

Feline infectious peritonitis

TORONTO, ON – Feline infectious peritonitis (FIP) is a disease of cats caused by a virulent biotype of feline coronavirus, affecting approximately one out of every 200 cats seen at referral centres such as veterinary medical teaching hospitals. Veterinarians are often faced with a diagnostic dilemma because there are no individual tests that are reliable for the diagnosis of FIP and the clinical picture is highly variable, explained Susan Little, DVM, DABVP (Feline), speaking at a Lifelearn live seminar.

Feline coronavirus is different from other feline viruses because systemic antibodies have no protective function for the cat and actually play a role in the disease itself; antibody titres have limited usefulness for diagnosis of FIP or predicting which cats are at risk of developing FIP; and although a vaccine is available, there is no consensus on its efficacy or safety.

Biology

There are two biotypes of feline coronavirus: feline enteric coronavirus (FECV) and feline infectious peritonitis virus (FIPV). FECV is a very common, highly infectious feline virus that is transmitted by the fecal-oral route. It has been estimated that in multi-cat households where FECV has been introduced, 80-90% of all the cats will be infected. In the general cat population, infection rates may reach 30-40%, and are lowest in feral cat populations.

The majority of cats with FECV remain healthy, although in a small number of cases, FECV infection is the first step in a chain of events leading to FIP. Dr. Little explained that the vast majority of cats do not “catch” FIP but become affected when their own FECV infection mutates. Therefore, cats that are ill with FIP are unlikely to be a risk to other cats, especially to adults, and may not need to be isolated.

Clinical presentation

Most cats affected with FIP are between three months and two years of age. Other risk factors include living in a multi-cat home; pedigree breeds; genetic susceptibility; concurrent diseases, especially feline leukemia virus (FeLV) infection; and stress.

FIP presents in two clinical forms: effusive (wet) and non-effusive (dry) and both may occur, usually during transition from one form to the other, in the same patient. The effusive form is traditionally the most commonly seen, although the non-effusive form appears to be increasing in prevalence in recent decades. Some clinical signs are common to both forms and include:

- Lethargy
- Anorexia
- Weight loss
- Chronic fluctuating fever non-responsive to antibiotics
- Poor growth rate in kittens

Overt clinical signs may be apparent for a few days to a few months, but in retrospect may have been preceded by a long period of vague ill health and poor growth in kittens. Generally the effusive form progresses more rapidly than the non-effusive form.

Clinical signs associated with the *effusive form* are due to immune complex damage of small blood vessels (vasculitis) with the resulting leakage of serum protein and fluid into body cavities. The most common clinical feature is ascites; in fact, FIP is the leading cause of ascites in young cats. Typically, the abdominal distension is non-painful and a fluid wave may be palpated.

If pleural effusion occurs, the primary clinical signs may include dyspnea, tachypnea, open-mouth breathing, and cyanotic mucous membranes. Heart sounds will be muffled on thoracic auscultation. Other less common signs include ocular or central nervous system (CNS) involvement, pericardial effusion, and scrotal enlargement due to extension of peritonitis to the tunics surrounding the testes.

Clinical signs associated with the *non-effusive form* are due to localized perivascular infiltrates of inflammatory cells in the parenchyma of organs. The most common clinical presentations involve the eyes or CNS. Ocular involvement may manifest as anterior uveitis with hyphema, hypopyon, aqueous flare, miosis, and keratic precipitates. Ocular disease may be the sole manifestation of FIP in affected cats, or it may be combined with CNS or abdominal involvement.

Diagnosis

Dr. Little went on to say that, unfortunately, there is no single test or indicator that is reliable for the diagnosis of FIP; the diagnosis must be based on a preponderance of evidence gathered from patient signalment, medical history, physical examination, and laboratory findings. The first step should be evaluation of the patient for evidence of effusion using radiographs and/or ultrasound if necessary.

The effusive form of FIP is the easiest to diagnose, but only about 50% of cats that present with effusions will have FIP. The most common diseases that produce effusions similar to FIP include lymphocytic cholangitis and malignancies. Therefore, it is important to confirm the diagnosis by examination of the effusion. Effusions due to FIP are non-septic exudates that are yellow and viscous with a high specific gravity (1.017-1.047), high protein content (>3.5 g/dL), an albumin:globulin ratio <0.45 and low to moderate cellularity (<5,000 cells/ μ L).

Other laboratory tests that may be used in the diagnosis of FIP include serum chemistries and the complete blood cell count (CBC). CBC results are variable and non-specific but may include neutrophilia with a mild left shift, lymphopenia (<1500/ μ L), and anemia of chronic disease. Serum chemistry changes may include an albumin:globulin ratio <0.45, total protein >8.0 g/dL, globulins >5.1 g/dL, elevated liver enzymes, hyperbilirubinemia and azotemia.

Histopathology on tissues remains the gold standard for diagnosis of FIP and is underutilized by practitioners. Perivascular pyogranulomatous inflammation is the hallmark of FIP. Immunohistochemistry can be used to confirm the presence of macrophages within pyogranulomas and can be performed on formalin fixed and paraffin embedded tissues.

Dr. Little added that FIP is one of the most frequent causes of neurological disease in the young cat, especially in cases with multifocal clinical signs. Both generalized tonic-clonic and complex focal seizures may be seen as well as other neurologic abnormalities. The occurrence of seizures indicates extensive brain damage and is an unfavourable prognostic sign.

All coronavirus antibody titres are non-specific and cannot be used alone to diagnose FIP. A positive coronavirus antibody test *does not rule in FIP* and a negative coronavirus antibody test *does not rule out FIP*.

Polymerase chain reaction (PCR) is a sensitive technique for detecting minute amounts of viral RNA in blood and effusions. However, no single unique genetic sequence has been identified as associated with FIP, regardless of the claims of some commercial laboratories.

Treatment

No effective treatment for FIP has been identified to date, although several have been proposed and discarded as ineffective. Some antivirals have shown promise *in vitro* but are limited in usefulness due to known toxicity in the cat. Oral low dose recombinant human interferon alpha is widely used, but anecdotal reports of efficacy are unconfirmed.

Polyprenyl Immunostimulant (PI) is an investigational veterinary biologic comprised of a mixture of plant-derived polyisoprenols. Limited information suggests it has low toxicity, is orally absorbed, and may upregulate biosynthesis of mRNA of Th-1 cytokines. Preliminary data from treatment of a small number of cases of non-effusive FIP appears promising.

Palliative care may be appropriate for some patients, particularly those cats with mild clinical signs, that are not too debilitated and that are still eating. Traditional palliative care for cats with FIP includes prednisolone +/- cyclophosphamide or chlorambucil. Antibiotics are not justified unless neutropenia occurs as a result of cytotoxic drug therapy. Good nutritional support and avoidance of stressors are also recommended.

Conclusion

Dr. Little concluded by saying that FIP can present a diagnostic dilemma due to the variety of presenting clinical signs and the lack of definitive diagnostic tests. The most important step is to identify any effusion that might be present, for diagnostic tests on effusions are more reliable than on blood or serum. She said that while various algorithms are available to aid in diagnosis, they should not be adhered to rigidly since the disease has considerable variation. Histopathological examination, with or without

immunohistochemistry, remains the gold standard for diagnosis. No effective treatment is available, and while palliative care only prolongs the inevitable, it may be desired by some cat owners and be appropriate for some affected cats. CV

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