EUROPEAN ADVISORY BOARD ON CAT DISEASES

ABCD

FIP diagnostic tool

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

ABCD TOOL

How to use this tool: this page will help you to weigh up the evidence for a diagnosis of FIP collected at various levels (signalment & history, clinical examination, biochemistry, effusion analysis and haematology). Based on the findings of this page, try and confirm your diagnosis by using one of the subsequent diagnostic trees (A, B, C or D).

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

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

Signalment & history

Signalment
<2 years ++++
>5 years –
Male +
Pedigree + (breeds vary geographically)

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 –
Dietary history compatible with thiamine deficiency –
Retrovirus infection +

Clinical examination
including looking for any evidence of an effusion

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 is dull ventrally ++
Tachypnoea or dyspnoea ++
Otoscopic examination :
Evidence of ear disease (e.g. polyps, otitis) –
Ocular examination (unilateral or bilateral intraocular 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 ++
Bicavitary effusion +++

Serum biochemistry

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 mg/mL ++
>3.0 mg/mL +++
<1.5 mg/mL –
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 – –

Locate & analyse effusion if present *

Locate any effusion
Point-of-care ultrasonography (POCUS) is most useful to locate any fluid and/or direct fluid sampling

Bicavitary effusion +++
Abdominal ultrasonography:
Peritoneal (or retroperitoneal) fluid +++
Thoracic ultrasonography:
Pleural (or pericardial) fluid ++
Thoracic radiography (if safe to perform):
Pleural fluid ++

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 (± low numbers of lymphocytes) ++++
Toxic neutrophils ± bacteria visible –
Neoplastic cells – – –
Marked lymphocytosis –
Marked neutrophilia –

Effusion cytology & biochemistry consistent with FIP? Go to diagnostic tree (A)

Haematology

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

***Absence of effusion (by POCUS) & presence of non-specific clinical signs?** Go to FIP diagnostic tree (B)

Neurological findings consistent with FIP? Go to FIP diagnostic tree (C)

Ocular findings consistent with FIP? Go to FIP diagnostic tree (D)

For differential diagnoses of FIP, see (E) on last page of this tool

To download the ABCD tools, fact sheets, or the full disease guidelines, please visit our website: www.abcdcatsvets.org
The ABCD is an independent panel of experts in feline health supported by Boehringer Ingelheim (founding sponsor), MSD Animal Health, Vetoquinol and Virbac. November 2024.

EUROPEAN ADVISORY BOARD ON CAT DISEASES

ABCD

FIP diagnostic tool

Evidence that can help you ***confirm*** a diagnosis of feline infectious peritonitis if you are already highly suspicious.

ABCD TOOL

A

Effusion sample cytology & biochemistry consistent with FIP

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

either test positive

negative

FIP less likely

If **still** suspicious of FIP,
take **FNAs of accessible abnormal organs**
(e.g. mesenteric lymph node, kidney, liver, spleen),
for cytology, FCoV **RT-PCR**, &/or **immunostaining** for FCoV antigen

either positive

Positive FCoV RT-PCR with high FCoV RNA loads
&/or
positive immunostaining for FCoV antigen

FIP very likely[1]

not consistent, negative

If still suspicious of FIP, look for **causes other than FIP** &/or
do laparotomy/laparoscopy/trucut to
biopsy for histopathology & immunohistochemistry for FCoV antigen

Histopathology consistent with FIP & positive immunohistochemistry for FCoV antigen

Confirms FIP

Histopathology not consistent with FIP & negative immunohistochemistry

FIP very unlikely

Contact your lab!

If submitting fluid or FNA cytology samples for FCoV antigen immunostaining (immunocytochemistry or immunofluorescence), it is wise to **contact the laboratory first** to ask for preferred samples &/or preparation methods e.g. some laboratories may prefer to use cell pellets prepared from fluid samples for immunohistochemistry.

Treatment trial?

As effective antiviral treatments for FIP (especially GS-441524) are increasingly available, a treatment trial can be instigated **if FIP is thought to be very likely**. Ideally, appropriate samples will have been collected & submitted for FCoV detection **before treatment is started** to either confirm a diagnosis of FIP or show that it is 'very likely'. During a treatment trial it is important to use objective measures to **monitor the response** (e.g. weight, temperature, A:G ratio). **If the cat does not respond rapidly** (within a week) to trial treatment using an antiviral of **known quality**, it is important to consider other diagnoses (for differential diagnoses of FIP, see (E) on last page of this tool).

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

EUROPEAN ADVISORY BOARD ON CAT DISEASES

ABCD

FIP diagnostic tool

Evidence that can help you ***confirm*** a diagnosis of feline infectious peritonitis if you are already highly suspicious.

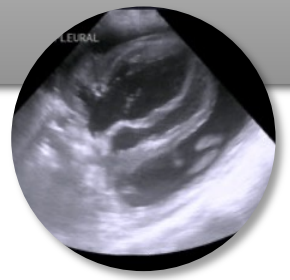
ABCD TOOL

B

Absence of an effusion (by POCUS) & presence of non-specific 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: less helpful but may show e.g. lymphadenopathy, alveolar pattern



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

either positive

Positive FCoV RT-PCR with high FCoV RNA loads
&/or
positive immunostaining for FCoV antigen

FIP very likely[1]

negative

FIP less likely

If **still** suspicious of FIP, continue monitoring **as abnormalities can develop over time,** which can then be sampled for diagnosis by either body cavity 'centesis, FNA, trucut or full biopsy
(cytology, immunostaining for FCoV antigen, RT-PCR, histopathology, immunohistochemistry for FCoV antigen)

not consistent, negative

FIP very unlikely

Positive FCoV RT-PCR with high FCoV RNA loads
&/or
positive immunostaining for FCoV antigen
with cytology consistent for FIP

Histopathology consistent with FIP &
positive immunohistochemistry
for FCoV antigen

FIP very likely[1]

Confirms FIP

* **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. Remember effusions can develop over time so new pockets of fluid may appear on sequential imaging.

Treatment trial?

As effective antiviral treatments for FIP (especially GS-441524) are increasingly available, a treatment trial can be instigated **if FIP is thought to be very likely**. Ideally, appropriate samples will have been collected & submitted for FCoV detection **before treatment is started** to either confirm a diagnosis of FIP or show that it is 'very likely'.

During a treatment trial it is important to use objective measures to **monitor the response** (e.g. weight, temperature, A:G ratio). **If the cat does not respond rapidly** (within a week) to trial treatment using an antiviral of **known quality**, it is important to consider other diagnoses (for differential diagnoses of FIP, see (E) on last page of this tool).

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

EUROPEAN ADVISORY BOARD ON CAT DISEASES

ABCD

FIP diagnostic tool

Evidence that can help you ***confirm*** a diagnosis of feline infectious peritonitis if you are already highly suspicious.

ABCD TOOL

C

Note: Always look for signs of disease elsewhere e.g. in the chest & abdomen via ultrasonography in cats with neurological signs as these areas can be easier & more cost-effective (compared to CT, MRI, CSF collection etc.) to sample to help you diagnostically, even if only neurological signs are apparent

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 sample, >0.46 g/L lumbar sample), high cell count (>0.008 x 10^9/L cisternal or lumbar samples), cytology predominantly neutrophilic, mononuclear, mixed or pyogranulomatous

CSF sample analysis
FCoV **RT-PCR** &/or **immunostaining** for FCoV antigen

either positive

Positive FCoV RT-PCR with high FCoV RNA loads &/or positive immunostaining for FCoV antigen

FIP very likely[1]

negative

FIP less likely

If **still** suspicious of FIP, continue monitoring for **non-neurological changes as abnormalities can develop over time,** which can then be sampled for diagnosis by either body cavity 'centesis, FNA, trucut or full biopsy
(cytology, immunostaining for FCoV antigen, RT-PCR, histopathology, immunohistochemistry for FCoV antigen)

Positive FCoV RT-PCR with high FCoV RNA loads &/or positive immunostaining for FCoV antigen *with cytology consistent for FIP*

FIP very likely[1]

not consistent, negative

FIP very unlikely

Histopathology consistent with FIP & positive immunohistochemistry for FCoV antigen

Confirms FIP

* **In absence of any non-neurological signs or abnormalities that allow easier sampling of more accessible 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.

Treatment trial?

As effective antiviral treatments for FIP (especially GS-441524) are increasingly available, a treatment trial can be instigated **if FIP is thought to be very likely**. Ideally, appropriate samples will have been collected & submitted for FCoV detection **before treatment is started** to either confirm a diagnosis of FIP or show that it is 'very likely'.
During a treatment trial it is important to use objective measures to **monitor the response** (e.g. weight, temperature, A:G ratio). **If the cat does not respond rapidly** (within a week) to trial treatment using an antiviral of **known quality**, it is important to consider other diagnoses (for differential diagnoses of FIP, see E on last page of this tool).

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

EUROPEAN ADVISORY BOARD ON CAT DISEASES

ABCD

FIP diagnostic tool

Evidence that can help you ***confirm*** a diagnosis of feline infectious peritonitis if you are already highly suspicious.

ABCD TOOL

Note: Always look for signs of disease elsewhere e.g. in the chest & abdomen via ultrasonography in cats with ocular signs as these areas can be easier & more cost-effective to sample (compared to aqueous humour sampling) to help you diagnostically, even if only ocular signs are apparent

Ocular findings consistent with FIP*

Aqueous humour cytology consistent with FIP (neutrophilic or pyogranulomatous)

D

Aqueous humour sample analysis

FCoV **RT-PCR** &/or **immunostaining** for FCoV antigen

either positive

Positive FCoV RT-PCR with high FCoV RNA loads
&/or
positive immunostaining for FCoV antigen

FIP very likely[1]

negative

FIP less likely

If **still** suspicious of FIP, continue monitoring for **non-ocular changes as abnormalities can develop over time,** which can then be sampled for diagnosis by either body cavity 'centesis, FNA, trucut or full biopsy

(cytology, immunostaining for FCoV antigen, RT-PCR, histopathology, immunohistopathology for FCoV antigen).

If **enucleation** is performed due to severe uveitis/glaucoma, eye can be submitted for **histopathology & immunohistochemistry**

Positive FCoV RT-PCR with high FCoV RNA loads
&/or
positive immunostaining for FCoV antigen
with cytology consistent for FIP

FIP very likely[1]

not consistent, negative

FIP very unlikely

Histopathology consistent with FIP &
positive immunohistochemistry
for FCoV antigen

Confirms FIP

* **In absence of any non-ophthalmological signs or abnormalities that allow easier sampling of more accessible 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.

Treatment trial?

As effective antiviral treatments for FIP (especially GS-441524) are increasingly available, a treatment trial can be instigated **if FIP is thought to be very likely**. Ideally, appropriate samples will have been collected & submitted for FCoV detection **before treatment is started** to either confirm a diagnosis of FIP or show that it is 'very likely'.

During a treatment trial it is important to use objective measures to **monitor the response** (e.g. weight, temperature, A:G ratio). **If the cat does not respond rapidly** (within a week) to trial treatment using an antiviral of **known quality**, it is important to consider other diagnoses (for differential diagnoses of FIP, see E on last page of this tool)

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

FIP Differential diagnoses

ABCD TOOL

E

FIP: examples of 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 bicavitary 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 manifested clinical signs.
- **Miscellaneous other causes**: infections such as those caused by *Actinomyces*, *Nocardia*, *Rhodococcus*, *Bartonella*, *Pseudomonas* and fungi. Also, sepsis and idiopathic sterile pyogranulomatous disease

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

The ABCD is an independent panel of experts in feline health supported by Boehringer Ingelheim (founding sponsor), MSD Animal Health, Vetoquinol and Virbac. November 2024.