

FIP: diagnostic approach I

Evidence contributing to being *highly suspicious* of a diagnosis of feline infectious peritonitis

ABCD TOOL

Clinical examination

Fever (typically <40°C) +++
Mucous membranes:
Icterus/jaundice ++
Pallor +
Abdominal palpation:
Fluid thrill due to ascites +++
Irregular organomegaly (e.g. kidneys, lymph nodes) +++
Masses (e.g. abdominal lymph nodes, intestinal) ++
Auscultation:
Absence or dullness of heart sounds ++
Heart murmur / arrhythmia –
Absence of lung sounds ++
Increased lung sounds with crackles –
Percussion of chest dull ventrally ++
Tachypnoea or dyspnoea ++
Otosopic examination:
Evidence of ear disease (e.g. polyps, otitis externa /media) –
Ocular examination (unilateral or bilateral changes):
Change in iris colour ++++
Dyscoria/anisocoria +++
Hyphaema ++
Aqueous or vitreous flare ++
Other signs of uveitis ++
Perivascular cuffing of retinal vessels ++
Nystagmus ++
Retinal detachment +
Neurological examination:
Ataxia +++
Seizures +++
Mental state or behaviour changes +++
Head tilt ++
Priapism ++
Scrotal enlargement ++
Multiple skin nodules or papules +
Body condition score < 5/9 ++
Bicavity effusion +++

Haematology

Mild non-regenerative anaemia ++
Severe non-regenerative anaemia +
Regenerative anaemia +
Microcytosis ++
Neutrophilia (mild ± left shift) ++
Lymphopenia ++
Lymphocytosis –

NOTE:
The + & - symbols indicate how likely or unlikely factors listed are to make a diagnosis of FIP

- slightly less likely
-- moderately less likely
--- far less likely
---- extremely unlikely
+ slightly more likely
++ moderately more likely
+++ far more likely
++++ extremely likely

Signalment & history

Signalment

<2 years ++++
>5 years –
Male +
Pedigree + (breeds vary geographically)
Dietary history compatible with thiamine deficiency –

Clinical examination

including looking for any evidence of an effusion

Serum biochemistry

Hyperbilirubinaemia +++
Hyperglobulinaemia +++
Hyperproteinaemia (or total solids) ++
Hypoalbuminaemia +
Albumin to globulin [A:G] ratio
A:G ratio < 0.4 +
A:G ratio > 0.6 –
Alpha1-acid glycoprotein, if available:
>1.5 g/L ++
>3.0 g/L +++
<1.5 g/L –
Serum protein electrophoresis, if performed:
Polyclonal gammopathy +
Marked elevation in ALT & ALP –
Only mild or moderate elevation in ALT & ALP with hyperbilirubinaemia +
FCoV antibody test with high titre +
FCoV antibody test negative –

Serum biochemistry

Locate & analyse effusion if present*

Locate any effusion

Ultrasonography is most useful to locate/direct fluid sampling
Bicavity effusion +++
Abdominal ultrasonography:
Peritoneal (or retroperitoneal) fluid +++
Thoracic ultrasonography:
Pleural (or pericardial) fluid ++
Thoracic radiography:
Pleural fluid ++

History

Weight loss/failure to thrive /stunted growth +++
Swollen abdomen ++++
Persistent/fluctuating fever non-responsive to antibiotics +++
Lethargy/dullness ++
Inappetence ++
Dyspnoea ++
Vision or ocular abnormalities incl. iris colour change &/or nystagmus ++
Jaundiced mucous membranes ++
Ataxia/paresis (para- or tetra-), hyperaesthesia, seizures ++
Sibling (or in-contact) with FIP ++
Multi-cat household +++
Pale mucous membranes +
Diarrhoea, vomiting &/or constipation +
Recent stress (e.g. vaccination, rehoming, neutering) ++
Outdoor only/feral cat –
History of fighting –

Analyse any effusion

Typically, high protein low cell count effusions in abdomen ± thorax ± pericardium
Biochemistry:
High protein (or total solids) >35 g/L ++++
Low protein (or total solids) < 25 g/L –
A:G ratio < 0.4 ++
A:G ratio > 0.8 –
Yellow ++++
Rivalta's test positive ++
Rivalta's test negative – – –
Cell count:
Low cell count < 5 x10⁹/L ++++
Moderate cell count ≤ 20 x10⁹/L ++
High cell count > 20 x10⁹/L –
Alpha1-acid glycoprotein, if available:
>1.5 mg/mL ++
Cytology:
Non-degenerate neutrophils & macrophages ++++
Non-degenerate neutrophils, macrophages & a few lymphocytes ++++
Toxic neutrophils ± bacteria visible –
Neoplastic cells – – –
Marked lymphocytosis –
Marked neutrophilia –

Effusion cytology & biochemistry consistent with FIP? Go to diagram

①

*Absence of effusion & presence of nonspecific clinical signs? Go to diagram ②
Neurological findings consistent with FIP? Go to diagram ③
Ocular findings consistent with FIP? Go to diagram ④

➔ For differential diagnoses of FIP, see box ⑤

FIP: diagnostic approach IIa

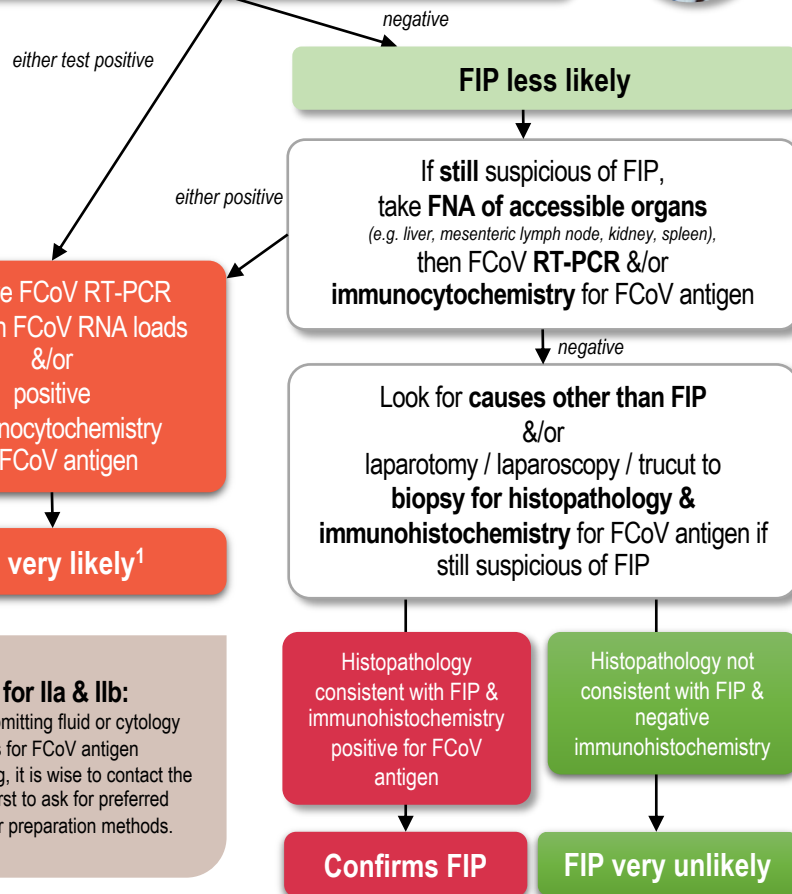
Looking for evidence that **confirms FIP** as a diagnosis following a high suspicion:

1

Effusion sample cytology & biochemistry consistent with FIP



Effusion sample analysis:
FCoV RT-PCR &/or immunocytochemistry for FCoV antigen



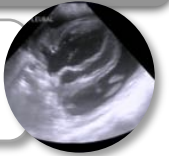
Note for IIa & IIb:
If you are submitting fluid or cytology samples for FCoV antigen immunostaining, it is wise to contact the laboratory first to ask for preferred samples &/or preparation methods.

1. Some authors regard a positive immunocytochemistry test for FCoV antigen on an effusion (with biochemistry & cytology consistent with FIP) adequate to confirm FIP

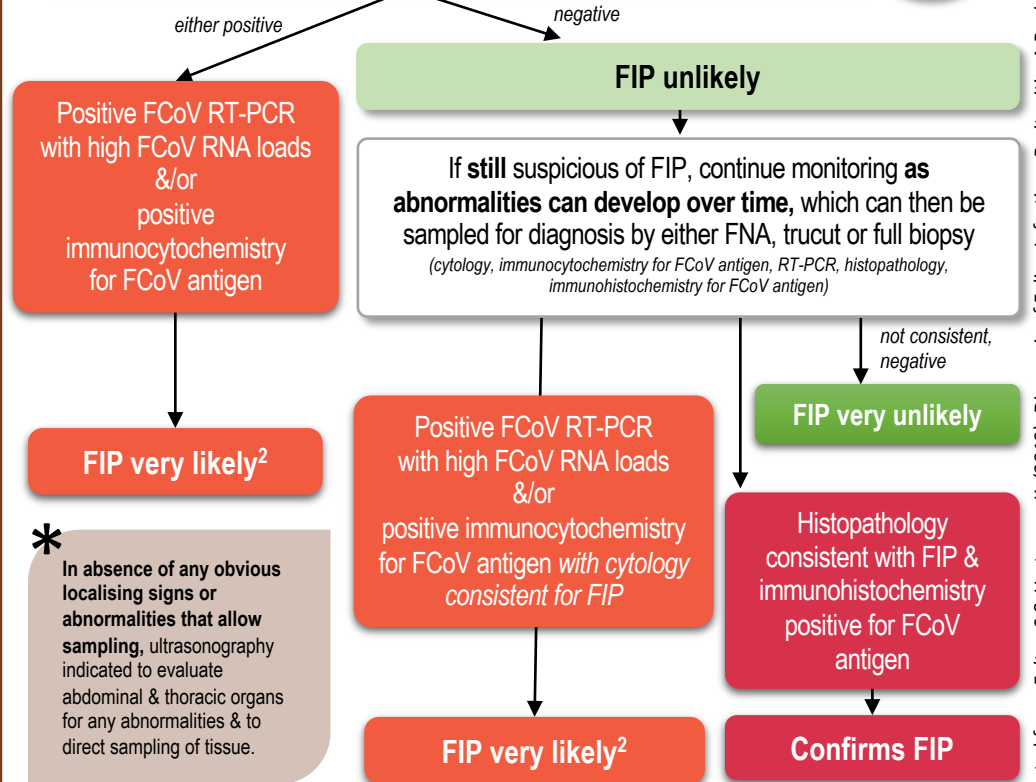
2

Absence of an effusion & presence of nonspecific clinical signs: perform diagnostic imaging*

Findings that could be consistent with FIP:
Ultrasonography: abnormalities e.g. in lymph nodes (abdominal lymphadenopathy), liver, spleen (variable echogenicity), kidney (variable echogenicity, medullary rim sign)
Radiography: abnormalities e.g. lymphadenopathy, alveolar pattern consistent with pneumonia



FNA sample of any abnormal organ/tissue (e.g. mesenteric lymph node) with consistent cytology (neutrophilic or pyogranulomatous):
FCoV RT-PCR &/or immunocytochemistry for FCoV antigen



* **In absence of any obvious localising signs or abnormalities that allow sampling**, ultrasonography indicated to evaluate abdominal & thoracic organs for any abnormalities & to direct sampling of tissue.

2. Some authors regard a positive immunocytochemistry test for FCoV antigen on an FNA sample (with cytology consistent with FIP) adequate to confirm a diagnosis of FIP

FIP: diagnostic approach IIb

Looking for evidence that **confirms FIP** as a diagnosis following a high suspicion:

ABCD TOOL

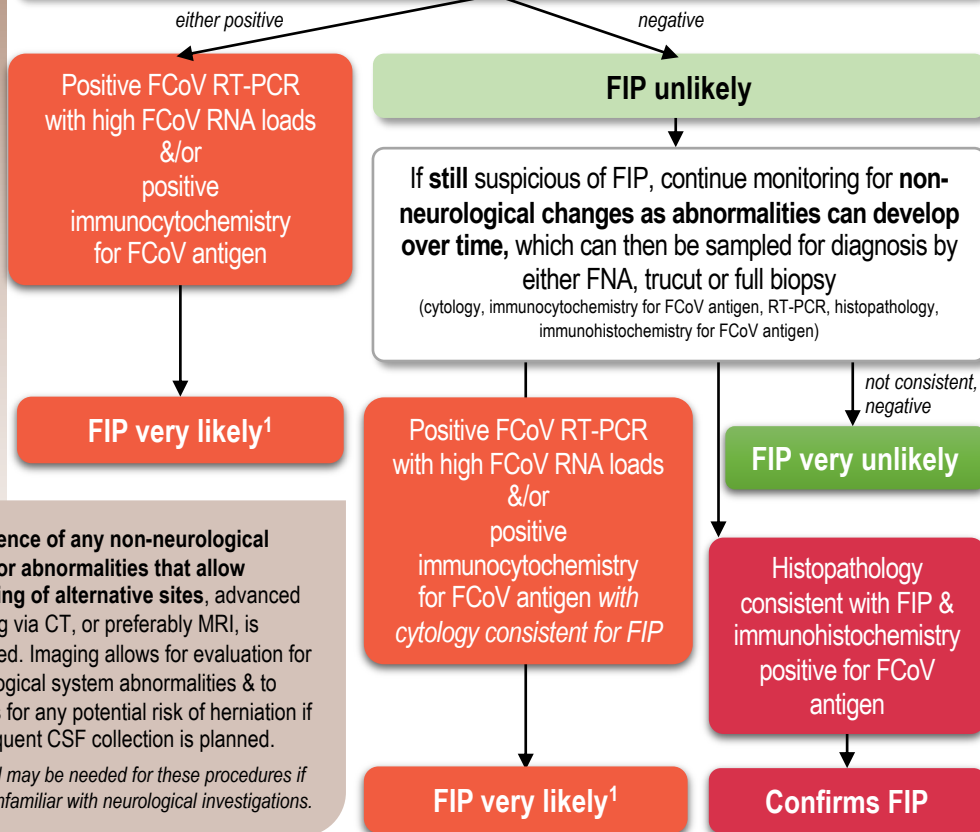
3

Neurological findings consistent with FIP*

MRI: Obstructive hydrocephalus, syringomyelia, foramen magnum herniation, marked contrast enhancement of the meninges, third ventricle, mesencephalic aqueduct & brainstem reported with FIP
CT: hydrocephalus &/or syringohydromyelia
CSF: high protein (>0.3 g/L cisternal samples, >0.46 g/L lumbar samples), high cell count (>0.008 x 10⁹/L cisternal or lumbar samples), cytology predominantly neutrophilic, mononuclear, mixed or pyogranulomatous



CSF sample analysis: FCoV RT-PCR &/or immunocytochemistry for FCoV antigen



* In absence of any non-neurological signs or abnormalities that allow sampling of alternative sites, advanced imaging via CT, or preferably MRI, is indicated. Imaging allows for evaluation for neurological system abnormalities & to assess for any potential risk of herniation if subsequent CSF collection is planned. Referral may be needed for these procedures if vet is unfamiliar with neurological investigations.

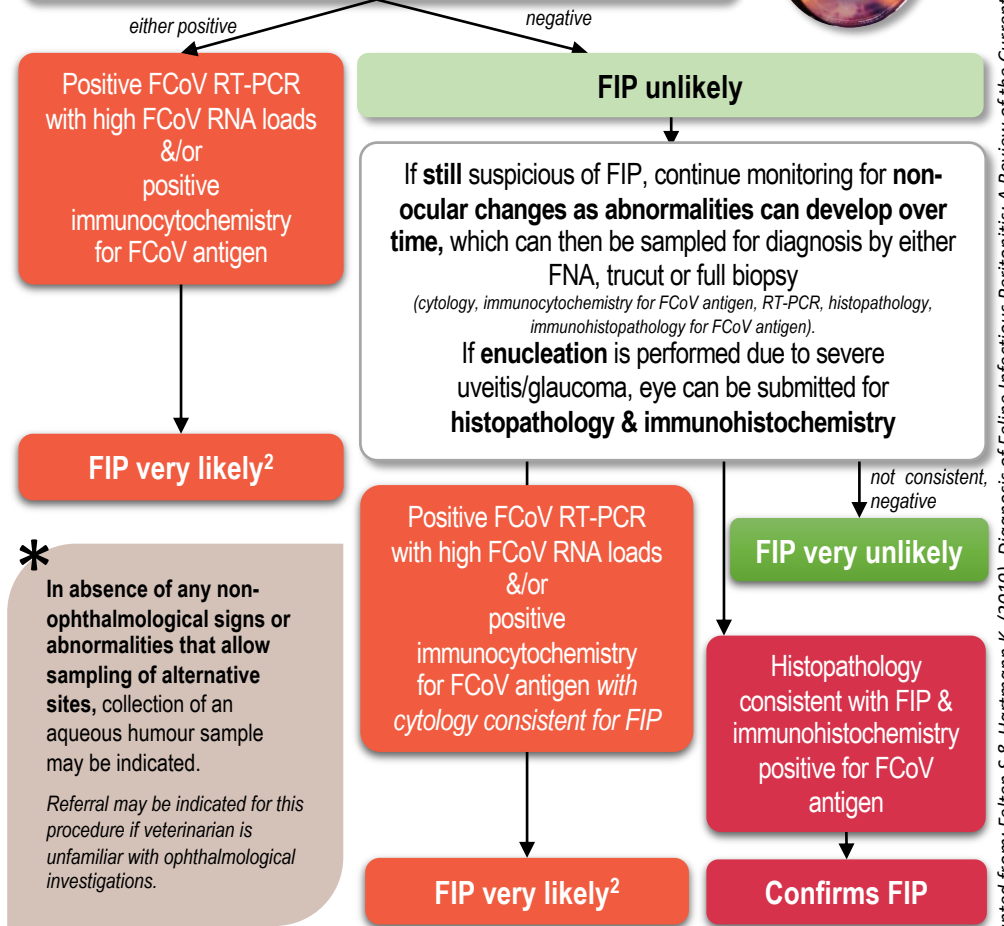
1. Some authors regard a positive immunocytochemistry test for FCoV antigen on a CSF sample (with biochemistry & cytology consistent with FIP) adequate to confirm a diagnosis of FIP

4

Aqueous humor cytology consistent with FIP* (neutrophilic or pyogranulomatous)



Aqueous humor sample analysis: FCoV RT-PCR &/or immunocytochemistry for FCoV antigen



* In absence of any non-ophthalmological signs or abnormalities that allow sampling of alternative sites, collection of an aqueous humour sample may be indicated. Referral may be indicated for this procedure if veterinarian is unfamiliar with ophthalmological investigations.

2. Some authors regard a positive immunocytochemistry test for FCoV antigen on an aqueous humor sample (with cytology consistent with FIP) adequate to confirm a diagnosis of FIP

FIP: differential diagnoses to be considered geography/lifestyle dependent

- **Lymphocytic cholangitis or cholangiohepatitis:** young, especially pedigree cats, jaundice ± abdominal effusion, on biochemistry elevated ALP & GGT; histopathology
- **Pyothorax:** outdoor cats, history of fighting, fever, leucocytosis with neutrophilia (± left shift) on haematology, pleural effusion with high cell count & degenerative neutrophils (septic)
- **Toxoplasmosis:** hunters &/or those fed raw meat diet, neurological/muscular/pulmonary/ocular signs all possible, effusions, jaundice; serology (antibody); PCR; cytology or histopathology, responds to clindamycin
- **Neoplasia:** lymphoma in young cats with lymphadenopathy &/or organomegaly, carcinoma/other in older cats, range of signs depending on type of neoplasia, can have bicavity effusions; cytology, histopathology
- **Septic peritonitis:** fever, leucocytosis with neutrophilia (± left shift) on haematology, abdominal effusion with high cell count & degenerative neutrophils (septic)
- **Pancreatitis:** mainly middle-aged to older cats, reduced appetite, jaundice, weight loss, abdominal effusion all possible, fever not prominent; ultrasonography & feline pancreatic lipase immunoreactivity
- **Mycobacterial infection:** hunters &/or those fed raw meat diet: skin, abdominal, thoracic signs all possible with lymphadenopathy, fever not prominent; Ziehl-Neelsen stain, interferon-gamma release blood test assay, PCR (tissue samples), culture
- **Haemoplasmosis:** cats with outdoor access, pallor, lethargy, fever, regenerative anaemia; PCR
- **Congestive heart failure:** pleural effusion more common but bicavity effusion possible, rare to see abdominal effusion alone, heart murmur/gallop/arrhythmia, jugular vein distension possible, no fever, effusion low protein, elevated serum N-terminal pro-B-type natriuretic peptide (NT-proBNP), echocardiography for aetiology
- **Retroviral infection:** feline immunodeficiency virus in middle-aged to older esp. male cats with outdoor access & history of fighting: FIV serology (antibody) test, or feline leukaemia virus in cats with outdoor access & history of fighting: FeLV serology (antigen). Note that when clinical signs are seen in retrovirus infected cats, there is usually an associated infection or morbidity present in addition to the retrovirus infection per se, resulting in clinical signs



In young cats with outdoor access, pyothorax, toxoplasmosis and mycobacterial infection can be differential diagnoses for FIP.