

Vcheck cPL & fPL

For the diagnosis of pancreatitis in dogs and cats

BIONOTE Marketing team

May 2020



Vcheck cPL & fPL

- 01 Pancreatitis in Dogs and Cats
- 02 Diagnosis of Pancreatitis
- 03 Treatment of Pancreatitis
- 04 Case Study

01 Vcheck cPL & fPL

- Pancreatitis in Dogs and Cats

Pancreatitis in Dogs and Cats

Anatomy

- Located in the cranial abdomen
- Lt. limb positioned between the transverse colon and the greater curvature of the stomach
- Rt. limb running next to the proximal duodenum

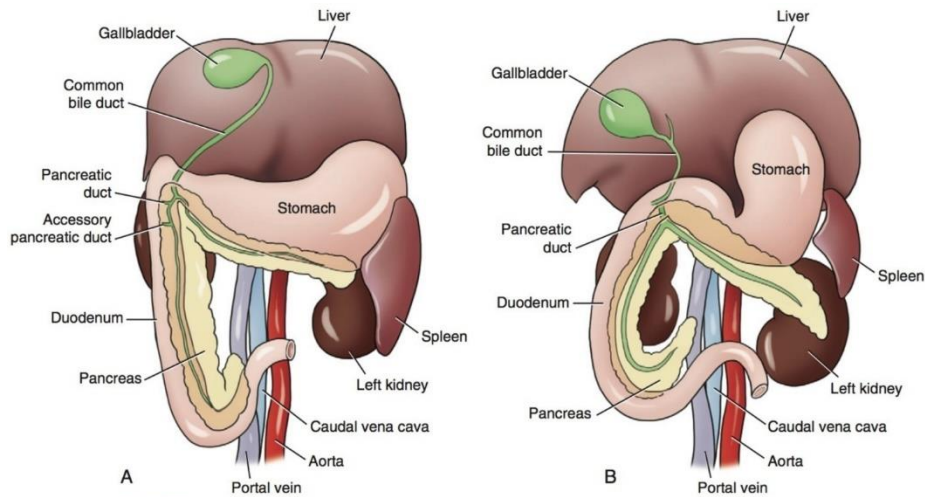
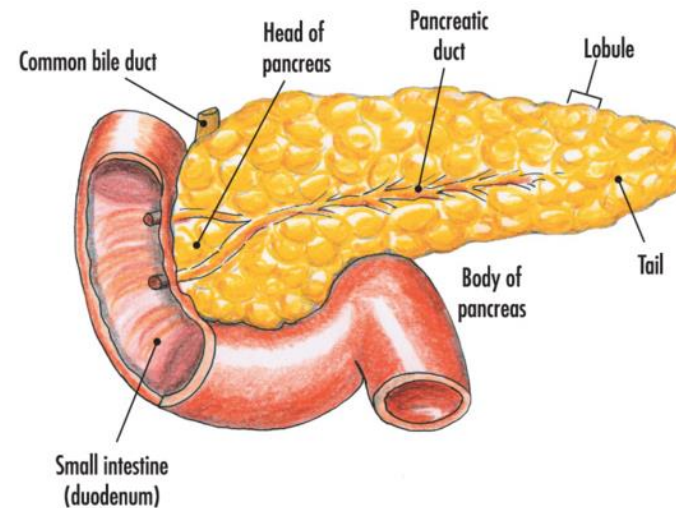


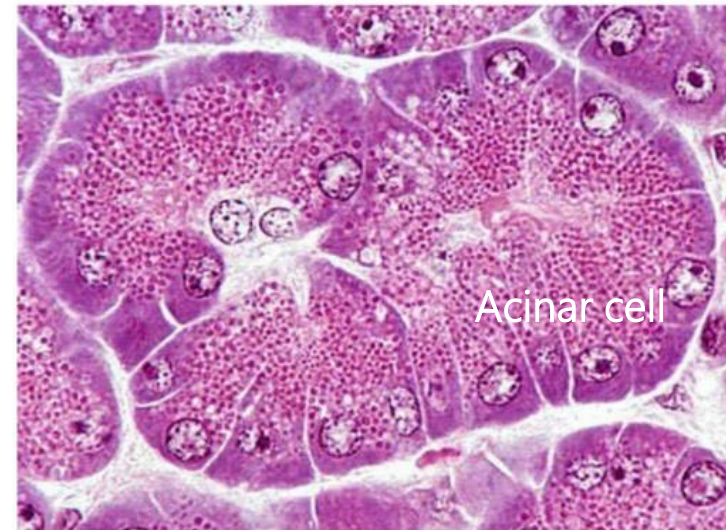
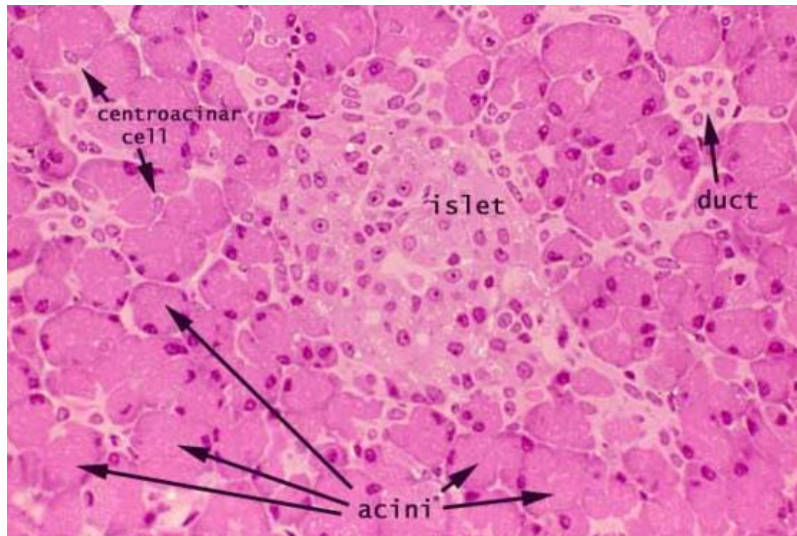
Figure 26-84 Schematic view of the ventral aspect of the (A) canine and (B) feline pancreas and adjacent organs.



Pancreatitis in Dogs and Cats

Histology

- Exocrine acini (90%) & Endocrine islets (10%)

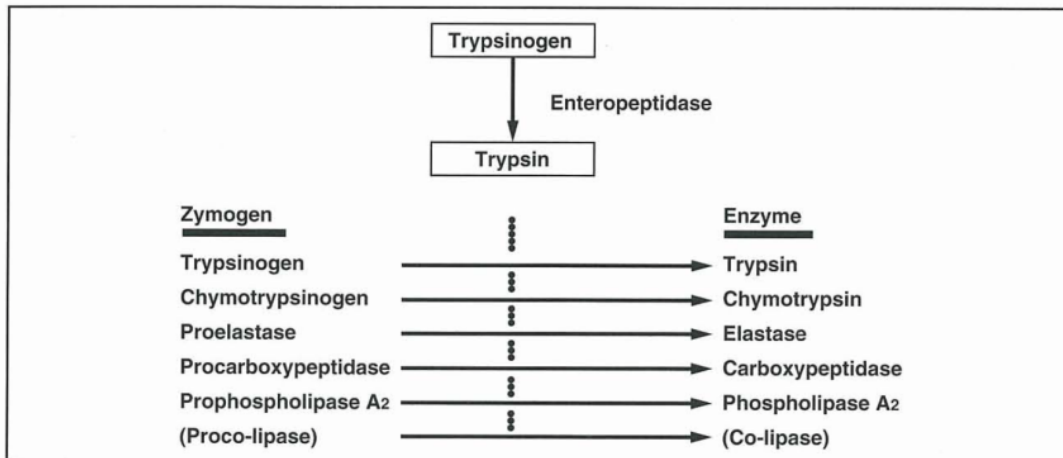


Zymogen granules

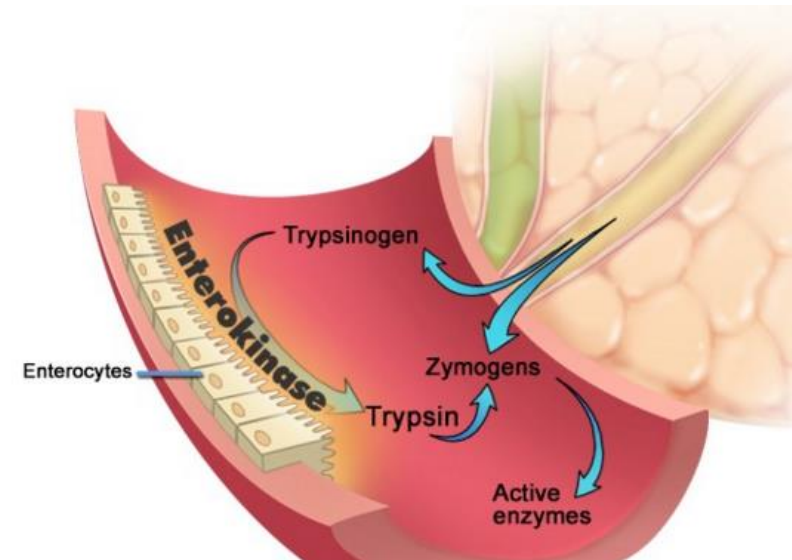
Pancreatitis in Dogs and Cats

Anatomy

- Pancreatic Enzymes



23.3 Activation of pancreatic proteases and phospholipase. (Reproduced from Williams (1995) with permission from Elsevier)



Pancreatitis in Dogs and Cats

Diseases of Exocrine Pancreas

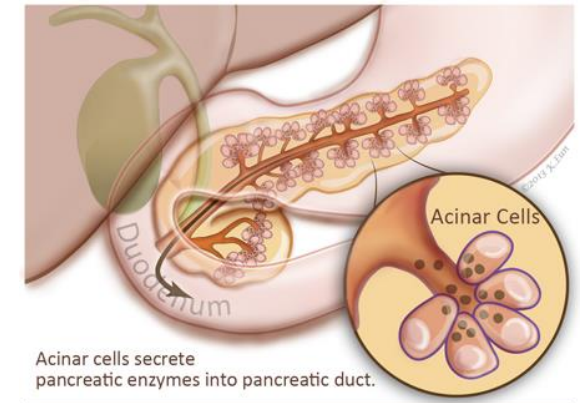
- **Pancreatitis**
 - ✓ Acute pancreatitis
 - ✓ Chronic pancreatitis
- Exocrine Pancreatic Insufficiency (EPI)
- Pancreatic Neoplasia
- Pancreatic Abscess, Pseudocyst

Pancreatitis in Dogs and Cats

Etiology

- Pancreatic acinar cells respond to a variety of harmful stimuli
 - ⇒ Inappropriate intracellular activation of trypsin
 - ⇒ Subsequently activation of other digestive zymogens

- These activated digestive enzymes cause local changes
 - Inflammation
 - Hemorrhage
 - Acinar cell necrosis
 - Peripancreatic fat necrosis



▲ Pancreas function

Pancreatitis

- Acute and chronic type based on histological findings
 - Severity & longevity of clinical signs
- High CRP or toxic change
- cPLI abnormal

Pancreatitis in Dogs and Cats

Acute vs. Chronic Pancreatitis

- Based on histologic features – not necessarily clinical

	Acute	Chronic	Chronic active
Histology	Inflammation with neutrophils Pancreatic necrosis, edema, peripancreatic fat necrosis	Infiltration of mononuclear cells , fibrosis , nodular hyperplasia	As chronic but with neutrophilic inflammation
Reversibility	Completely reversible	Irreversible	Irreversible
Clinical features	Mild to severe & fatal (necrotizing)	Generally mild	May be severe

BSAVA Canine and Feline Clinical Pathology

Pancreatitis in Dogs and Cats

Prevalence

- Acute pancreatitis is common in **dogs**.
- Chronic pancreatitis is common in **cats**.

- In a post-mortem study, histopathological findings suggestive of **chronic** pancreatitis were present in an unexpectedly large number of **dogs**, ranging between **34~64%**.
- The prevalence of chronic pancreatitis is **under-estimated**.

Pancreatitis in Dogs and Cats

Pancreatic Lipase Immunoreactivity (PLI)

- Pancreatitis: **More common than you think!**
- The true prevalence of pancreatitis is by far greater.
- Pancreatitis is far more common in dogs and cats than previously suspected.



- ✓ In one study 208 dogs, **more than 21%** had macroscopic lesions suggesting pancreatitis.
(By necropsy at the Animal Medical Center in New York City)
- ✓ In 200 unselected dogs, **25.6%** showed evidence of chronic pancreatitis and **2%** showed evidence of acute pancreatitis.
- ✓ Chronic hepatitis in dogs coexist in patients with pancreatitis.

Pancreatitis in Dogs and Cats

Pancreatic Lipase Immunoreactivity (PLI)

- Pancreatitis: **More common than you think!**

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- Pancreatitis is far more common in dogs and cats than previously suspected.



- ✓ In a study of 115 cats, **75.7% showed lesions suggestive of acute and/or chronic pancreatitis.**
(By necropsy at the University of California in Davis)
- ✓ Cholangitis in cats coexist in patients with pancreatitis.
- ✓ Approximately 50% of all canine and feline patients with exocrine pancreatic disorders have pancreatitis.

Pancreatitis in Dogs and Cats

Risk Factors

- Causes of Acute Pancreatitis in Dogs and Cats



RISK FACTOR	CAUSE
Idiopathic, 90%	Unknown (some may be hereditary or inherited susceptibility to environmental trigger)
Duct obstruction ± hypersecretion ± bile reflux into pancreatic duct	Experimental; neoplasia; surgery ± cholangitis + role in chronic pancreatitis
Hypertriglyceridemia	Inherent abnormal lipid metabolism (breed-related—e.g., Miniature Schnauzers) Endocrine—diabetes mellitus, hyperadrenocorticism, hypothyroidism
Breed, gender (?)	Increased risk in terriers ± spayed females—may reflect risk of hypertriglyceridemia in some (also Miniature Schnauzers; see above) and potentially other mutations (see text)
Diet	Dietary indiscretion, high-fat diet Malnutrition, obesity (?)
Trauma	Road traffic accident, surgery, high-rise syndrome
Ischemia, reperfusion	Surgery (not just pancreas), gastric dilation, volvulus; shock, severe immune-mediated hemolytic anemia (common association if anemia severe)
Hypercalcemia	Experimental (more common in cats than dogs); hypercalcemia of malignancy (uncommon association clinically); primary hyperparathyroidism
Drugs, toxins	Organophosphates, azathioprine, asparaginase, thiazides, furosemide, estrogens, sulfa drugs, tetracycline, procainamide, potassium bromide, clomipramine
Infections	Toxoplasma, others (uncommon)

Glucocorticoids?

Pancreatitis in Dogs and Cats

Clinical Signs

- Not specific
- Dependent on the degree of
 - Local pancreatic inflammation (pain, vomiting, etc.)
 - Systemic complications (DIC, MODS)
- Abdominal pain
 - Very common in dogs
 - Much less frequent in cats – accurate assessment is difficult
- In chronic pancreatitis, intermittent low-grade GI signs are common
- Cats: anorexia, lethargy dehydration, vomiting

Pancreatitis in Dogs and Cats

Clinical Signs

Dog: Pancreatitis	
Clinical signs	<ul style="list-style-type: none">• Anorexia (91%)• Vomiting (90%)• Weakness (79%)• Abdominal pain (58%)• Dehydration (46%)• Diarrhea (33%)
<ul style="list-style-type: none">✓ Mild cases : subclinical✓ Severe cases : Systemic clinical signs such as fever or even cardiovascular shock	

Cat: Pancreatitis	
Clinical signs	<ul style="list-style-type: none">• Lethargy (100%)• Anorexia (97%)• Dehydration (92%)• Hypothermia (68%)• Vomiting (35%)• Abdominal pain (25%)• A palpable abdominal mass (23%)• Dyspnea (20%)• Ataxia (15%)• Diarrhea (15%)
<ul style="list-style-type: none">✓ Less specific clinical signs✓ Low incidence of vomiting and abdominal pain	

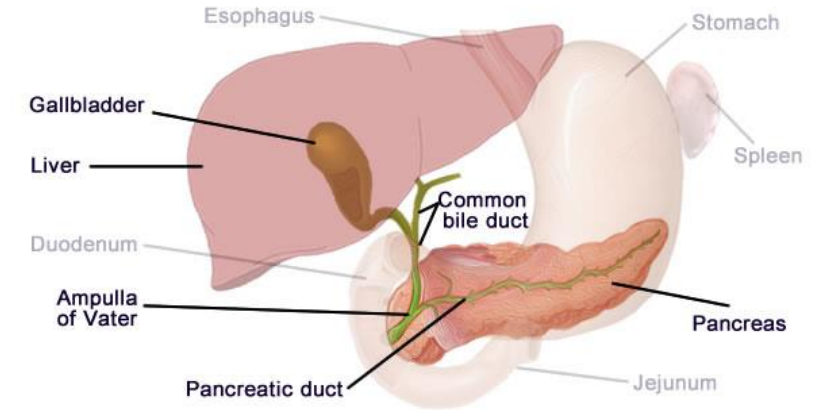
Pancreatitis in Dogs and Cats

Feline Triaditis

Pancreatitis in cats often is associated with diseases in other organs

- Liver
 - Hepatic lipidosis
 - Cholangiohepatitis
 - Cholangitis
- Intestine
 - Inflammatory bowel disease

⇒ " Triaditis "



- ✓ 38% (5/13) cats with hepatic lipidosis were noted to have acute pancreatitis.
- ✓ 40% (2/5) cats with cholangitis were reported to have chronic pancreatitis.
- ✓ 39% (7/18) with cholangiohepatitis had inflammatory bowel disease and mild pancreatitis.

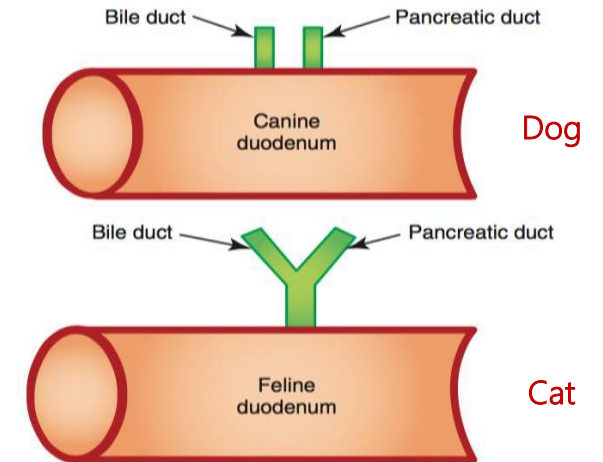
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01 Vcheck cPL & fPL

- Diagnosis of Pancreatitis

Diagnosis of Pancreatitis

General Considerations

- A combination of history, clinical signs, PLI, ultrasonography ± cytology / histopathology
- Physical examination, CBC, serum chemistry, urinalysis
 - Concurrent diseases
 - General condition
 - Optimal therapeutic plan
- EHBO (Extrahepatic Biliary Tract Obstruction) ?

Diagnosis of Pancreatitis

Diagnostic Imaging

- Radiographic changes
 - Decreased contrast in cranial abdomen
 - Displacement of abdominal organs
 - Pleural effusion
- ✓ Insensitive and nonspecific
- ✓ To rule out other differential diagnoses (Ex. GI foreign body)

Diagnosis of Pancreatitis

Abdominal ultrasonography

- **Severe acute pancreatitis:** necrosis \Rightarrow hypoechoic pancreas
Pancreatic enlargement, peritoneal effusion, hyperechoic mesentery and abdominal fat,
enlarged duodenal papilla, dilated pancreatic duct
- **Chronic pancreatitis:** fibrosis \Rightarrow hyperechoic pancreas
 - Highly operator-dependent
 - Cannot be reliably used as a rule-out test
 - Provides significant additional information useful for management of pancreatitis

Diagnosis of Pancreatitis

General Clinical Pathology

- Typically does not help in arriving at a specific diagnosis
- Provides important prognostic information
- Aids in effective treatment

- **CBC:** leukocytosis, Lt shift neutrophilia
- **Biochemistry:** elevated ALT and ALP, elevated bilirubin, azotemia, hypercholesterolemia, hypoalbuminemia, hypocalcemia, hyperglycemia

- Hypocalcemia is often associated with more severe, necrotizing presentations.

Diagnosis of Pancreatitis

Serum Amylase & Lipase Activity

- Amylases

- ✓ Catalyze the hydrolysis of complex carbohydrates
- ✓ Synthesized and secreted by several different cell types in the body
- ✓ Can be increased with various conditions other than pancreatitis

- ✓ Little value in the diagnosis of canine pancreatitis
 - Low sensitivity and specificity

- Lipase

- ✓ Hydrolyze lipids
- ✓ Many different lipases: gastric, pancreatic, hepatic, hormone-sensitive

- ✓ Limited specificity (approx. 50%) and sensitivity (approx. 50%) for pancreatitis
- ✓ Not specific for the exocrine pancreas

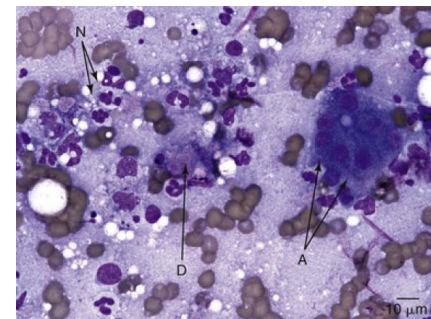
Diagnosis of Pancreatitis

Trypsin-Like Immunoreactivity (TLI)

- Specific for exocrine pancreatic function
- **Sensitivity:** much lower than serum PLI concentration or abdominal US
 - Trypsin is quickly scavenged from the serum by proteinase inhibitors.
 - Sensitivity of feline TLI: 28-64%
- Test of choice for the diagnosis of exocrine pancreatic insufficiency (EPI)

Cytology and Histopathology

- Cytologic evaluation of FNA
 - Great modality to confirm diagnosis of pancreatitis
 - Presence of inflammatory cells
 - But lack of inflammatory cells does not rule out pancreatitis.



N: Neutrophilic infiltration
A: Intact acinar cells
D: Debris

Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

- Detection of pancreatic lipase by use of specific antibody
- **Measuring pancreatic lipase exclusively**

- Diagnostic and monitoring test
- Screening test (rule-out)
 - ✘ Long-term oral administration of prednisone did not have any affect on serum cPLI level.

- **Most sensitive and specific diagnostic tool currently available**
 - Sensitivity > 80% for dogs with acute clinical pancreatitis
 - Sensitivity > 60% for dogs with mild pancreatitis

Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

- cPL Test in dogs with clinical signs of acute abdominal disease

A positive cPL may be indicative of pancreatic inflammation, however this cannot readily determine the primary reason for clinical presentation.

Dogs with signs of acute abdominal disease	Pancreatitis Group	Non-pancreatitis group
CPL \geq 400 ug/L	7	6
CPL < 400 ug/L	3	20
Clinical sensitivity 70% (7/10 dogs) Specificity 77% (20/26 dogs)		

- cPL results may provide a "false positive" diagnosis of pancreatitis in up to 40% of dogs presenting with acute abdominal disease.
- Additional testing such as **abdominal imaging**, along with **stringent assessment of clinical and historical findings** should be performed to make a diagnosis of acute pancreatitis

The diagnosis of AP in dogs was achieved by taking into consideration the history, physical exam findings and the results of CBC, biochemical analysis, and abdominal ultrasonography.

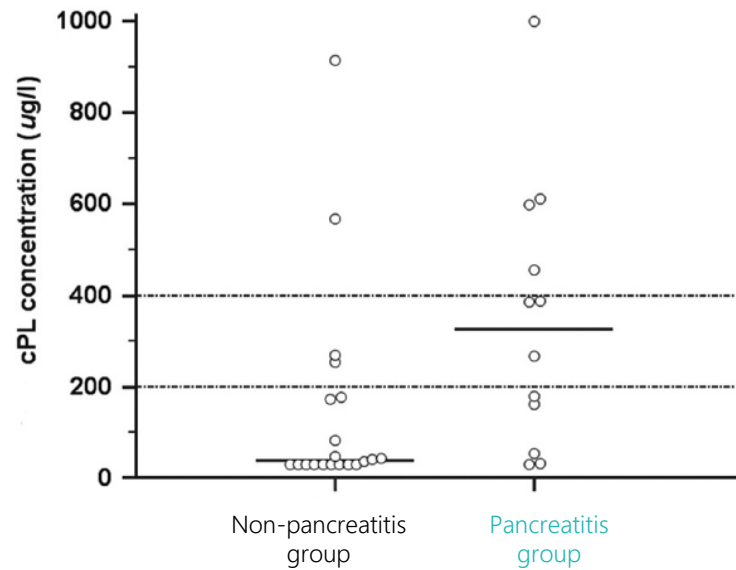
*Reference range: >400 ug/L -Pancreatitis



Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

- Association between cPL and histologic findings in dogs

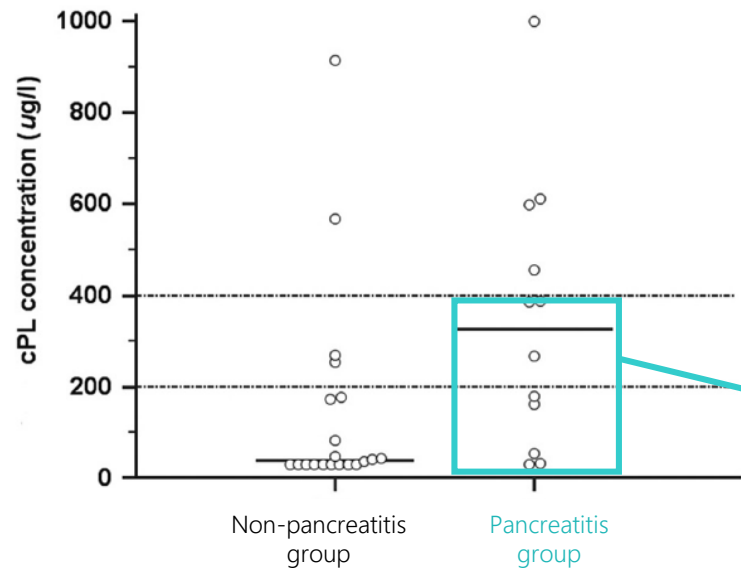


- Good specificity overall in dogs without pancreatitis
 - The cutoff value of 200 µg/l: Specificity 80% (95% CI: 56–94%)
 - The cutoff value of 400 µg/l: Specificity 90% (95% CI: 68–99%)
- A significant correlation ($r = 0.47$) between cPL and the pancreatic inflammation score

Diagnosis of Pancreatitis

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pancreatic inflammation score

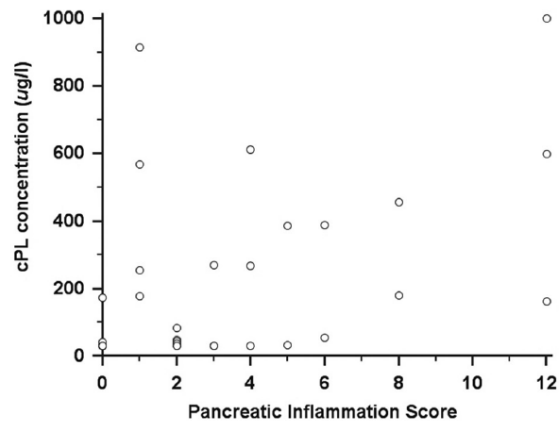
One possible explanation

- The disease may have initiated in the peri-pancreatic fat
 - Inflammation centered on the pancreas itself had yet to develop.
- ⇒ Results in less stimulation of the pancreatic enzyme cascade

Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

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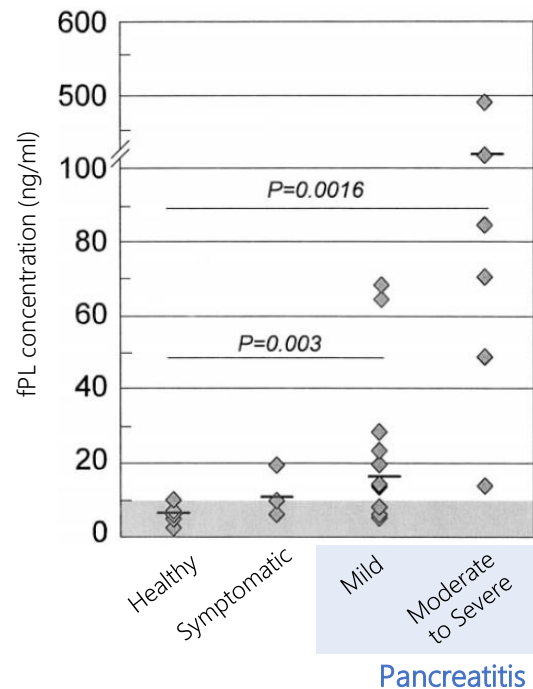
Pancreatic inflammation score	
≤3	≥4
Subclinical pancreatitis of little to no significance	Pancreatic inflammation of increasing degrees

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Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

- Association between cPL and histologic findings in dogs



	Healthy with Normal Pancreas	Symptomatic with Normal Pancreas	Mild Pancreatitis	Moderate to Severe Pancreatitis
fPL Conc.	5.5 ng/ml (2.4–7.5)	11.4 ng/ml (5.5–19.6)	15.9 ng/ml (4.9–68.5)	167.9 ng/ml (48.9–460.3)
AUS score	0.13 (0–1)	0.67 (0–1)	0.77 (0–2)	2.2 (0–5)

* fPL: By radioimmunoassay, Reference range: 2.0–6.8 ng/mL (≥ 10 mg/L: pancreatitis)

** AUS score: abdominal ultrasound total score

- **fPL concentration**
 - Sensitive in cats with moderate to severe pancreatitis (100%)
 - Specific in the healthy cats (100%)
- **Abdominal ultrasound**
 - Sensitive in cats with moderate to severe pancreatitis (80%)
 - Specific in healthy cats (88%)
- The high sensitivities suggest that these tests should play an important role in the noninvasive diagnosis of feline pancreatitis.

Vcheck cPL & fPL

Diagnosis of Pancreatitis

Pancreatic Lipase Immunoreactivity (PLI)

Dogs with clinical signs suggestive of pancreatitis
(Ex. vomiting and/or abdominal pain)



cPL Blood Testing



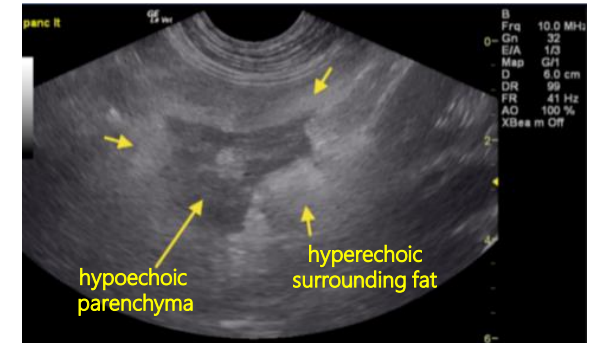
Abdominal ultrasound

Diagnosis of Pancreatitis

The diagnosis of acute pancreatitis by ultrasound

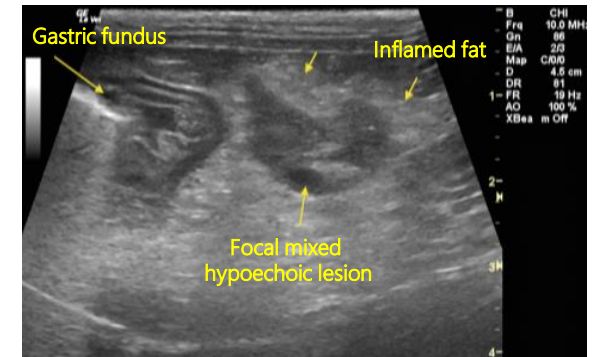
- **Sensitivity** : 66 - 68%
⇒ Believed to be much higher now due to improved equipment and operator expertise
- **Specificity** : Well accepted
⇒ Enlarged and diffusely **hypoechoic** (Pancreatic necrosis)
⇒ Hyperechogenicity in cases of pancreatic fibrosis
⇒ **The surrounding fat** appears moderately **hyperechoic**
⇒ Fluid accumulation around the pancreas
- History, clinical signs, laboratory testing, and abdominal imaging are often used together to make a clinical diagnosis of Acute pancreatitis.

Image courtesy of Andi Parkinson Intrapet Imaging, Baltimore, MD, USA.



▲ Pancreatitis affecting the left limb of the pancreas in dogs

Image courtesy of Doug Casey DMV, DABVP English Bay Ultrasound, Vancouver, BC, Canada.



▲ Pancreatitis affecting the left limb of the pancreas in dogs

Vcheck cPL & fPL

- Treatment of Pancreatitis

Treatment of Pancreatitis

General Considerations

- Fluid therapy (most important)
- Antiemetics
- Analgesia
- Antibiotics
- Nutrition
- Gastric acid suppression
- Plasma transfusion
- Prevention of DIC
- Pancreatic enzyme supplement.

Table 1. Assessment of the overall level of evidence for major treatment strategies of acute pancreatitis (AP) in dogs

Treatment intervention	Treatment recommendations	Level of evidence
Intravenous fluid therapy	Lactated Ringers preferable crystalloid Dextrans beneficial if unable to maintain perfusion with crystalloids No benefit of fresh frozen plasma	B (humans) D (dogs) C (dogs) A (humans) C (dogs)
Anti-emetic therapy	Metoclopramide potentially detrimental Maropitant ideal first line treatment	D (dogs) B (dogs)
Antibiotics	Not required unless suspect bacterial translocation Amoxicillin-clavulanate or ticarcillin first drug of choice if needed	A (humans) D (dogs) C (dogs)
Gastric cytoprotection	Nasogastric suctioning contraindicated Omeprazole first-line drug of choice at 2 to 2.5 mg/kg orally daily in divided doses	A (humans) D (dogs) C (dogs)
Corticosteroids	Hydrocortisone could be considered in cases non-responsive to iv fluid resuscitation	B (humans) D (dogs)
Surgical intervention	No indication for surgical intervention with AP unless infection is documented	A (humans) B (dogs)
Pancreatic fluid collections	Fluid collections should be aspirated via ultrasound guidance only if associated with pain	A (humans) C (dogs)
Post-recovery treatment	Exocrine pancreatic supplementation and a low-fat diet should be given for 4 weeks Serum triglyceride and cholesterol concentrations should be measured 2 to 4 weeks postrecovery from AP. If hyperlipidaemic, a low-fat diet should be continued indefinitely, and if necessary lipid-lowering medications prescribed. If hyperlipidaemia is not present, then the regular diet can be cautiously reintroduced	D (dogs) D (dogs)

Level A is based on consistent randomised control trials and cohort studies in different populations of subjects; level B is based on consistent retrospective cohorts, experimental cohorts of the same species, case-control studies or extrapolated from level A studies; level C is based on case series, or extrapolation from level B studies; level D is expert opinion without explicit critical appraisal, or extrapolated from bench-top research or physiological (first) principles. Adapted from Elwood *et al.* 2010. Further discrimination is given by indicating the species of study

Treatment of Pancreatitis

Fluid therapy

- Pancreas is susceptible to altered blood flow.
 - ⇒ Pancreatitis occurred following hypoperfusion
- Alkalinizing fluid – Lactated Ringer's solution
 - ⇒ To increase pH
 - ⇒ To prevent further trypsin activation within acinar cell



Antiemetics

- Maropitant (Cerenia)
 - Most effective in dogs & cats
 - Inhibition of NK1 receptors and substance P production
 - 5 days on and 2 days off
 - SC or PO
- Ondansetron
 - Can be used with maropitant
- Metoclopramide?
 - Not recommended



Treatment of Pancreatitis

Analgesia

Pain is one of common clinical signs in pancreatitis.

- NSAIDs & α 2-adrenoreceptor agonists
 - Not recommended
- Fentanyl
 - Negative effect on GI motility, seldom used
- Lidocaine
 - Anti-inflammatory effect
- Tramadol, gabapentin

Antibiotics

- Bacterial translocation from small intestine
- Poor gut health (melena, hematochezia) combined with prolonged fasting and/or hypotension.
- Amoxicillin-clavulanate, metronidazole, quinolones:
Recommended



Treatment of Pancreatitis

Nutrition

- NPO > 3 days ("rest" the pancreas) ?
⇒ Intestinal mucosal atrophy, increased risk of bacterial translocation
- TPN (total parenteral nutrition)?
- Early enteral nutrition decreases clinical severity & complication rate in pancreatitis

- Low-fat, high-fiber diet



Royal Canin® GI LOW FAT

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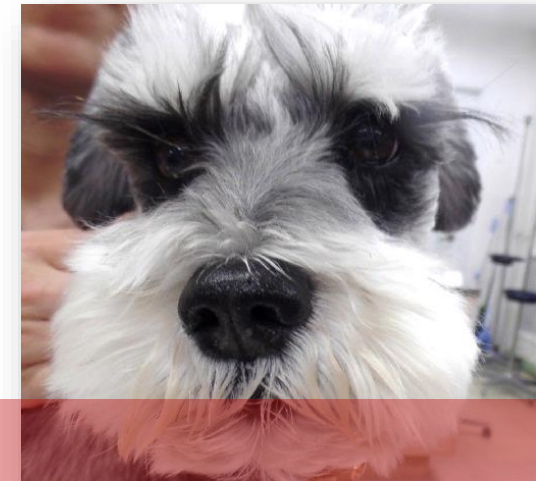
- Case Study – cPL/fPL

Case Study – cPL/fPL

Case #1

- 9 yrs, CM, M. Schnauzer
- CC : Pancreatitis (LAH)
- HPI
 - Chronic vomiting, mucous feces, abd. Pain
 - Hospitalized at LAH with monitoring of lipase level
 - Currently normal feces without abd. pain
- **CRP & CPL Testing**
 - cPL : 37 ng/mL (*Reference: normal <200 ng/ml)
 - CRP : <10 mg/L (*Reference: normal <20 mg/L)

	Ref	Day 1	Day 5	Day 10	Day 14
Lipase	135-755	810	1018	1278	985



No pancreatitis!

Case Study – cPL/fPL

Case #2

- 5 yrs, CM, Maltese
- CC : chronic pancreatitis, CRP elevated
- HPI
 - 4 months ago: lethargy
 - 3 months ago: vomiting and mild fever (39.4°C)
 - 2 months ago: CRP elevated, abnormal SNAP cPL kit, normal cPL (142 ug/L)
 - 1 month ago: pancreatitis diagnosed
 - ⇒ Not recovered even after continuing treatment

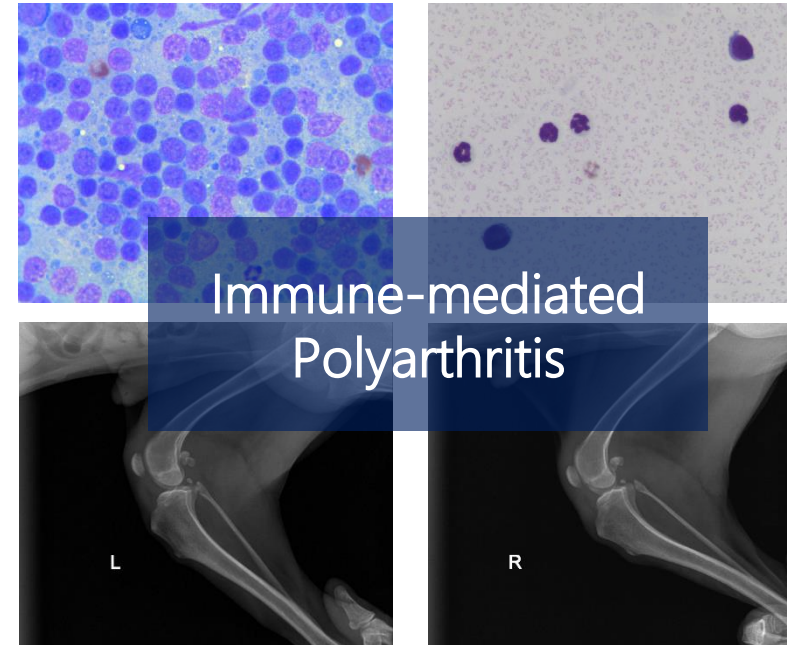


- Signs of pancreatitis?
- CRP elevation?
- cPL test?
- Cause of fever and CRP elevation?

Case Study – cPL/fPL

Case #2

- MDB
 - NCS except CRP elevation (127 mg/L)
 - Urinalysis : NRF
 - Chest X-ray : NRF
 - Abdominal ultrasonography : mild pancreatitis, sublumbar LN enlargement
- Vcheck cPL : 145 ng/mL (normal)

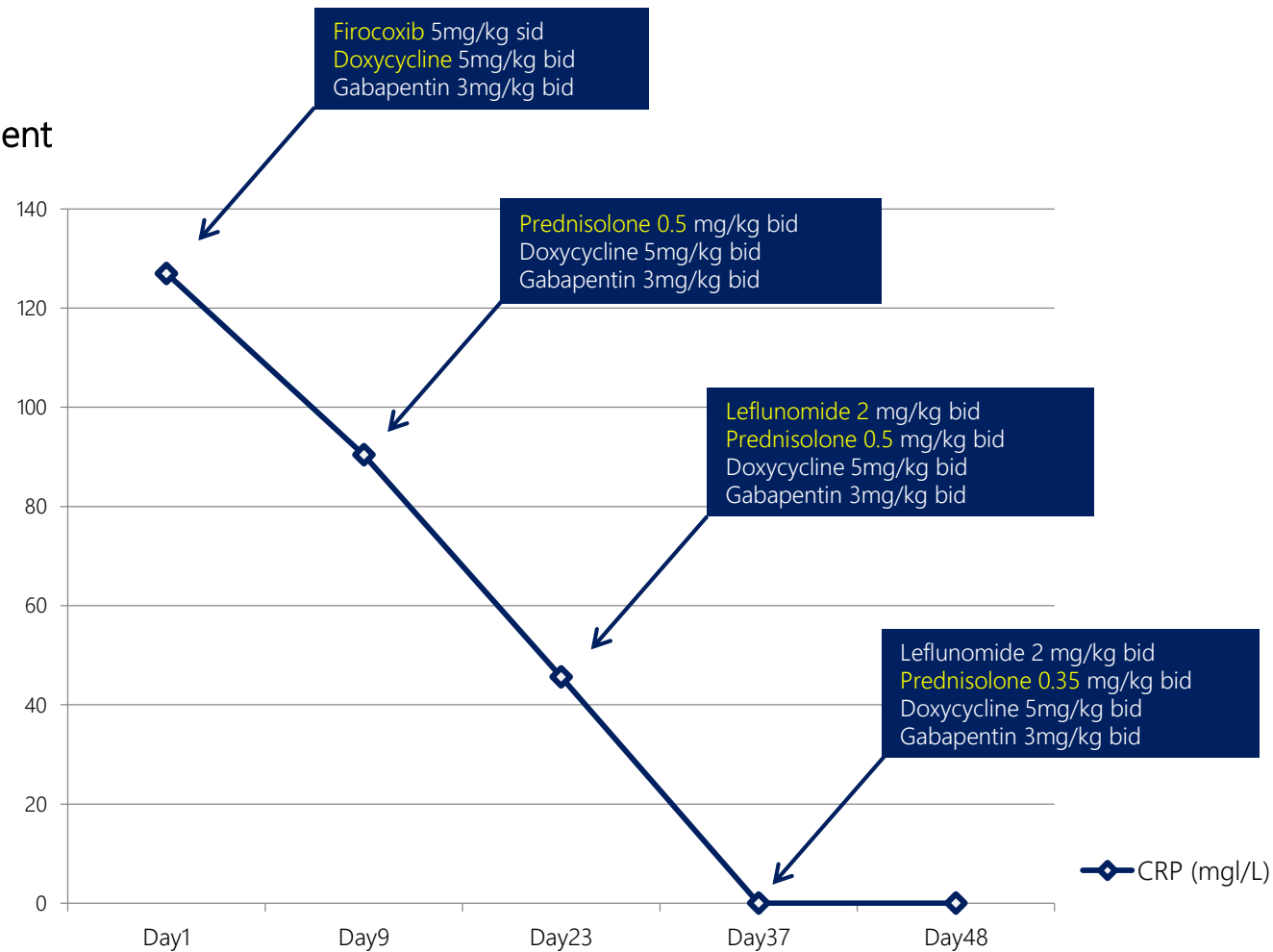


- Lymph node enlargement
- Vector-borne disease PCR : negative
- Synovial fluid cytology
- Radiography of forelimbs and hindlimbs
- Autoimmune panel (IDEXX)

Case Study – cPL/fPL

Case #2

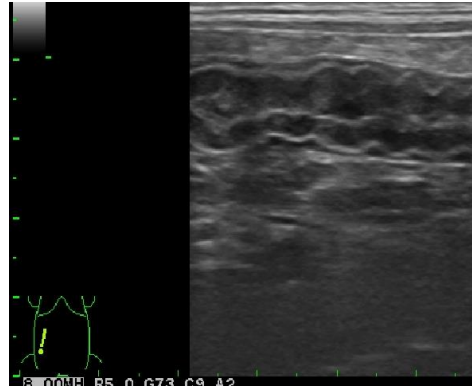
- CRP Changes during treatment



Case Study – cPL/fPL

Case #3

- Maltese, SF, 12 yrs
- HPI
 - GI signs – vomiting
 - Dyspnea
 - Dullness
 - Hypotension
 - Dehydration (7%)
- **CRP 163 mg/L** (*Reference: normal <20 mg/L)
- **cPL > 2000 ng/mL** (*Reference: normal <200 ng/ml)
 - ⇒ Indicating severe inflammation
- Renal & hepatic parameters very high
 - ⇒ Further evaluation on liver and kidney parenchyma required



▲ Ultrasonographic findings (Pancreatitis)

Date/Time : 2017-09-18 오전 11:14:45

Name	Unit	Min	Max	Result
cCRP	mg/L			163
cPL concentration	ng/ml	0	200	2000

Name	Unit	Min	Max	Result
WBC	10x9/L	6	17	7.2
RBC	10x12/L	5.5	8.5	6.65
Hemoglobin[Hb]	g/dL	12	18	15.7
Hematocrit[Hct]	%	37	55	45.3
MCV	fL	66	77	68.1
MCH	pg	19.9	24.5	23.6
MCHC	g/dL	32	36	34.7
Platelet	10x9/L	200	500	581
ALB	mg/dL	2.6	4	3
TP	g/dL	5.2	8.2	6.1
GLU	mg/dL	70	110	53
ALP	U/L	0	212	557
ALT	U/L	0	120	1100
TBIL	mg/dL	0	0.9	0.4
AMY	U/L	400	1500	3000
BUN	mg/dL	6	26	81.7
CREA	mg/dL	0	1.6	4
Ca	mg/dL	8.6	12	8.2
PHOS	mg/dL	2.5	6.8	13.8
Na	mmol/L	138	160	133
K	mmol/L	3.7	5.8	5.1

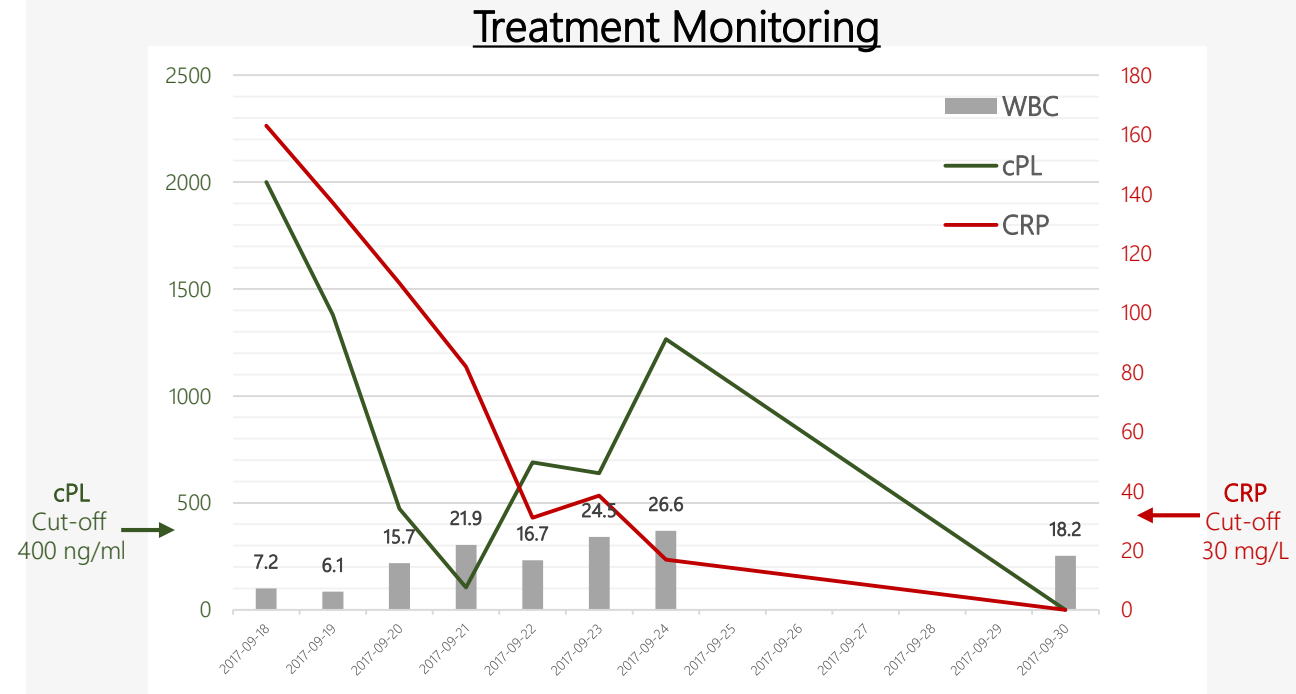
▲ Blood work

Case Study – cPL/fPL

Case #3 (Treatment)

- **Fluid Therapy**
 - D/S 80ml/hr → until BP recover to 120
 - Plasma transfusion 20ml/kg IV for 4 hrs
 - H/D + Vit. B & C, 5% taurine
- **Maropitant** 0.1ml/kg SC SID
- **Pantoprazole** 1mg/kg IV BID
- **Cefazolin** 30mg/kg IV BID
- **Enoxaparin** 0.8mg/kg SC TID
- **Dexamethasone** 0.5mg/kg IV ONCE

- **Diet:** NPO

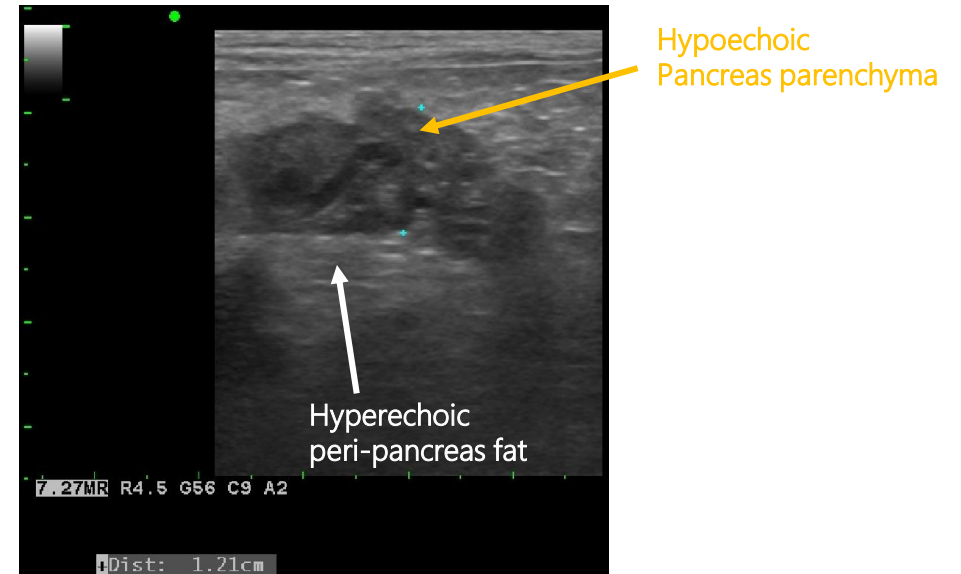


- Following the appropriate Tx, clinical signs disappeared.
- When the patient started to eat on 21st of Sep, cPL level was slightly increased and CRP level was decreased at the same time.
- When the patient completely recovered, both CRP and cPL levels were decreased to the normal ranges.

Case Study – cPL/fPL

Case #4

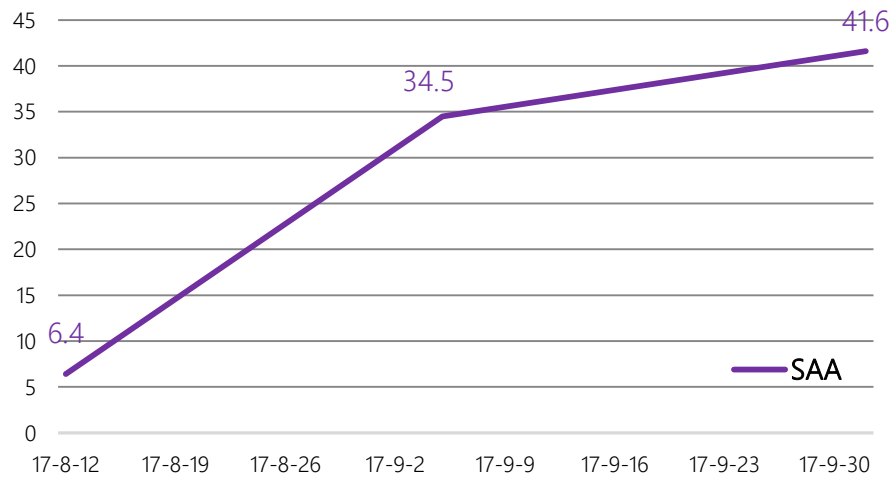
- Korean Short Hair, CM, 12 yrs
- HPI
 - Necrotizing / hemorrhagic pancreatitis
 - Pancreatic pseudocyst
- Diagnostic Imaging
 - Cystic change and peripancreatic inflammation (very severe)
 - Initially, no significant finding in gallbladder, intestines, etc



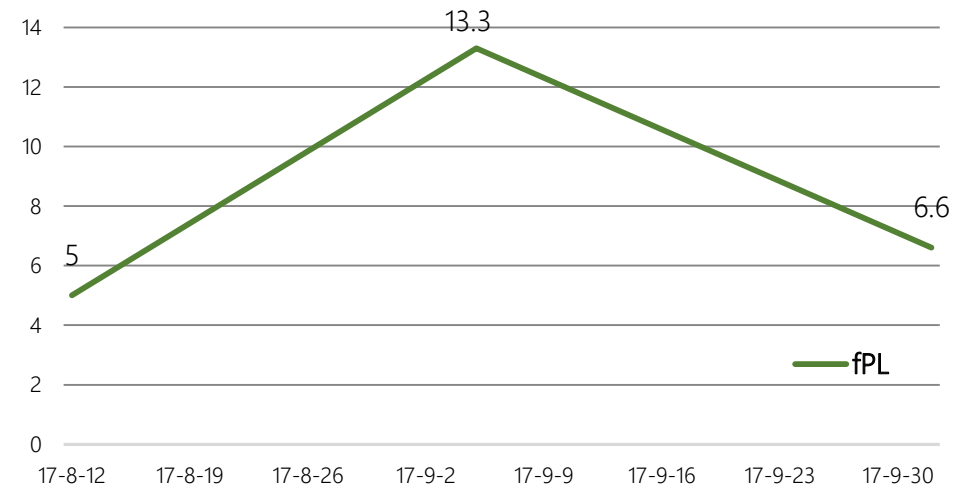
Case Study – cPL/fPL

Case #4 (Treatment Monitoring)

- Although the cat ate well, fPL level was above the normal range.
- Based on the fPL concentration and the patient's age, the prognosis seemed poor. The cat eventually died.



▲ SAA Changes



▲ fPL Changes

02 Product Introduction

Vcheck cPL & fPL

- Specifications
- Test Procedure
- Product Comparison
- Performance

02 Product Introduction

- Specifications

- Vcheck series for diagnosis of pancreatitis

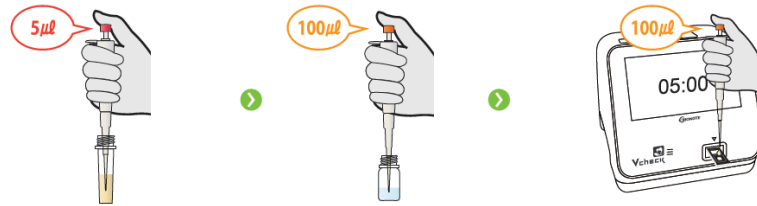
Vcheck cPL 2.0	 The image shows the Vcheck cPL 2.0 product, which includes a white box and a black test strip. The box is labeled 'Vcheck cPL 2.0' and '10 TESTS/KIT'. A yellow circular icon with a thermometer symbol and the text '1~30°C' is overlaid on the box, indicating the storage temperature range. The BIONOTE logo is visible in the bottom right corner of the box.	<ul style="list-style-type: none">Species : DogSample : Serum 25 μlTesting Time : 5 minutesMeasurement : QuantitativeMeasurement Range : 50 – 2,000 ng/mlStorage Condition : 1 - 30 $^{\circ}$C
Vcheck fPL 2.0	 The image shows the Vcheck fPL 2.0 product, which includes a white box and a black test strip. The box is labeled 'Vcheck fPL 2.0' and '10 TESTS/KIT'. A yellow circular icon with a thermometer symbol and the text '1~30°C' is overlaid on the box, indicating the storage temperature range. The BIONOTE logo is visible in the bottom right corner of the box.	<ul style="list-style-type: none">Species : CatSample : Whole blood 50 μl, Plasma(EDTA)/Serum 25 μlTesting Time : 15 minutesMeasurement : QuantitativeMeasurement Range : 1 – 50 ng/mlStorage Condition : 1 - 30 $^{\circ}$C

02 Product Introduction

- Test Procedure

✓ Vcheck cPL 2.0

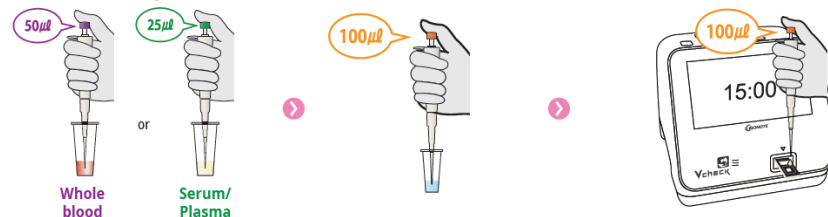
- 1 Draw **5 μ l** of serum or heparinized plasma and add it into an assay diluent bottle
- 2 Mix well 5-6 times by using a **100 μ l** pipetting
- 3 Add **100 μ l** of mixture in the sample hole of the test device



< 200 ng/ml	200~400 ng/ml	> 400 ng/ml
Pancreatitis very unlikely	If clinical signs are present, treat appropriately and perform retest in 2 weeks. If the dog is asymptomatic or with mild symptoms, retesting should be performed after a month.	Consistent with pancreatitis

✓ Vcheck fPL 2.0

- 1 Draw whole blood **50 μ l** or serum/plasma(EDTA) **25 μ l** and add it into an assay diluent tube
- 2 Mix well 5-6 times by using a **100 μ l** pipetting
- 3 Add **100 μ l** of mixture in the sample hole of the test device



\leq 3.5 ng/ml	3.6-5.3 ng/ml	\geq 5.4 ng/ml
Pancreatitis very unlikely	If clinical signs are present, treat appropriately and perform retest in 2 weeks. If the cat is asymptomatic or with mild symptoms, retesting should be performed after a month.	Consistent with pancreatitis

02 Product Introduction

- Product Comparison

- Vcheck cPL 2.0



Test	BIONOTE	Company 'I'	
	Vcheck cPL 2.0	SNAP cPL	Spec cPL ELISA
Test Spot	In clinic	In clinic	Laboratory
Preparation time	Less than 1 min.	30 min. (incubation)	-
Reading time	5 min.	10 min.	2 - 3 days or more
Amount of sample	25 µl	100 µl	At least 500 µl
Type of sample	Serum	Serum	Serum
Measurement type	Quantitative	Semi-quantitative	Quantitative
Dynamic range	50 – 2000 ng/ml	Not Applicable	50 – 2000 ng/mL
Storage temperature	1 - 30 °C	Refrigerated	Refrigerated

02 Product Introduction

- Product Comparison

- Vcheck fPL 2.0



Test	BIONOTE	Company 'I'	
	Vcheck fPL 2.0	SNAP fPL	Spec fPL ELISA
Test Spot	In clinic	In clinic	Laboratory
Preparation time	Less than 1 min.	30 min. (incubation)	-
Reading time	15 min.	10 min.	2 - 3 days or more
Amount of sample	Serum, plasma 25 µl Whole blood 50 µl	100 µl	At least 500 µl
Type of sample	Serum, Plasma, Whole blood	Serum	Serum
Measurement type	Quantitative	Semi-quantitative	Quantitative
Dynamic range	1 – 50 ng/ml	Not Applicable	1-50 ng/ml
Storage temperature	1 - 30 °C	Refrigerated	Refrigerated

02 Product Introduction

- **Performance** (Vcheck cPL 2.0)

- ✓ **Strong correlation with laboratories**

Vcheck cPL 2.0 has a **high correlation ($R^2 = 0.9979$)** with company 'I' laboratories.
This analyzer allows you to perform quantitative measurements for the accurate diagnosis easily in your clinics.

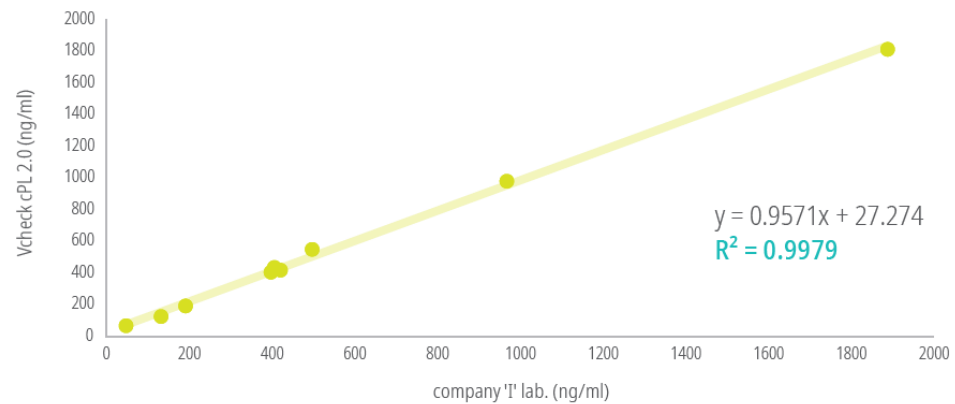
Reproducibility

CV < 15%

Accuracy

Bias < 20%

Comparative Evaluation of Vcheck cPL 2.0
- Compared to laboratories (N=21) -



02 Product Introduction

- **Performance** (Vcheck fPL 2.0)

- ✓ Greater accuracy at low concentrations

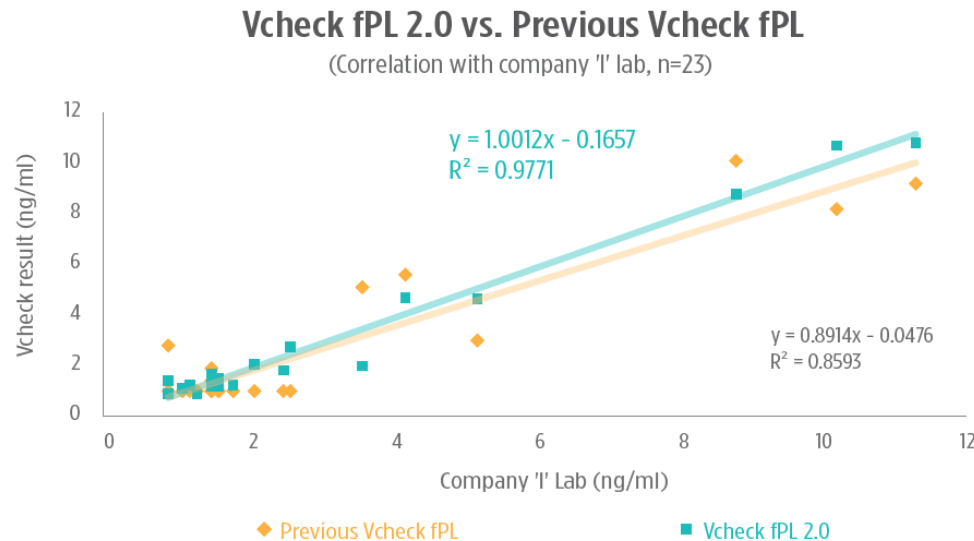
- Stronger correlation ($R^2=0.98$) of Vcheck fPL 2.0 with company 'I' laboratory, compared to our existing products

Reproducibility

CV < 15%

Accuracy

Bias < 20%



Thank you
Any Questions?

BIONOTE Marketing team

May 2020

