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Feline Infectious Peritonitis

Feline Infectious Peritonitis (FIP) is a progressive, almost always fatal, viral disease of domestic cats. It affects some exotic cats, with the cheetah being particularly susceptible. It does not affect non-feline species, such as dogs.

Cause and Transmission

FIP is caused by a virus in the coronavirus family. The feline infectious peritonitis virus (FIPV) and the feline enteric coronavirus (FECV) are the main coronaviruses of cats.

Disease caused by FECV is usually self-limiting and involves diarrhea in young kittens. Infection with the FIPV is serious and usually has fatal consequences.

Transmission of FIPV between cats is most likely by the fecal-oral route; a susceptible cat is infected by coming in contact with fecal material from an infected cat. The virus is swallowed and begins to reproduce in the lining of the intestine. Once certain blood cells become infected with the virus, they transport it throughout the body. Also, it is considered possible that the virus can be transmitted between cats through nasal, salivary and urinary secretions.

Contributing Factors

Exposure to the virus does not necessarily equate with infection and progression to death. A strong, healthy immune system is important for recognition of the virus and preventing its reproduction in the cat's body. Some cats are able to completely eliminate the virus, whereas others are infected but show minimal or no signs of infection. These cats may eventually eliminate the virus or continue to harbor a small amount of virus in the body. They may or may not become ill with FIP at a later time. Cats who are unable to eliminate the virus may show signs of serious illness in a matter of a few weeks.

Environmental stresses are important factors in transmission of the disease. Crowding of many cats together leads to stress, suppression of the immune system, and sharing of the virus. This scenario is most common in overcrowded catteries where cats come in close contact with one another. Concurrent infection with immune-suppressing viruses, such as the feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV), also predisposes cats to infection with FIPV.

Prevalence

Male and female cats are affected equally. There are two main age groupings for FIPV: kittens less than a year of age have the highest incidence, followed by geriatric cats over 13 years of age. It is relatively less common in young adult and middle aged cats. Because of its transmission in cattery situations, it is more common in purebred cats.

Because FIP is difficult to diagnose, studies, which evaluate its overall prevalence in cats, provide only an estimate. In infected catteries, 80-90% of the cats may test positive for exposure to one of the coronaviruses.

Clinical Signs

Cats with FIP may initially only show vague, nonspecific signs, such as poor appetite, fever, and weight loss. Virtually any organ system may be affected, so a variety of signs are possible.

In general, we consider that there are two forms of FIP: the dry (non-effusive) form and the wet (effusive) form. The wet form is characterized by the accumulation of large quantities of fluid in the chest and/or abdomen. If it occurs in the chest, the cat will experience difficulty breathing. When it occurs in the abdomen, a large, bloated appearance will result. The dry form affects the target organs in a similar fashion, but no fluid is produced. At different times during the disease process, the cat may pass from one form to the other. Because the type of fluid that is produced with wet FIP is very unusual, it is easier to diagnose than the dry form, where signs may be more vague.

Diagnosis

Diagnosis of FIP may be difficult and frustrating. There are no specific tests, which are reliable in all cases. Biopsy of an affected organ provides the only definitive diagnosis; this provides the pathologist with a small sample of tissue for study. Recovery of such tissue from an already sick cat involves a certain amount of risk.

The following tests are usually used on cats with suspicious clinical signs.

1. **Coronavirus Test.** Antibodies are the circulating defense agents of the immune system. This test detects antibodies to *any* coronavirus so this test does not discriminate between exposure to FIPV and FECV. If positive, this test indicates that one or both of those viruses WAS or IS present in the cat. Since antibodies may persist even when the virus is no longer present, a positive test can be misleading in some cases. Also, terminally ill cats may have their antibodies "tied up" when large amounts of the FIPV are present. This can result in a false negative test result. Therefore, this test must be interpreted in conjunction with results of other tests. These tests are listed below.
2. **Serum Protein Levels.** If the total serum protein is elevated at ≥ 7.8 gm/dL AND the A:G ratio (ratio of two different blood proteins) is < 0.6 , FIP becomes a more likely diagnosis. A few other diseases may also cause this, but these are also very severe and often fatal. These findings occur in 50% of the cases of FIP.
3. **White Blood Cell Count.** An elevated white blood cell count ($> 25,000$ cells/ μ l) is consistent with FIP. However, many other diseases may cause this and some of these are not fatal. Also, many cases of FIP have a normal white blood cell count (less than 18,000 cells/ μ l). One particular white blood cell, called the lymphocyte, is often decreased in number with FIP.
4. **Abdominal/Chest Fluid Analysis.** If fluid is present in either the chest or the abdomen, analysis of the fluid can be very helpful. If the characteristics of the fluid are appropriate and the cat has the correct clinical signs, a presumptive diagnosis of FIP can be made with greater assurance. Unfortunately, this fluid is not present in the dry form of FIP.
5. **Fine Needle Biopsy of the Liver or Kidneys.** A few cells may be collected from the liver or kidney without stressing the cat (i.e., with a local anesthetic in the skin). FIP produces a particular inflammatory pattern in these organs which, although not diagnostic, is strongly suggestive for the disease. This helps to rule out other diseases.
6. **Radiographs (X-rays) of Chest or Abdomen.** Radiographs serve to identify enlargements in organs and the presence of fluid in the chest or abdomen. They are helpful but not diagnostic and are used to decide which other tests are appropriate.
7. **A Combination of Three Blood Tests.** Cats with the combination of a low lymphocyte (a white blood cell) count, a high blood globulin (protein) level, and a positive coronavirus antibody test have been shown to have a 94% chance of having FIP.
8. **Organ Biopsy with a Large Needle or Surgery.** Organ biopsy is the only test that is diagnostic of FIP. A case workup in the absence of organ biopsy often includes several or all of the above tests. Strongly suggestive findings with several tests often provide the basis for a presumptive diagnosis of FIP.

Treatment

Many treatments have been tried for cats with FIP, but none have been consistently successful. Apparently, an occasional cat will recover, but this is the exception rather than the rule. Removing fluid from the chest or abdomen in cats with the wet form will make them comfortable for a short while, and a few drugs will make some of them feel better. Some of the available antiviral drugs have been tried alone and in various combinations. Human interferon has had some effect in prolonging the lifespan. Some of the other antiviral drugs are toxic and cannot be given to cats. There is no known curative treatment available.

Prognosis

The prognosis for a cat with FIP is very poor. Once a reasonably reliable presumptive diagnosis has been made, euthanasia is often the most appropriate course of action.

Transmission to Humans

The feline coronaviruses are not transmitted to humans. They are species-specific.

Prevention

The coronavirus may live for up to 3 weeks in the environment. If viral shedding into the environment seems likely, a 1:30 mixture of household bleach and water (i.e., 1 cup of bleach in a gallon of water) should be used to disinfect food and water bowls, litter pans, cages, bedding material, and items that will not be adversely affected by household bleach.

A preventive vaccine against FIP is available, but most veterinarians do not recommend that the vaccine be given routinely to all cats. The vaccine is generally recommended for cats in contact with free-roaming cats or for those living in households that have had a cat with FIP. Initially, two doses are given at a 2-4 week interval. An annual booster is needed to maintain immunity. For cats already infected with FIPV, the vaccine is of no known benefit.