

The gut, the pancreas and the liver: feline triaditis

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Feline triaditis describes concurrent pancreatitis, cholangitis and chronic enteropathy (CE) and has been reported with prevalence of 17-39%. Etiology is poorly understood, including infectious, autoimmune and physical problems. Different organs may be affected by different diseases, or the same process. It may be part of a multi-organ inflammatory disease. Feline gastrointestinal tract anatomy plays its role; its short small intestine, high bacteria load, and pancreatic duct joining the common bile duct before entering the duodenal papilla increase the risk of bacterial reflux and parenchymal inflammation. The latter may also be caused by intestinal bacterial translocation and systemic bacteremia. Studies are needed to understand the complex pathophysiology, improving diagnosis and treatment.

In most cases, pancreatitis is considered idiopathic; however, some underlying causes such as viral infection, toxoplasmosis, fluke infection, trauma or organophosphate poisoning have been reported. Pancreatitis can be divided into acute and chronic inflammation on the basis of histological findings. Since cats with CP are more likely to have concurrent diseases (e.g. hepatobiliary disease) than cats with AP, CP may be more common in triaditis. Pancreatic inflammation can extend to the pancreatic duct and even the Sphincter of Oddi, extending to cause cholangitis, and even result in extrahepatic biliary obstruction (EHBO). Cholangitis occurring as a primary disease can cause inflammation extending to the Sphincter of Oddi and pancreatic duct, and so, in turn, is a risk factor for pancreatitis.

Cholangitis describes inflammation of the biliary ducts, and when the inflammation extends into hepatic parenchyma, a diagnosis of cholangiohepatitis is made. The most common type of cholangitis in cats is neutrophilic cholangitis (NC), characterised by infiltration of large numbers of neutrophils into portal areas of the liver and bile ducts. It is believed to result from bacterial infection ascending from the intestine, which is supported by finding common enteric species, including *Escherichia coli*, *Streptococcus* spp., *Clostridium* spp. and *Salmonella typhimurium*. Neutrophilic cholangitis can be further divided into acute and chronic forms that are distinguished by their histopathological appearance.

The clinical signs associated with feline triaditis can be vague and non-specific. Anorexia has been reported in 63-97% of cases and lethargy in 28-100%. Weight loss, dehydration, pallor and icterus are frequently noted on physical examination. Cholangitis, pancreatitis and/or CE manifest with similar and overlapping clinical signs, often vague and non-

specific. Cholangitis may have increased serum liver enzymes, total bilirubin and bile acid concentrations and variable ultrasonographic changes. A presumptive diagnosis of pancreatitis is based on increased serum pancreatic lipase immunoreactivity (fPLI) or feline pancreas-specific lipase (Spec fPL), and/or abnormal pancreatic changes on ultrasonography; although sensitivity of these tests is low. Diagnosing CE is challenging without histopathology; ultrasound changes vary from normal to mucosal thickening or loss of layering. Triaditis may cause decreased serum cobalamin (B12) concentrations due to intestinal disease and/or pancreatitis. Definitive diagnosis of triaditis can only be confirmed with histopathology; hence it remains presumptive in most cases.

Since triaditis describes concurrent pancreatitis, cholangitis and CE and the etiology of these comorbidities is unclear, treatment should be focused on the specific type and the severity of the disease present in each of these organs in any particular cat (Table 1).

Anti-emetics	Maropitant 1mg/kg SC/IV/PO [†] q24h
	Ondansetron 0.5-1mg/kg PO q8-12h
Analgesia	Buprenorphine 0.02-0.03mg/kg IV/IM/SC* q6-12h *can also be given transmucosally
	Methadone 0.1-0.3mg/kg IV q4-6h
	Fentanyl 5µg/kg IV bolus or 2-4µg/kg/hr CRI
	Gabapentin 5-10mg/kg PO q8-12h
Antibiotics*	Amoxicillin clavulanate 10-20mg/kg SC/IV/PO q 8-12h
	Marbofloxacin 2.5mg/kg PO q 24h
	Pradofloxacin 7.5mg/kg PO q24h
Anti-inflammatories	Prednisolone 1-2mg/kg PO q 24h
Vitamins	Cobalamin 250µg/cat SC/IM) q 7 days for 6 weeks, then monthly (re-evaluate serum concentration one month after the last injection); 250µg/cat PO q24h for 12 weeks (re-evaluate serum concentration one week after stopping the treatment)
	Vitamin K 0.5-1.5mg/kg SC/IM q12h for 2-3 days* (acute supplementation, particularly prior to any sampling) *check coagulation factors
Appetite stimulants	Mirtazapine 1.88mg/cat PO or transdermally q 24-48h
	Capromorelin 2mg/kg PO q 24h

Other drugs	Ursodeoxycholic acid 10-15 mg/kg q 24h – to aid bile flow and potentially reduce biliary inflammation
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Table 5: Recommended dosages of medication commonly used for the treatment of triaditis. *PO* – per orally; *SC* – subcutaneously; *IV* – intravenously; *IM* – intramuscularly; *CRI* – constant rate infusion;

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