

Practice Tip

by
Diane D Addie

Diane Addie graduated from the University of Glasgow Veterinary School in 1979 and worked in small animal practice for nine years. She is now engaged in research for a PhD on feline coronavirus under the supervision of Professor Oswald Jarrett in the Feline Virus Unit at Glasgow.



Interpretation of feline coronavirus serology

A REAL or apparent increase in the incidence of feline infectious peritonitis (FIP) has led to veterinary practitioners submitting more samples to laboratories for feline coronavirus serology. The results of the serological tests can be difficult to interpret.

It is important to understand that the test is a measure of antibody, not virus, and that an antibody titre reflects exposure to the virus and not necessarily the presence of virus in the cat. *Therefore on no account is the presence of antibody alone sufficient evidence to euthanase a cat.*

Feline infectious peritonitis was the first recognised form of disease associated with feline coronavirus, and other manifestations, such as diarrhoea, have been recognised since. As in poliovirus infection in humans, the virus is basically an enteric virus which only causes fatal disease when it becomes systemic. Whether a cat develops effusive or non-effusive FIP, diarrhoea or no symptoms at all, probably depends on the immune response of the cat and the virulence of the coronavirus concerned. There is no doubt that laboratory strains of feline coronavirus of varying virulence exist, though it is not known whether in the field those of lesser virulence are capable of producing FIP. This is difficult to evaluate because of the low incidence of disease even in seropositive cats. Therefore, in the absence of any proof to the contrary, all coronaviruses should be treated with great caution.

At present, two types of coronavirus antibody tests are available — an immunofluorescent antibody (IFA) test from Glasgow or Bristol veterinary schools which gives an antibody titre; and an enzyme linked immunosorbent assay (ELISA) that other laboratories use which gives positive results graded on a scale of one to four. It is important, when doing repeat tests, to use the same laboratory because procedures vary slightly and the readings can be different between laboratories.

There are three major situations in which FIP serology is requested:

- As an aid in the diagnosis of FIP
- Because the cat has been in contact with a confirmed case of FIP
- Because the owner of a stud or queen demands a test before allowing the client's cat access for mating.

Confirmation of clinical diagnosis

The signs associated with feline coronavirus infection are usually classified as effusive or 'wet' FIP and non-effusive or 'dry' FIP, though a case can progress from one form to the other or both can be present simultaneously. These signs are summarised in the table.

In assessing the significance of the presence of an antibody titre in a sick cat, its background must be taken into consideration. If it is from a single cat household where only 5 per cent of cats have titres, presence of antibody, particularly if the titre is high, should be regarded as significant.

The significance of antibody in a sick pedigree cat from a multicat household, however, is harder to define because, on average, 40 per cent of these cats have antibody and in general

Clinical signs

Pyrexia (usually chronic and intermittent)
Malaise
Anorexia Weight loss
Ascites — typically clear yellow, which clots or forms fibrin strands on exposure to air
Pleural exudate — as above
Jaundice Uveitis
Keratic precipitates
Hypopyon
Intraocular haemorrhage
Dilated pupil(s) Fits
Progressive incoordination
Paralysis
Incontinence Behavioural changes

Haematological values

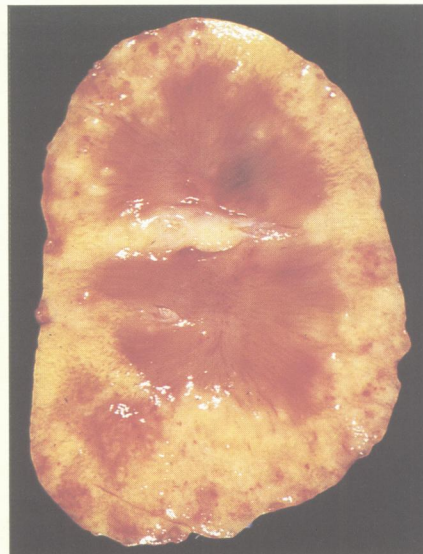
	In FIP	Normal
PCV	19 - 30%	30 - 45%
rbc	$3.25 - 4.95 \times 10^{12}/l$	$5 - 10 \times 10^{12}/l$
wbc	$5.9 - 10.8 \times 10^9/l$	$5 - 14 \times 10^9/l$
Neutrophils	65 - 92%	35 - 75%
Band neutrophils	2 - 27%	0 - 3%
Lymphocytes	0 - 8 %	12 - 30%
Monocytes	0 - 2%	1 - 4%
Eosinophils	0 - 1.5%	2 - 12%

Biochemical values

	In FIP	Normal
Total serum protein		
50% wet FIP	64 - 110 g/l	60 - 80 g/l
75% dry FIP		
Globulin	>46 g/l	26 - 50 g/l
Albumin	<25 g/l	25 - 35 g/l
A:G ratio	<0.6	0.5 - 1.0
Peritoneal or pleural fluid		
Specific gravity	1.017 - 1.047	
Protein	50 - 80 g/l	
wbc	1600 - 25,000 cells / μ l	
Gamma globulins	>32% probably is FIP	
Gamma globulins	<32% probably not FIP	
Albumin	>48% probably not FIP	
Albumin/globulin (Shelly 1988)	>0.81 probably not FIP	
Cerebrospinal fluid		
Elevated protein	90 - 2000 g/l	
wbc	90 - 9250 cells/ μ l	



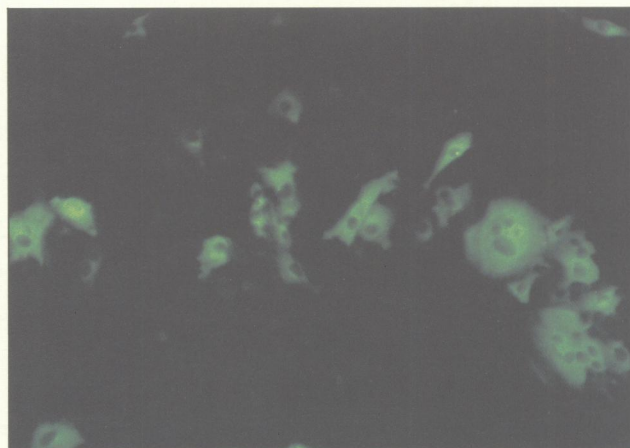
Left: Exudate from a case of effusive FIP. Right: The same exudate 24 hours later



Right: Kidney from a non-effusive FIP showing gross appearance of pyogranulomata



A case of effusive FIP showing fibrin tags in the chest. 25 per cent of cases of effusive FIP have fluid in the chest as well as the abdomen



Immunofluorescent antibody test: only 50 per cent of the cells are infected with FIPV which gives an internal negative control.

their levels are higher than in single cat households. Other tests should therefore be undertaken to establish the diagnosis, one of the most useful being the albumin:globulin ratio.

In my experience, cats presenting with dry FIP invariably have high titres — over 640; cats with wet FIP, while they usually have a high titre, may show any level.

Examples of presentations

A young cat presenting with ascites has a titre of 320. If it were from a multicat household, differential diagnosis would have to be considered very seriously. In the same cat from a single cat household, a titre of 320 might reasonably be taken as confirmation of FIP.

A cat with anterior uveitis from either environment, without evidence of ascites, and with a low or medium titre, such as 40 to 80, should have alternative diagnoses (such as FeLV or toxoplasmosis) rigorously explored. If FIP is still suspected, a second test should be taken two to four weeks after the first, when the titre would be expected to have risen in a case of non-effusive FIP.

Samples for histopathological confirmation of FIP

Send samples (about 1 cm square) in 10 per cent formalin. If sending a whole, young kitten remember to open thoracic and abdominal cavities and cranium to allow formalin to reach internal organs and brain.

- | | |
|----------|----------------------------|
| Liver | Mesenteric lymph node |
| Kidney | Lung |
| Spleen | Heart |
| Pancreas | Section of small intestine |
| Brain | Section of large intestine |

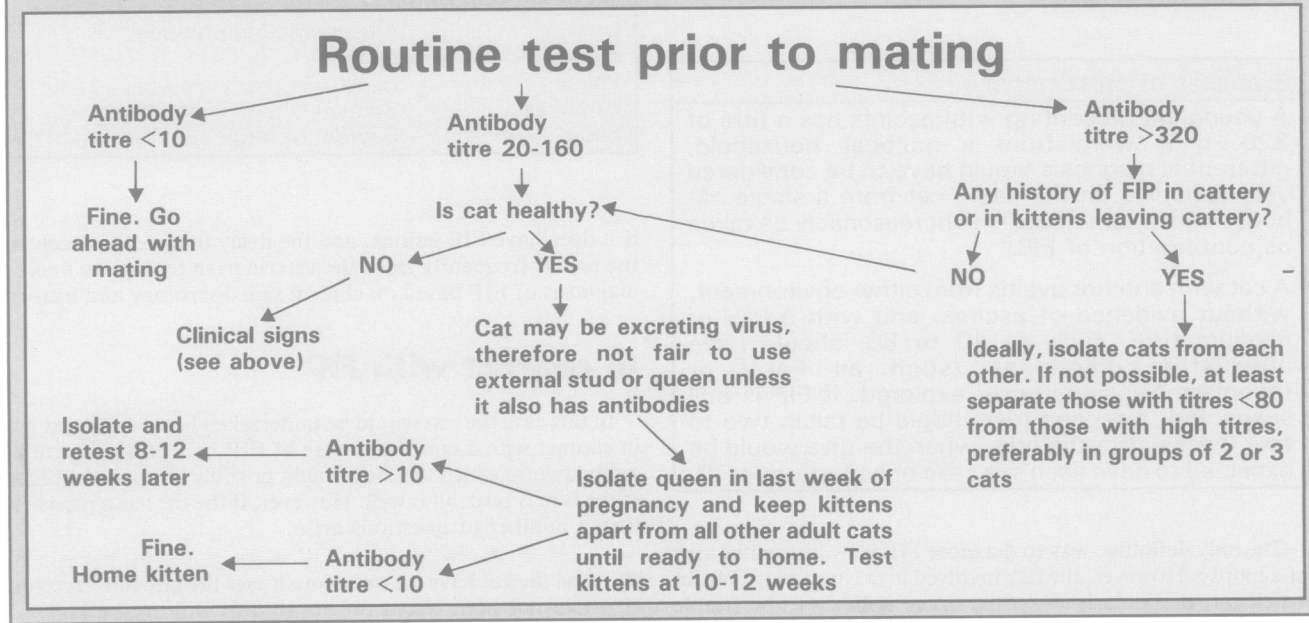
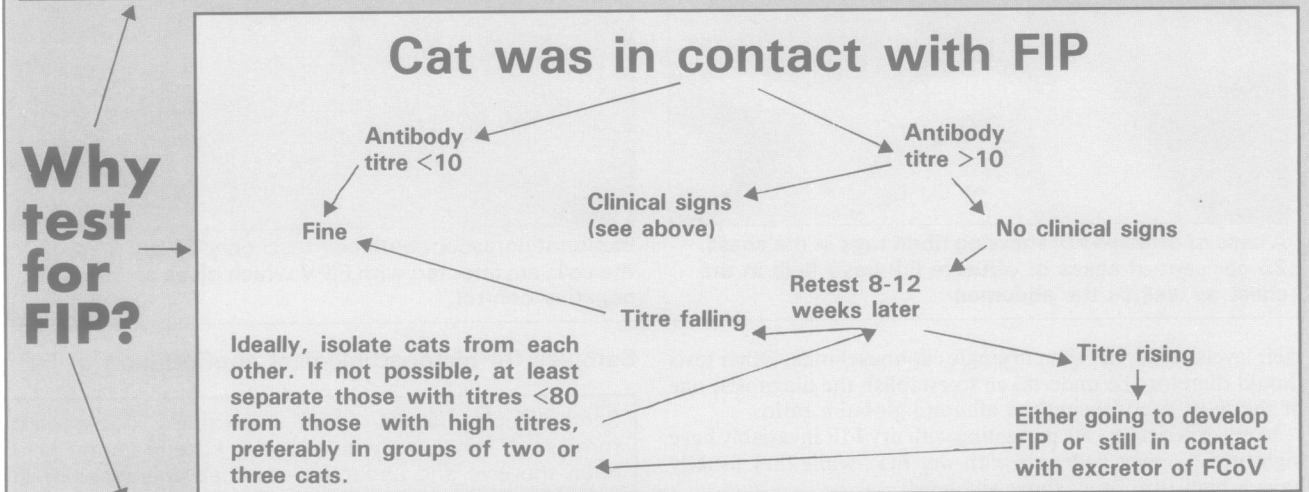
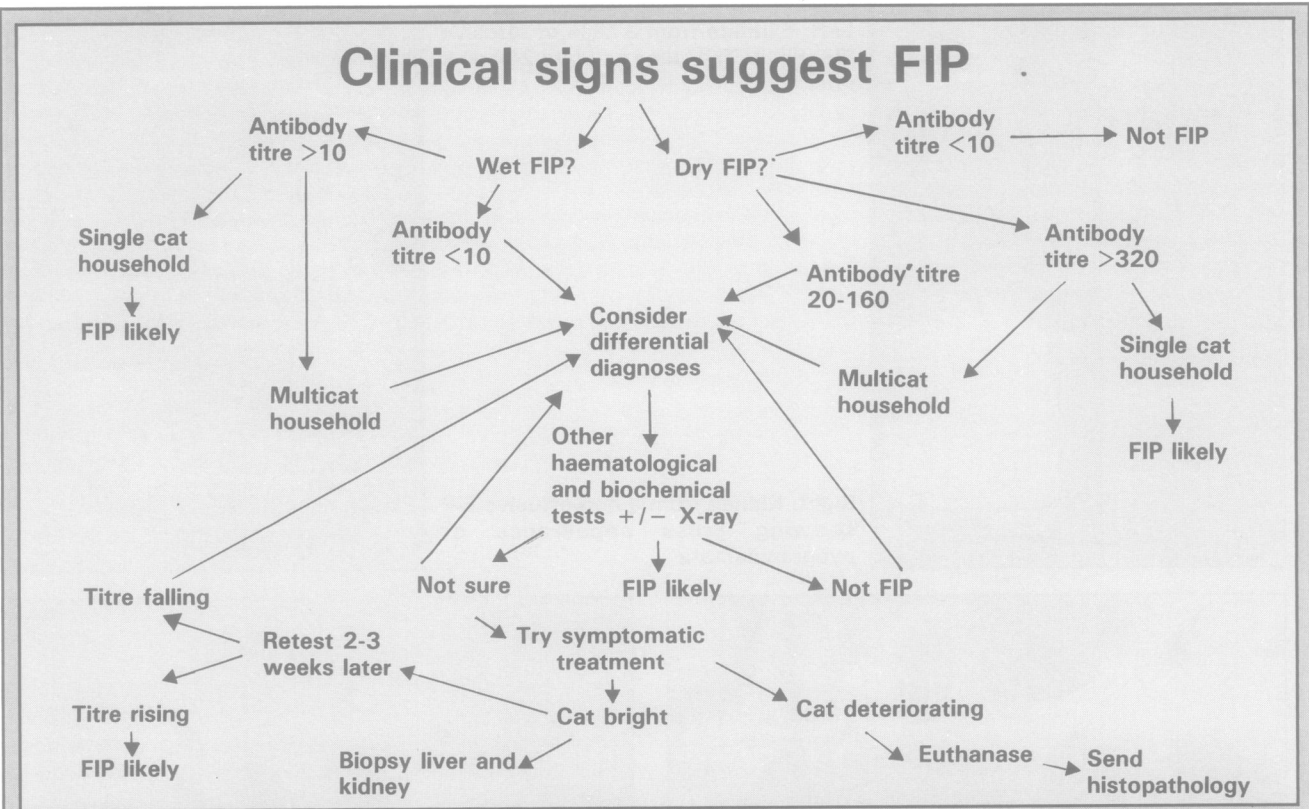
if it does have FIP lesions, and the delay incurred in receiving the result, frequently leads the veterinarian to have to make a diagnosis of FIP based on clinical signs, serology and history.

In contact with FIP

In this case the test would be undertaken because the cat was in contact with a confirmed case of FIP or with a cat with an antibody titre which therefore might possibly be a virus shedder. If the titre is zero, all is well. However, if the cat has a persistent titre a number of questions arise.

■ **Did the cat have a titre before it met the possible excretor?** If it had not been tested previously this will not be known.

The only definitive way to diagnose FIP is by histopathology of a biopsy. However, the risk involved in taking a biopsy from a sick cat, particularly when the organ is likely to be friable



Why test for FIP?

■ Will it go on to develop FIP?

Only a very small proportion of cats that seroconvert develop FIP, and there is *no recognisable correlation of titre with the development of disease*. Obviously the cat will be watched closely by the owner and the veterinary surgeon over the following months for the development of possible signs of FIP, and it may be helpful to take daily temperature readings. If the cat is from a multi cat household it is wise for it to be kept in isolation and a second test taken two months later to find if the titre has fallen. If the titre has not fallen, the cat should be kept in isolation and retested in another two months. Only a fourfold or greater fall is considered significant (eg, a fall from 640 to 80). If the titre rises, either the cat is still being exposed to coronavirus or it is developing FIP.

■ Is the cat infectious to other cats?

This is impossible to tell unless it is housed with a seronegative kitten which then remains seronegative. In kittens from seropositive queens maternal antibody has usually waned by around six weeks so tests taken at 10 or 12 weeks old will indicate whether or not the kittens have been exposed to virus. If the kittens have been in contact only with their mother and are found to be seronegative (see below), then the queen has not been excreting virus.

Screening for mating

In a cattery in which FIP has not occurred the only safe titre of visiting cats is zero. Unfortunately this constraint means that catteries with cats which have antibody titres though no history of active disease will not be allowed access to coronavirus-free studs and queens. However, since there is no way to differentiate between cats which are merely seropositive and those which are excreting virus, this is the only way to safeguard those catteries which have no problem.

If a queen or stud has a low titre, provided its state of health has been good, there is no reason why it could not be mated

to a male or female from the same cattery. The best policy for the kittens of such a mating would be to wean them at four weeks and keep the litter in total isolation until testing at 10 to 12 weeks of age, homing them only if the titre is zero. Alternatively, the kittens could be kept with the mother, provided the breeder understands the risk that if the mother is excreting virus, the kittens will seroconvert, will be difficult to home and may develop FIP. In our recent experience, these management schemes dramatically reduce the incidence of seropositive kittens. Obviously for breeding, the lower the titre the better. In a cattery with a chronic FIP problem one must ask if the line is really worth continuing. If so, then breeding should be suspended until there are overall falling titres. If the line is really not contributing to the standard of the breed then a neutering policy should be carried out. It should be emphasised that a test and euthanase policy should *never* be considered, since most seropositive cats are immune to FIP.

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Further reading

- BARLOUGH J.E., (1985) Cats, coronaviruses and coronavirus antibody tests. *Journal of Small Animal Practice* 26, 353-363
- KERR M.G. (1989) *Veterinary Laboratory Medicine*. Blackwell Scientific Publications
- LUTZ H., HAUSER B. & HORZINEK M.C. (1986) Feline infectious peritonitis (FIP) — the present state of knowledge. *Journal of Small Animal Practice* 27, 108-116
- SHELLY, S.M., SCARLETT-KRANZ, J. & BLUE, J.T. (1988) Protein electrophoresis on effusions from cats as a diagnostic test for feline infectious peritonitis. *Journal of the American Animal Hospitals Association* 24, 495-500
- STODDART M.E., GASKELL R.M., HARBOUR D.A. & GASKELL C.J. (1988) Virus shedding and immune responses in cats inoculated with cell culture-adapted feline infectious peritonitis virus. *Veterinary Microbiology* 16, 145-158
- WEISS R.C. & SCOTT F.W. (1980) Laboratory diagnosis of feline infectious peritonitis. *Feline Practice* 10, 2 16-22

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