Feline Infectious Peritonitis: Diagnosis and treatment – is anything new?

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INTRODUCTION
- A viral disease of cats characterized by insidious onset, persistent non-responsive fever, pyogranulomatous tissue reaction, accumulation of exudative effusions in body cavities, and high mortality.

ETIOLOGY/PATHOPHYSIOLOGY
- Two genomic types of FCoV: FCoV-1 (causes perhaps 85% of infections) and FCoV-2.
- Distinguishing between forms – there has been great effort to distinguish between the low virulent or avirulent enteric strains (FECV) and the virulent strains.
- FECV and FIP virus occur in both type 1 and type 2 forms.
- Spectrum of disease within each type - avirulent viruses (producing asymptomatic infections) to fatal FIP.
- Fecal shedding of virus – important in transmission.
- FIP virus – replicates locally in epithelial cells of the upper respiratory tract or oropharynx.
- Antiviral antibodies are produced – virus is taken up by macrophages.
- The virus is transported within monocytes/macrophages throughout the body – localizes at various vein walls and perivascular sites.
- Local perivascular viral replication and subsequent pyogranulomatous tissue reaction – produce the classic lesion.
- Multisystemic – pyogranulomatous or granulomatous lesions in the omentum, on the serosal surface of abdominal organs (e.g., liver, kidney, and intestines), within abdominal lymph nodes, and in the submucosa of the intestinal tract.
- Respiratory – lesions on lung surfaces.
- Pleural effusion – in the wet form.
- Nervous – vascular lesions can occur throughout the CNS, especially in the meninges.
- Ophthalmic – lesions may include uveitis and chorioretinitis.
- FIP virus can infect fetuses – resulting in fetal death or neonatal disease.
- Worldwide distribution.
- Prevalence of antibodies against FCoV – high in most populations, especially in multicat facilities.
- Incidence of clinical disease – low in most populations, especially in single-cat households.
- Because of the difficulty in diagnosis, control, and prevention – outbreaks within breeding catteries may be catastrophic.
- In endemic catteries – risk of an FCoV antibody-positive cat eventually developing FIP is usually < 10%.

signalment/history
- Some families or lines of cats appear more susceptible.
- Highest incidence in kittens – 3 months to 3 years of age.
- Incidence decreases sharply after cats reach 3 years of age.
- Incidence increases again in cats > 10 years of age.
- Insidious onset.
- Gradual weight loss and decrease in appetite.
- Stunting in kittens.
• Gradual increase in the size of the abdomen – giving a potbellied appearance.
• Persistent fever – fluctuating and unresponsive to antibiotics.

**SIGNS**

• Vary widely.
• Depend on:- virulence of the strain; effectiveness of the host immune response; organ system affected.
• Two classic forms:-
  o Wet or effusive form – targets the body cavities
  o Dry or non-effusive form – targets a variety of organs.
• Depression, poor condition, stunted growth, weight loss, dull, rough hair coat.
• Icterus.
• Abdominal and/or pleural effusion.
• Palpation of the abdomen – abdominal masses (granulomas or pyogranulomas) within the omentum, on the surface of viscera (especially the kidney), and within the intestinal wall.
• Mesenteric lymph nodes – may be enlarged.
• Ocular – anterior uveitis; keratic precipitates; fibrin in the anterior chamber, cataract formation, color change to the iris; and irregularly shaped pupil can all be presentations.
• Neurologic – brain stem, cerebrocortical, or spinal cord.

**DIFFERENTIAL DIAGNOSIS**

• Fever of unknown origin – when other causes of fever are ruled out.
• Cardiac disease causing pleural effusion – typically has low specific gravity and cell count.
• Lesions of lymphoma, especially in the kidney, on palpation.
• CNS tumors – most cats test positive for FeLV.
• FeLV-negative cats – biopsy the lesion (if accessible) for histopathology and immunohistochemistry for diagnosis of FCoV.
• Respiratory disease – FCV, FHV, chlamydiosis, or various bacteria.
• Pansteatitis (yellow fat disease) – classic feel and appearance of fat within the abdominal cavity; pain on abdominal palpation; often a fish-only diet.
• Panleukopenia producing enteritis – leukopenia; positive fecal canine parvovirus antigen assay.
• Hepatic involvement – cholangiohepatitis; lymphoma (and other neoplasia); infectious.

**DIAGNOSTICS**

• CBC
  o leukopenia - common early in the infection
  o later leukocytosis with neutrophilia and lymphopenia
  o mild to moderate anemia may occur.
• Serum biochemical profile – variety of abnormalities possible depending on organ involvement.
• High total plasma globulin common.
• Often hyperbilirubinemia and hyperbilirubinuria.
• Serum antibody tests – immunoassays, viral neutralization assays
• Detect antibodies against FCoV – positive tests not diagnostic, indicate only previous infection or vaccination; correlation between height of titer and eventual confirmation of infection not high.
• PCR assays – detect viral antigen; accuracy of positive tests correlating with clinical disease is still being evaluated.
• RT-PCR assay of effusions and tissue – better positive predictive value for identifying cats with FIP.
• Both PCR reactions – available at commercial laboratories.
• Immunohistochemistry (immunoperoxidase) assays – detect FCoV within specific cells of
biopsy samples or histopathologic sections of tissues from cats with fatal diseases.

- Immunohistochemistry – excellent for confirming cause of specific lesions, especially inflammatory abdominal disease, which often is not diagnosed as FIP.
- Fluid obtained via thoracocentesis and abdominocentesis – pale to straw colored; viscous; flecks of white fibrin often seen; will clot upon standing; specific gravity usually high (1.030–1.040); high protein concentrations (> 3.5 g/dl).
- Laparoscopy or exploratory laparotomy – to observe specific lesions of the peritoneal cavity; to obtain a biopsy sample for histopathology or immunohistochemistry confirmation.
- The triad of: hyperglobulinemia, FCoV serum antibody titer > 160, and lymphopenia – very high predictive value for diagnosing FIP in a patient with consistent clinical signs.

**THERAPEUTICS**

- Inpatient or outpatient – depends on stage and severity of disease, and owner’s willingness and ability to provide good supportive care.
- Therapeutic paracentesis – may relieve pressure on respiration from excessive ascites or pleural effusions.
- Important to encourage the affected cat to eat.

**DRUGS**

- No treatment routinely effective.
- Patients with generalized and typical signs – almost invariably die.
- Most FCoV-positive cats – have subclinical infection or mild, localized granulomatous disease that is not diagnosed as FIP.
- Immunosuppressive drugs (e.g., prednisolone and cyclophosphamide) – limited success.
- Corticosteroids (subconjunctival injection) – may help ocular involvement.
- Interferon – effective in vitro; limited success in vivo; a recombinant interferon reported to have some success in Japan and other investigators (Addie – see reference list).
- Antibiotics – ineffective because generally not associated with secondary bacterial infections.
- No antiviral drugs proven to be efficacious.
- MLV intranasal vaccine – available against FIP virus; efficacy low; cannot rely on vaccination alone for control; may produce antibody-positive cats, complicating monitoring in catteries or colonies; should only be considered for sero-negative cats that are at extremely high risk of exposure to FCoV.

**COMMENTS**

- Inform client – of all the various aspects of disease, including the grave prognosis.
- Inform client – of the high prevalence of FCoV infection but low incidence of actual clinical disease.
- Less than 10% of FCoV antibody–positive cats < 3 years of age eventually develop clinical disease.
- Mother/offspring – main method of transmission appears to be from asymptomatic carrier queens to their kittens at 5 - 7 weeks of age, after maternally derived immunity wanes.
- Break cycle of transmission – early weaning at 4 - 5 weeks of age kittens and isolating litter from direct contact with other cats, including the queen.
- Routine disinfection – premise, cages, and water/food dishes; readily inactivates virus; reduces transmission.
- Introduce only FCoV antibody–negative cats to catteries or colonies that are free of virus.
- Restrict household cats to indoor environments.
- Prognosis – clinical course; a few days to several months.
- Prognosis grave once typical signs occur – mortality nearly 100%.
REFERENCES
1. Addie DD. Feline infectious peritonitis and coronavirus website http://www.dr-addie.com/