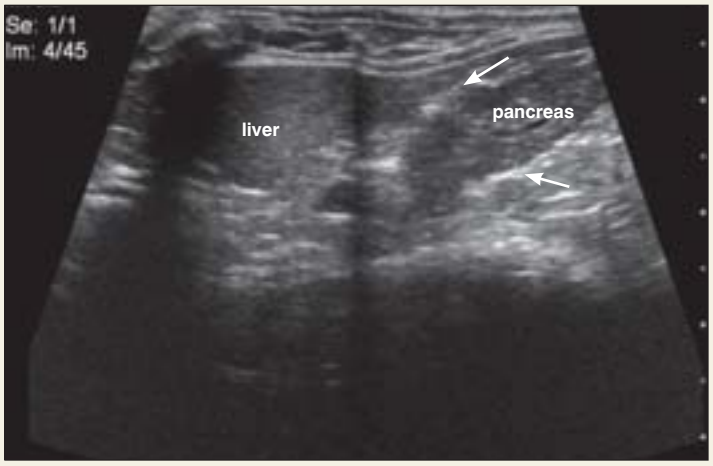
OTHER TESTS	VALUE	UNITS		REF INTERVAL
Cobalamin	224	ng/L	Low	(290 – 1499)
Folate	10.6	µg/L		(9.7 – 21.6)
Total T_4	2.12	µg/dL		(0.78 – 3.82)
Spec fPL	8.6	µg/L	High	(0.1 – 3.5)

≤3.5 µg/L—Serum Spec fPL concentration is in the normal range. It is unlikely that the cat has pancreatitis. Investigate for other diseases that could cause observed clinical signs.
3.6– 5.3 µg/L—Serum Spec fPL concentration is increased. The cat may have pancreatitis and Spec fPL concentration should be reevaluated in two weeks if clinical signs persist. Investigate for other diseases that could cause observed clinical signs.
≥5.4 µg/L—Serum Spec fPL concentration is consistent with pancreatitis. The cat most likely has pancreatitis. Consider investigating for risk factors and concurrent diseases (e.g., IBD, cholangitis, hepatitic lipidosis, diabetes mellitus). Periodic monitoring of Spec fPL concentration may help assess response to therapy.

Additional testing: Problems identified by the initial laboratory work included nonregenerative anemia, hyperglycemia with glycosuria and microscopic hematuria, hypocobalaminemia and pancreatic inflammation. After reviewing these results, the following additional tests were performed:

ADDITIONAL TESTS	VALUE	UNITS	REF INTERVAL
Urine Culture	Negative		
Trypsin-like immunoreactivity	10.6	µg/L	(9.7 – 21.6)
Fructosamine	250	µmol/L	(<375)

Abdominal ultrasonography revealed a prominent pancreas, with diffuse mottling and an irregular margin. The tissue appeared hypoechoic, whilst the surrounding mesentery was hyperechoic. Renal parenchyma was slightly hyperechoic; these changes appeared consistent with age. The remainder of the scan was unremarkable.



The pancreas and liver are labelled in the image above. The pancreas is enlarged and hypoechoic with an irregular margin. The surrounding mesentery is hyperechoic.

Final diagnosis

1. Pancreatitis: Likely an acute exacerbation of a chronic condition.

Frisky's progressive inappetance and poor body condition were consistent with the diagnosis of pancreatitis. The findings on the abdominal ultrasound combined with an elevated Spec fPL concentration confirmed the diagnosis of pancreatitis. Minimal biochemical abnormalities and a normal trypsin-like immunoreactivity (TLI) are not uncommon in cats with pancreatitis. Frisky's normal fructosamine in face of her hyperglycemia and glucosuria suggested she had transient stress-induced hyperglycemia.

2. Hypocobalaminemia: Likely due to chronic small intestinal disease.

Cobalamin is a B-group, water-soluble vitamin that is absorbed from the distal small intestinal along with cofactor produced in the pancreas. Frisky's cobalamin deficiency in face of her normal pancreatic function was indicative of chronic small intestinal disease. Inflammatory bowel disease and intestinal lymphoma are the most common causes of hypocobalaminemia in cats, but small intestinal biopsies would be required for definitive diagnosis.

3. Nonregenerative anemia: Likely due to chronic disease.

Frisky had a moderate to severe anemia with no reticulocytosis. Pancreatitis is an inflammatory condition and a nonregenerative anemia is the most frequent hematologic abnormality that occurs with this disease.

Therapeutic plan

Day 1: Frisky was admitted to the hospital and started on intravenous fluid therapy. Her estimated deficit and on-going needs were provided with lactated Ringer's solution (13 mL/hour initially), supplemented with 16 mEq/L of KCl. A continuous-rate infusion (CRI) of fentanyl (2 µg/kg/hour) was started to manage her pain. Her respiration rate and pain score (see table 1 on page 16) were monitored closely so that adjustments could be made if necessary. Cyanocobalamin was administered subcutaneously (250 µg) to address the hypocobalaminemia.

Day 2: Frisky was briefly anesthetized for placement of an esophagostomy feeding tube (e-tube). The procedure took less than 10 minutes and she recovered with no complications. Tube feedings started that same day, using an energy-dense prescription diet (Royal Canin Veterinary Diet™ Recovery RS™). Her calorie needs were calculated based on an estimated optimal body weight of 4 kg ($4\ kg^{0.75} \times 70 = 198$ calories). To avoid complications from refeeding syndrome, she received one third of her target calorie needs on the first day, divided into 4 equal meals. Her fluids were changed to a maintenance type (Normosol®-M with dextrose, supplemented with 7 mEq KCl/L at 6 mL/hour). Blood glucose and serum electrolytes were rechecked; all parameters were within the normal range. Her packed cell volume (PCV) had decreased to 17%.

Day 3: The fentanyl CRI was discontinued and buprenorphine (0.02 mg/kg) was administered sublingually instead. The volume of each e-tube feeding was doubled. Methimazole was restarted at the previous dose (2.5 mg twice daily, through the e-tube).

Day 4: Intravenous fluids were discontinued and the e-tube feedings were increased to the target volume. Frisky showed some interest in food, but still would not eat. She was given another injection of cyanocobalamin (250 µg subcutaneously) and discharged from the hospital with instructions to continue the e-tube feedings, buprenorphine and methimazole. *(continued on next page)*

Clinical case outcome

One week later, Frisky was alert and responsive. She was hydrated and did not appear to have any abdominal discomfort. Body weight was improved at 2.7 kg. The owner reported that Frisky was now eating about 50% of her target intake, and she was now receiving only two meals a day through the e-tube. Results of a serum biochemical profile were within normal limits, and the Spec fPL concentration was substantially improved at 3.2 μg/L. Frisky's clinical improvement and reduction in her Spec fPL concentration were evidence that her pancreatitis was resolving. She was still anemic at 23%, but some regeneration was now evident. Another injection of cyanocobalamin (250 μg subcutaneously) was administered and four more doses were dispensed for the owner to give at home at weekly intervals. Further evaluation of the gastrointestinal tract via endoscopy was discussed, but the owner declined further diagnostics. A recheck visit was scheduled in two weeks to reevaluate her appetite, anemia, Spec fPL concentration and to determine if her e-tube could be removed.

Table 1.

Pain scoring system for dogs and cats

Analgesia score	Patient observations
1: No pain	Patient moves freely. Responds appropriately to environment and interacts readily. Normal heart rate and respiratory rate.
2: Slightly painful	Responsive but avoids interaction. Patient looks at affected site if this area is palpated but does not demonstrate distress.
3: Mildly painful	Movements are limited. Patient is somewhat restless. Objects if affected area is palpated.
4: Moderately painful	Limited interest in surroundings. Patient is restless and vocalizing but may be comforted by contact. Guards affected site and tries to escape if palpation is performed.
5: Very painful	Pain could not be worse. Patient is tense and shivering. Avoids touch if possible. Unsolicited vocalization is noted. May have shallow, labored breathing and increased heart rate. May not move at all.

Adapted from: Buback JL, Boothe HW, Carroll GL, Green RW. Comparison of three methods for relief of pain after ear canal ablation in dogs. *Vet Surg.* 1996;25:380–385.

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their progress, the presence or absence of concurrent conditions and their therapeutic regime. Biweekly visits are warranted initially to evaluate activity level, appetite and body weight. Laboratory testing will depend upon their concurrent conditions and the Spec fPL concentration can be used to evaluate the pancreatitis.

When treating with glucocorticoids, the cat should be rechecked 10–14 days after initiating therapy. Decisions to continue or discontinue therapy should be based upon clinical response and trending of laboratory results including the Spec fPL.

In cats with concurrent pancreatitis and intestinal disease in which cobalamin supplementation is initiated, repeat cobalamin and Spec fPL concentrations should be reassessed one month after initiation of cobalamin therapy.

Prognosis

The prognosis for cats with pancreatitis is directly related to the severity of the disease. Cats with acute, severe disease, especially if systemic complications are present, have a poor prognosis. Hypocalcemia is a complication of feline acute necrotizing pancreatitis that is associated with a worse prognosis.[8] Cats with concurrent acute pancreatitis and hepatic lipidosis have a poorer prognosis than cats with hepatic lipidosis alone.[1] Chronic pancreatitis is common in cats and long-term management and commitment by the owner is required. In addition, pancreatitis may complicate management of concurrent diseases such as diabetes mellitus, inflammatory bowel disease and cholangiohepatitis. The well-being of these cats will depend upon the successful management of all concurrent conditions. |DX|

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