

What is feline infectious peritonitis (FIP)?

- FIP is a fatal disease in cats caused by feline coronavirus (FCoV). New drugs show promise for effective treatment but are not yet licensed.
- FCoV infection is ubiquitous in multi-cat environments, however only a small proportion of FCoV-infected cats develop FIP.
- FIP is caused by FCoV variants which arise in the individual cat by mutation(s) and replicate to high concentrations in monocytes/macrophages. The FCoV variant type, viral load and the cat's immune response all likely play a role in determining whether FIP develops following FCoV infection.
- Risk factors for FIP include:
 - Young age (>50% of cases are cats <2 years old)
 - Stress (e.g. adoption, neutering, boarding)
 - Cats living close together in multi-cat households.

Transmission & infection

- FCoV is primarily transmitted via the faecal-oral route. Cats shed FCoV in their faeces a few days after infection and continue for weeks or months; others become infected via contact with faeces in litter trays followed by ingestion (e.g. grooming).
- FCoV remains infectious for a few days to weeks but is readily inactivated by heat and most detergents and disinfectants.

Clinical signs & lesions

- FCoV infection is usually subclinical, but some cats, and especially young kittens, develop diarrhoea (usually self-limiting).
- In cats that go on to develop FIP fluctuating fever, weight loss (or failure to gain weight), anorexia and lethargy are common.
- FIP can also include clinical signs due to:
 - Effusions (ascites, thoracic and/or pericardial effusion) (e.g. abdominal enlargement/swelling or dyspnoea)
 - Granulomatous lesions in abdominal and/or thoracic organs (e.g. renomegaly, chronic diarrhoea, lymph node enlargement)
 - Ocular inflammation (e.g. uveitis and/or chorioretinitis which can manifest as granulomatous "mutton-fat" keratic precipitates, anterior chamber fibrin and dense aqueous flare, retinal perivascular cuffing)

- Central nervous system lesions due to encephalitis and/or myelitis, usually multifocal and slowly progressive (e.g. ataxia, hyperaesthesia, nystagmus, seizures, behavioural changes, paralysis, cranial nerve defects).

Diagnosis

- Definitive diagnosis is by histopathology with positive immunostaining for FCoV antigen within the lesions.
- Blood changes due to FIP can include: lymphopenia, non-regenerative anaemia, increased total serum protein, hyperglobulinaemia, a low albumin/globulin ratio (A:G), hyperbilirubinaemia, microcytosis, high α -1 acid glycoprotein (AGP) levels.
- Effusions are non-septic exudates with high protein levels (with a low A:G) and a low cell count (typically $<5 \times 10^9/l$ cells, mainly neutrophils and macrophages).
- Positive FCoV RNA RT-PCR results on fluids (e.g., effusions, CSF, but not blood) or fine needle aspirates (FNAs, of e.g. kidney, liver, mesenteric lymph nodes), especially when high viral loads are detected by quantitative RT-PCR, are suggestive of FIP but do not confirm the diagnosis.
- Presence of FCoV antigen-positive cells in fluids or FNAs with changes consistent with FIP is very suggestive of FIP.
- Serum FCoV antibodies are not diagnostic of FIP as they only signify previous FCoV infection or vaccination.

Treatment

- Without new, potentially curative, anti-coronaviral drugs (e.g. GC376, GS-441524 - not yet licensed), FIP has a very poor prognosis. Veterinarians in many countries are not allowed to obtain or prescribe these unlicensed drugs but many clients are sourcing the drugs themselves online. In some countries vets are supplying diagnostic and treatment monitoring support, without providing or prescribing the drugs, to help support cat welfare. An accurate diagnosis is important to prevent unnecessary use of these drugs.
- Successful treatment indicators include improvement of clinical signs (e.g. reduced effusion, weight increase) and laboratory parameters (e.g. decreasing globulin, bilirubin and AGP levels).
- Supportive treatment can include appetite stimulants for anorexia, effusion drainage (e.g. thoracocentesis if dyspnoeic), anti-pyretic drugs.

Control

- FCoV infection risk can be reduced by keeping cats in small (≤ 3), well-adapted groups (to reduce stress) with strict hygiene (sufficient, frequently cleaned litter trays with clumping cat litter or outdoor access for toileting).
- In multi-cat households, where separation of cats is feasible, faeces (free of cat litter) or rectal swabs can be tested by quantitative RT-PCR for FCoV RNA to identify shedders and separate them from non-shedders. In case of a negative result the possibility of intermittent shedding has to be considered. To check this, multiple sampling (ideally at least 3 x each 1-4 weeks apart) is necessary.

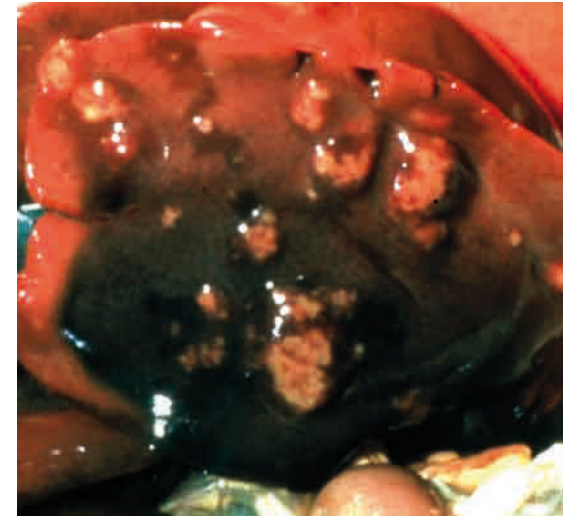
Prevention

- FCoV-infected cats should be kept in a low-stress environment.
- An intranasal FIP vaccine is available in some countries for cats over 16 weeks. However its efficacy is doubtful and it is ineffective in cats previously infected by FCoV.



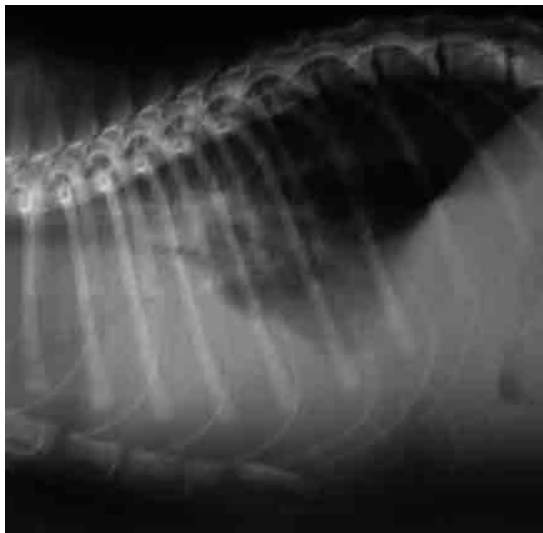
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■ Fluid accumulation in a *Sphinx* cat with FIP.



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■ Granulomatous lesions of the liver in a cat with FIP.



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■ Radiograph of a cat with FIP showing thoracic and abdominal effusion.



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■ Uveitis in a cat with FIP



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■ Hyphaema in a cat with FIP.