

Feline Infectious Peritonitis (FIP)

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The basics

1. What is a virus?

viruses	Bacteria
Eg flu, measles, HIV	Eg E coli, multiresistant staphs (MRSA)
Very small - need electronmicroscope	Can see individual bacteria with normal microscope. Can see colonies with naked eye
Contain either DNA or RNA	Contain both DNA and RNA
Cannot multiply outside a cell - have to hi-jack a cell and get the cell to manufacture more copies of the virus	Can multiply on their own - inside / outside a body
Antibiotics have no effect. (Many antiviral drugs either don't work / are toxic to cats)	Antibiotics kill them

2. The immune system

The immune system is designed to prevent other organisms invading the body. It consists of cells, antibodies and some organs. The organs include the bone marrow, lymph glands, spleen and thymus - think of them as police stations. Antibodies are proteins that stick to invading gogs, making it easier for immune cells to recognize and deal with them. Think of them as handcuffs or a lasso for invaders. The immune cells (eg lymphocytes, macrophages) can capture organisms that have been identified by antibodies. They can also catch some organisms that don't have antibodies attached. They can kill cells infected with viruses. Think of them as the policemen.

3. Mutation

The genetic code (DNA) is sometimes not copied exactly when cells divide / organisms replicate. When this happens in a body it occasionally causes cancer. When it happens in bacteria it can make them resistant to antibiotics. When it happens many times in isolated subpopulations, new species can evolve. When it happens in bacteria and viruses it can change their characteristics, making them able to do things the original organism couldn't.

FIP - the cause

FIP is caused by a virus called coronavirus. Unusually the virus only affects the gut, causing vomiting and diarrhoea. Usually, signs are mild and sometimes they're not even noticeable.

Cats get infected with feline coronavirus by coming into contact with infected cat poo. Coronavirus is a tough virus and will survive in faeces for up to a week. Luckily it is killed by most disinfectants.

Coronavirus mutates easily and often (a mutation caused the SARS outbreak in Japan a few years back, though that coronavirus did not come from a cat). Occasional mutants are able to infect white blood cells called macrophages and are carried all through the body by them.

Whether a cat with mutant virus in macrophages goes on to develop FIP depends on its own immune system.

- If the cat makes lots of antibodies to fight the infection it develops FIP. This is because the antibodies cannot kill the virus hiding inside the cells. If anything, antibodies make it easier for the virus to get inside uninfected macrophages. The result is WET FIP where the severe inflammation causes fluid to leak out into body cavities.
- If the cat mainly mobilizes lots of immune cells to deal with the invader, it can kill the virus and recovers completely.
- If the cat is able to raise some immune cells but they're not enough to eliminate the virus, you get DRY FIP. Here the inflammation is more localized, forming granulomas (like dry abscesses) anywhere in the body. The symptoms the cat shows depend on where the granulomas form.

DRY FIP	WET FIP
30-40% of cases	60-70% of cases
Fever that doesn't resolve with antibiotics, decreased appetite, lethargy, weight loss	
Granulomas form in <ul style="list-style-type: none"> - liver, kidneys, lymph glands: no specific signs, vet may be able to feel lumps - Brain: seizures, unsteady gait, tremor, twitching eyes (nystagmus) - Eyes: discoloured or misshapen iris, cloudy / bloody behind cornea 	Fluid collecting in body cavities abdomen <ul style="list-style-type: none"> - abdomen: distended tummy - chest: increased effort breathing - heart sack: weakness, distended tummy
	Fluid typically clear, bright yellow and sticky

This means that coronavirus is very infectious and spreads easily from cat to cat FIP will not spread from cat to cat because you need the virus to mutate AND you need a particular sort of immune response from the infected cat

FIP - who is more likely to get ill

- Cats < 2 years old
- Cats living with lots of other cats
- Cats that are immune-suppressed e.g. when infected with cat leukaemia (FeLV) or cat AIDs virus (FIV)
- Pedigree cats
- Some genetic lines
- Stressed cats e.g. after re-homing, after neutering, concurrent infections

FIP - diagnosis

This is often very tricky. Wet FIP is easier because the fluid that accumulates is reasonably characteristic. There is a condition called lymphocytic cholangitis that looks almost identical. Lymphocytic cholangitis will only cause effusions in the abdomen though.

Dry FIP is difficult. There are a whole bunch of tests that, if positive, make the diagnosis more and more likely. The only definitive way of proving that a cat has dry FIP is to collect tissue samples and use special stains called immunofluorescent antibodies on them. If a pedigree kitten you sold dies from suspected FIP, it would be sensible to request a post mortem (autopsy) to confirm this.

NB Many perfectly healthy cats have feline coronavirus antibodies. The fact that a cat has high antibody titres to coronavirus does NOT mean that he has FIP - Just like you don't have measles or chickenpox even though you probably still have antibodies against these diseases. If a cat has high antibody levels AND has other signs consistent with FIP, then antibody levels can be used as circumstantial evidence. Some cats (particularly cats with wet FIP) can have antibody titres of 0 and still be dying of the disease.

FIP- treatment

You can try and slow down the progression of the disease by giving prednisone (cortisone). There are a bunch of other drugs that have been tried but none have any solid evidence that they are of benefit. FIP is almost invariably fatal. In fact, cats that survive FIP.... usually didn't have it in the first place.

FIP - risk to companion cats

Cats with FIP will probably be shedding feline coronavirus but it's very rare for them to shed the mutated virus that's triggering the FIP. The other cats in the house would have already been exposed to any coronaviruses the ill cat is shedding before the affected cat developed signs of illness, so there's no sense in isolating the cat from its companions.

FIP - getting a new cat

The virus survives in faeces for up to a week. It is susceptible to most disinfectants. Household bleach / F10 are good choices. If you've removed all faeces and have disinfected all litter trays and areas where the ill cat may have soiled, the chances of a new cat picking up coronavirus from the environment is low. Some have suggested waiting 2 months to be 100% sure that all coronavirus in the environment is dead.

You can decrease the risk of a new cat developing FIP if you

- Obtain the new kitten from household with few cats
- Obtain the new kitten from coronavirus free colony
- Adopt adult cat

If the FIP cat came from a multicat household, general management should receive attention before attempting to introduce another cat (see the information for breeders). If you want to be as safe as possible, you should wait for 6 months AND until all the cats in the house have no FCoV antibodies on a blood test (this is unlikely to happen without some effort if you have > 8-10 cats in a house).

FIP - decreasing the disease in a breeding colony

The difficult thing for a breeder is that few if any adult cats in the colony will develop FIP and they may not even have diarrhoea. Kittens sent out to new homes are more likely to become ill and then you're blamed. The first thing is to educate new owners. The 2nd thing is to confirm the diagnosis.

1. Hygiene - decrease contact with infected poo

- There should be 1 litter tray per cat. Faeces should be removed 1-2 x daily and disinfected at least weekly (1:32 bleach, contact time 20 minutes)
- Litter trays should be far away from feed bowls
- **Gross and microscopic litter dust contains high numbers of infectious viruses**
- Clip trousers of long coated cats to decrease soiling and ingestion of faeces during cleaning
- Cats should be kept in **stable groups of 2-4**
- Keep < 8 cats in a house (including kittens). If you want to breed with more, purpose built facilities are strongly indicated to improve disease control and decrease stress from intercat aggression

2. Try and establish a coronavirus free cattery

This is very cost and labour intensive especially if you have more than 8 cats. Use antibody titres (every 3-6 months) or PCR tests on faeces (every month) to determine which cats in the colony are likely to be shedding virus

- Cats could be separated into groups according to their antibody titres / faecal PCR (and this shedding) results
- Quarantine and test cats before introducing them to the others: only coronavirus negative cats should be introduced to a negative colony

3. Early weaning - virus free kittens

Resign yourself to having coronavirus positive adults but try and prevent contact between kittens and coronavirus before they're re-homed.

- Isolate queen 1-2 weeks before she is due to kitten
- Maintain excellent hygiene to prevent transmission of virus from adults in the rest of the house to kittens on feed bowls, litter trays, poop scoops etc
- Early weaning 5-6 w and isolate from the rest of the cattery
- Confirm the kittens are antibody negative at 12-16w

Socialisation of the kittens becomes a problem with this system.

Further reading

1. FAB (Feline advisory board - run by Bristol vet school) cats website. This is aimed at cat owners and breeders as well as at vets: <http://www.fabcats.org>
2. ABCD (European advisory board on cat diseases) website: (NB This one is very technical and aimed mainly at vets, but good if you want lots of detail) http://www.abcd-vets.org/guidelines/feline_infectious_peritonitis/index.asp
3. Dr Dianne Addie (based at Glasgow Vet school and has done extensive research on FIP. She researched the early weaning program and has extensive advice for breeders on her site: <http://www.dr-addie.com/>