

## Gastrointestinal Function Tests in Dogs and Cats

### Lab Locations:

Atlanta, GA

Chicago, IL

Dallas/Fort Worth, TX

Honolulu, HI

Houston, TX

Los Angeles, CA

Memphis, TN

New York, NY

Phoenix, AZ

Portland, OR

San Francisco, CA

Tampa, FL

Clinical assessment of patients with chronic or severe gastrointestinal (GI) disease may include evaluation of fecal samples, CBC, biochemical and thyroid profiles, urinalysis, imaging studies for masses and foreign bodies, endoscopy, and biopsy. Fecal analysis includes direct smear, fecal flotation, zinc sulfate centrifugation, *Clostridium perfringens* enterotoxin assay, fecal cytology, giardia testing, cryptosporidium testing, fecal occult blood test, and sometimes fecal culture.

These testing procedures can be complemented by several more direct GI absorption and function tests to assist in the diagnosis and treatment of GI disease.

### *Trypsin-Like Immunoreactivity (TLI) Test*

The TLI test detects trypsinogen that leaks into the circulation from the pancreas and can be used in the diagnosis of both exocrine pancreatic insufficiency (EPI) and pancreatitis in dogs and cats. TLI is of test of choice (sensitive and specific) for diagnosing EPI; affected animals have low TLI concentrations. An 8 to 12-hour fast is required prior to sampling, and exocrine pancreatic supplements should be discontinued for 24 hours prior to testing. Evaluation of fecal fat, starch, and muscle content is neither sensitive nor specific for making a diagnosis of EPI.

Pancreatitis can be a difficult diagnosis to confirm. Amylase and lipase are not reliable tests for ruling pancreatitis in or out. In dogs with severe pancreatitis, amylase and lipase are elevated in only 50 to 60% of cases. Furthermore, amylase and lipase can be increased in diseases other than pancreatitis, including gastritis, intestinal obstruction, liver disease, and renal failure, and subsequent to corticosteroid administration. Amylase and lipase are considered even less useful in diagnosing pancreatitis in cats. While an elevated TLI concentration is specific for pancreatitis in dogs, it is not a highly sensitive indicator. Although marked azotemia may also cause an increase in TLI concentrations, this test is normal in most patients with renal failure. In addition to laboratory tests, the history, physical examination findings, imaging studies, and treatment response are important

components in establishing a diagnosis of pancreatitis. Cats with inflammatory bowel disease (IBD) frequently have elevated TLI concentrations, which likely reflects concurrent pancreatitis. In contrast, elevated TLI concentrations are unusual in dogs with inflammatory bowel disease. Some cats with an elevated TLI have been found to have focal pancreatic hypertrophy and not pancreatitis. Rarely, an elevated TLI can be caused by pancreatic neoplasia.

### *Serum Folate & Cobalamin Concentrations*

Laboratory tests available for evaluation of small intestinal function are limited. Tests such as fat balance studies, xylose absorption, and breath hydrogen testing are impractical and often insensitive. Serum concentrations of folate and cobalamin are simple tests of small intestinal function that can be helpful in the diagnosis and treatment of patients with GI disease. Folate and cobalamin are absorbed in different parts of the small intestine so that an abnormal concentration of either one may help to determine the precise location of intestinal disease. Serum folate and cobalamin concentrations must be measured after an 8 to 12-hour fast to reduce dietary influence. As it is important to have excluded EPI to correctly interpret folate and cobalamin test results, TLI should be measured simultaneously. In general, folate and cobalamin concentrations are reported to have good specificity but low sensitivity in detecting small intestinal disease.

Disease of the proximal small intestine may cause a decreased folate concentration, whereas disease of the ileum may cause cobalamin to be decreased. With diffuse small intestinal mucosal disease, both cobalamin and folate concentrations may be decreased. Small intestinal bacterial overgrowth (SIBO) in dogs may cause increased serum folate concentrations with or without decreased serum cobalamin concentrations. *Note that sample hemolysis will cause folate concentrations to be falsely increased because red blood cells contain high concentrations of folate.* EPI can influence serum folate and cobalamin concentrations by causing cobalamin malabsorption and SIBO.

# Gastrointestinal Function Tests in Dogs & Cats (cont'd)

## Interpretation of Serum TLI, Folate and Cobalamin Concentrations

TLI	Folate	Cobalamin	Interpretation
N	N	N	Normal TLI concentration rules out EPI. Normal folate and cobalamin concentrations do not rule out small intestinal disease.
D	N or D	N or D	EPI ± SIBO.
I	N or D	N or D	Pancreatitis ± small intestinal disease
N	D	D	Diffuse small intestinal disease ± SIBO
N	D	N	Disease of the proximal small intestine (duodenum and jejunum)
N	N	D	Disease of the distal small intestine (ileum) ± SIBO
N	I	D	This pattern of results in dogs indicates SIBO. Disease of the distal part of the small intestine may also be present.
N	I	N	SIBO, dietary folate supplementation, or sample hemolysis
N	I	I	Dietary folate and cobalamin supplementation
N = normal D = decreased I = increased			

Changes in serum folate and cobalamin concentrations also may have treatment implications. Many cats with severe cobalamin deficiency as a result of GI disease will not respond to treatment unless supplemented with cobalamin. Cobalamin needs to be administered *parenterally* at a dose of 250-1000 ug SQ or IM weekly for 8-12 weeks. Folate deficiency in cats can cause megaloblastic anemia (macrocytic, non-regenerative), anorexia, lethargy and poor growth. Folate can be administered orally in large doses to overcome the decreased absorption caused by small intestinal disease. The dose administered in one reported case of folate deficiency was 0.5 mg/day for 30 days. In dogs, supplementation with folate or cobalamin is rarely necessary.

## Sampling Information for Gastrointestinal Disease Function Testing

Test	Sample	Qty.	Test Code Number		Comments
			East & Test Express	West	
Canine TLI	Separated serum or spun SST	1 ml	717	4024	8 to 12 hour fast required
Feline TLI	Separated serum or spun SST	1 ml	722	16800	8 to 12 hour fast required
Folate & Cobalamin	Separated serum or spun SST	0.5 ml	959	16195	8 to 12 hour fast required. Avoid hemolysis. TLI should be requested simultaneously.
Fecal alpha-1 protease inhibitor	Feces				

## Fecal Alpha-1-Protease Inhibitor Activity

The fecal alpha-1-protease inhibitor activity test is a newly developed assay to assist in the diagnosis of protein-losing enteropathies (such as IBD, intestinal lymphoma, lymphangiectasia, and histoplasmosis). Alpha-1-protease inhibitor is a serum protein that leaks into the intestinal lumen of animals with protein-losing enteropathies, and can be detected in the feces because it resists degradation by fecal proteases. This test is very sensitive for detecting protein-losing enteropathies, and will detect disease before protein loss is severe enough to cause hypoalbuminemia or panhypoproteinemia. The test is species-specific and is *only available for dogs at this time*.

## LAB TIPS

### Low Calcium Values Obtained with Diluted Serum and Plasma

The concentration of calcium in mammalian blood is approximately 10 mg/dL, with some variation due to species (e.g., up to 13 mg/dL in normal horses and rabbits), age, dietary intake, and analytical method. Calcium in the blood is composed of protein-bound and ionized fractions. Precise control of calcium ion levels in extracellular fluids is vital for health, as low or high levels may lead to significant diseases such as hypothyroidism, puerperal tetany, hypoparathyroidism, hypoproteinemia, renal disease, and pancreatitis.

Reliable laboratory diagnosis depends upon accurate measurement of calcium levels. Antech's Research Dept. has studied the variation of serum and plasma calcium levels when different collection tubes are used or the sample volume is too small and is diluted to obtain a result. Serum and plasma calcium levels also

were measured undiluted and diluted 1:3 with water or saline. The calcium level did not vary significantly when samples were collected either in red top (RTT), serum separator (SST), sodium heparin or lithium heparin tubes. Although there was no difference between using water or saline as diluent, calcium levels of the diluted samples were almost 3 mg/dL **lower** than undiluted specimens.

***These findings confirm that when serum or plasma samples are diluted, falsely lowered calcium values are obtained.*** This poses a problem for small samples, such as those submitted from avian or exotic species, that may have to be diluted prior to analysis. Antech reports include a comment whenever samples are diluted indicating that interpretation should take the lowering effect of dilution into account.

**Note:** For tick identification, contact your local vector control agency.