



**Veterinary Emergency  
+ Referral Center**  
of Hawaii

**Ettinger: Textbook of Veterinary Internal Medicine,  
7th Edition**

## **Feline Enteric Coronavirus and Feline Infectious Peritonitis**

### **What is FIP?**

Feline infectious peritonitis (FIP) is a fatal disease of cats caused by one genetic form of feline enteric coronaviruses (FECV). Other genetic forms of FECV are not dangerous to cats. Cats infected with the FIP form of the virus can develop a slowly or rapidly progressing disease in their kidneys, liver, intestines, heart, or other organs and eventually die.

### **How do cats contract FIP?**

There are two ways a cat may contract FIP—from other cats with FIP or from a mutation during FECV infection. It is very uncommon for cats to contract FIP from other cats. Most cats with FIP do not shed the FIP virus, although they may shed a benign FECV. This benign FECV sometimes develops a genetic mutation while in the gut of a healthy cat and effectively becomes an FIP virus. This occurs in about 5% of kittens with FECV and less commonly in older cats. But every new FIP mutation does not induce the FIP disease and cause the cat to die.

### **How do outbreaks of FIP occur in multiple-cat households?**

Multiple sporadic FIP cases usually indicate that FECV is present and that multiple unrelated mutations have occurred to produce FIP virus. If there are multiple cases occurring simultaneously or in related or in-contact cats (which is very rare), we suspect that very young kittens all may have been exposed to an FIP virus from their mother or a nearby cat, the family of cats may be genetically predisposed, or, rarely, that cats have been infected with the FIP virus from a severely affected cat.

### **What are some signs of FIP?**

The most common signs of FIP are cyclic fever (up and down), tiredness, and failure to grow. Some cats develop the "wet form" of FIP and may have difficulty breathing or a distended abdomen because of the accumulation of thick, yellow abnormal fluid in their chest or abdomen. Cats with the "dry form" develop masses (granulomas) on the kidneys, in the lymph nodes, in the brain and eyes, and elsewhere. Cats with dry FIP develop signs associated with the location of the masses, such as cloudy eyes, seizures, or other neurologic signs.

### **How can FIP be diagnosed?**

Diagnosing FIP is not easy and sometimes impossible before the cat dies. Additionally, many cases do not fit all of the rules. To *suspect* FIP, there must be: 1) a sick cat, 2) a positive titer on a serology blood test, and usually 3) abnormal findings in other blood tests and on the physical examination. Serology by itself must never be used to diagnose FIP. (See section entitled "How do we interpret FIP titers?"). Complete blood count abnormalities include increased total protein (mainly globulin), increased numbers of total white blood cells, particularly neutrophils, and decreased numbers of lymphocytes. On physical examination, the cat may have masses in the lymph nodes, neurological problems, be thin or dehydrated, or many other vague findings that suggest FIP. If the cat has wet FIP, the fluid in the chest or abdomen is usually yellowish, sticky, high in protein, and containing numerous neutrophils and macrophages. If the cat has dry FIP, the veterinarian can obtain a biopsy and the laboratory can document "granulomatous

inflammation." Polymerase chain reaction (PCR) tests are new DNA tests that can help suggest FIP but cannot be relied on completely to make a diagnosis because some cats with FIP are PCR-negative and cats with FECV infection can be PCR-positive.

There is only one way to confirm a diagnosis of FIP and that is to identify the FIPV in biopsies or at necropsy. The most accurate technique to detect virus is by a procedure called "immunohistochemistry for the FIP N-protein" which is performed on biopsy tissues and is available at some laboratories.

### **How do we interpret FIP titers?**

There is no specific titer (number) of FIP antibodies that can confirm the diagnosis, and cats with either FECV or FIP can have a positive antibody (serological) test. The titer will be expressed as a number like 1:400, 1:600, or 1:3200. Cats often have high titers even if only infected with FECV especially if they are young or from a multiple-cat household, shelter, or breeder. Titers cycle up and down in number, so it is not helpful to look at the trend except over long periods such as many months to a year or more. Only if the titer was astronomical (>1:16,000), would there be a strong suggestion of FIP.

Cats with FIP usually have moderate titers, from 1:100 to 1:1600. Some laboratories do not test for very low titers and may report a cat as "negative" when in fact it has a low titer. Unfortunately, this result is not interpretable and the serology would need to be repeated at a laboratory that tests for all titers 1:25 and higher. If the titer is negative at 1:25, you can almost always assume that the cat is truly negative (although there are always rare cases that break diagnostic rules).

*Remember:* Cats must be showing clinical signs of FIP in addition to having antibodies. Virtually all cats in multiple-cat households are antibody positive because they have been exposed to FECV. Most do not have FIP. New antibody tests using proteins such as 3c and 7b have not been fully validated and cannot confirm a diagnosis of FIP.

### **How can I cure my cat that has been diagnosed with FIP?**

First you must be sure that the cat has FIP, because many cats with FECV or some other disease are misdiagnosed with FIP. Virtually every cat with biopsy-confirmed FIP dies. Some cats can be treated with drugs to suppress the immune system such as corticosteroids and this may slow the disease, but the cat does eventually die. Some veterinarians use drugs to stimulate the immune system (immunoregulin, interferon, acemannan) to treat cats with FIP. This therapy often is not effective or may make the disease worse, although some veterinarians believe that some cats do better. Cats with FIP should receive supportive therapy (rest, good nutrition, lack of stress, broad-spectrum antibiotics) for as long as the cat is reasonably comfortable. Once disease signs become debilitating and weight and appetite decline, the owner must be prepared for the reality that the cat is dying and should consider euthanasia, as dying with FIP appears to be painful.

### **How do I lower the risk of FIP in a household?**

There are several ways that FIP losses can be decreased:

1. Decrease the level of FECV infection by general cleanliness, fewer cats, and cleaning litter boxes frequently.
2. Breeders may be able to breed genetic lines that have higher genetic resistance to FIP.
3. Reduce the number of cats, especially kittens, in the environment. It is not sufficient to divide cats into small groups in multiple rooms because FECV is easily carried among rooms on clothes, shoes, dust, and cats' fur. If possible, the whole house should have five or fewer cats, because

below this number FECV infection eventually dies out. Above five cats, the virus maintains itself in the home by constantly infecting and re-infecting the same cats.

4. Unfortunately, FIP vaccination may offer only slight if any protection against FIP.
5. Always pick the healthiest cats and kittens to introduce into the home.

**If a cat died of FIP, how long should I wait before I get another cat?**

People typically wait at least one month. Vacuum and clean the house as thoroughly as possible. Litter pans, bowls, and toys should be cleaned with hot soap and water and rinsed in a 1:32 dilution of household bleach. However, if there are any cats in the household already or the new cat has FECV infection, there is no way to guarantee against FIP.

**Can members of my family get FIP?**

No, it is not a human disease.

Copyright © 2005, 2000, 1995, 1989, 1983, 1975 by Elsevier Inc. All rights reserved.