

01

FELINE INFECTIOUS PERITONITIS





1.1 About fIP

feline infectious peritonitis

Feline Infectious Peritonitis (FIP) can affect cats of any age, **but it's particularly common in cats under 3 years old, especially those between 4 to 24 months.** The incidence of FIP significantly decreases as cats age. However, adult and older cats are not immune to FIP, with at least 20% of FIP cases reported in these age groups. Older cats, having weaker immune responses, may be more susceptible to developing FIP when faced with a strong viral attack.

FIP is more likely to occur in environments with multiple cats. In densely populated living conditions, the Feline Enteric Coronavirus (FECV) can spread extensively through cross-contamination.

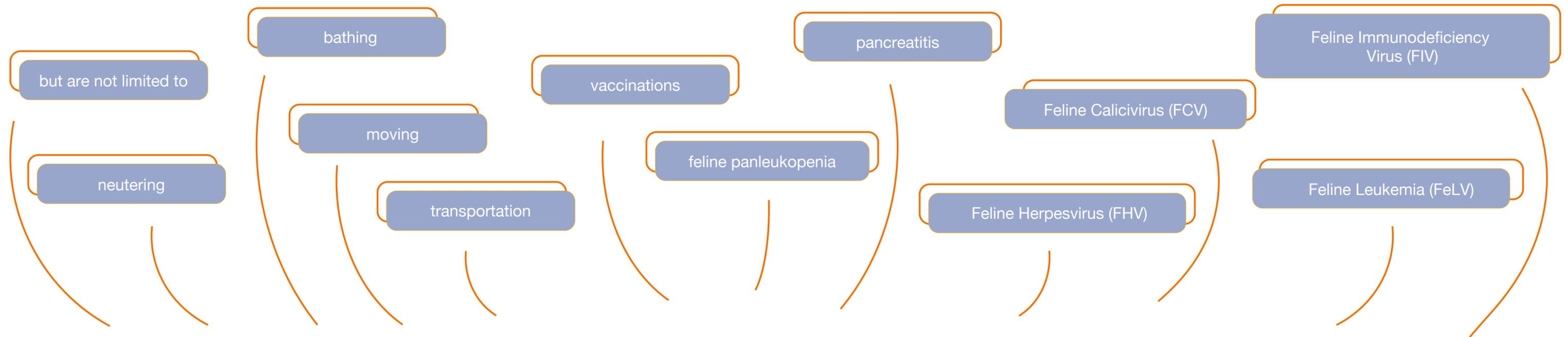
Furthermore, FIP has a certain genetic predisposition. Inbreeding can lead to genetic defects in some cats, making them more susceptible to FIP. In some cases, this genetic susceptibility can be as high as 50%. Unfortunately, while the genetic risk is clear, genetic analysis indicates that numerous genes might influence susceptibility, making it currently impossible to conduct genetic testing for FIP susceptibility. Overall, 0.3% of cats may develop FIP, but in densely populated conditions, the incidence can rise to 1-5% or even higher.

In recent years, there has been an upward trend in FIP cases. This increase could be due to more backyard breeding and stray cat rescue efforts. Kittens from these environments are often weaned early, have lower immunity, and are exposed to a high volume of the FECV virus.



Feline Infectious Peritonitis (FIP)

The risk factors for Feline Infectious Peritonitis (FIP) include the infection rate of Feline Enteric Coronavirus (FECV) in cat populations, the extent of virus spread, the most susceptible age range of 4 to 24 months, and genetic predisposition (notably in cats with a breeding pedigree). FIP most commonly affects young cats that are under stress or have weakened immune systems.



FACTORS THAT CAN LEAD TO STRESS OR A WEAKENED IMMUNE SYSTEM

Feline Infectious Peritonitis (FIP) is typically categorized into two types: non-effusive (dry) and effusive (wet), with mixed forms occurring occasionally. The incubation period for naturally contracted FIP is challenging to determine, ranging from as short as 2-3 weeks to several months or even years, although the latter is less common. This period reflects the mutation process of the disease or the time it takes to progress from a subclinical to a clinical state. Subclinical infections are usually confined to the mesenteric lymph nodes and may resolve on their own or worsen. The emergence of clear clinical symptoms indicates the immune system's failure to combat the virus. As the disease progresses, a decline in the quality of life is inevitable, with natural recovery being extremely rare.

The effusive (wet) form of FIP progresses rapidly, and without timely and effective treatment, it usually leads to death within days to weeks. While fluid accumulation in the chest can be drained, it's not recommended to remove a large amount of abdominal fluid unless necessary. Cats with **the non-effusive (dry)** form of FIP can survive for several weeks to months. Although a few cats may live for several months or even a year or two post-diagnosis, the median survival time reported for cats with FIP is only 8 days.

Feline Infectious Peritonitis (FIP)



INCUBATION TIME

Ranging from as short as 2-3 weeks to several months or even years

DISEASE PROGRESSES

A decline in the quality of life is inevitable, with natural recovery being extremely rare

WET WITHOUT TIMELY

It usually leads to death within days to weeks

DRY SURVIVE

Survive for several weeks to months

1.2 Clinical symptoms and diagnosis of FIP

The cat's age, history, physical examination, and clinical symptoms are the main factors taken into account while diagnosing Feline Infectious Peritonitis (FIP). Whenever a cat in a multi-cat setting between the ages of 4 and 36 months exhibits recurrent fevers that do not improve with medication, FIP should be immediately considered. Few other viral or infectious disorders show this feature except FIP. Observations made on a daily basis, especially the development of more pronounced FIP symptoms, can help pet owners further increase suspicion of the illness. While fast or difficult breathing may indicate pleural effusion, abdomen distension with a fluctuating sensation may indicate the presence of abdominal effusion. Cats with FIP also frequently experience jaundice, excessive bilirubinuria, uveitis, enlarged kidneys and/or mesenteric lymph nodes, and a variety of neurological symptoms linked to damage to the brain and/or spinal cord, particularly in the non-effusive (dry) form of the disease.



Age



history



Physical examination



Clinical symptoms

Depending on which organs are affected, the clinical signs of FIP can vary and include fever, decreased appetite, weight loss, diarrhea or jaundice, neurological symptoms, and ocular lesions. Fibrous and granulomatous serositis, together with protein-rich effusion and/or granulomatous lesions (pyogranulomas) in bodily cavities, are the disease's hallmarks. There may be variations in the cellular makeup of distinct organs, viral antigen expression levels, and the distribution of distinctive FIP lesions amongst cases.

Protein-rich effusion in the abdomen and chest cavities is a defining characteristic of FIP, which can be categorized as effusive (wet), non-effusive (dry), or mixed (a combination of the two).



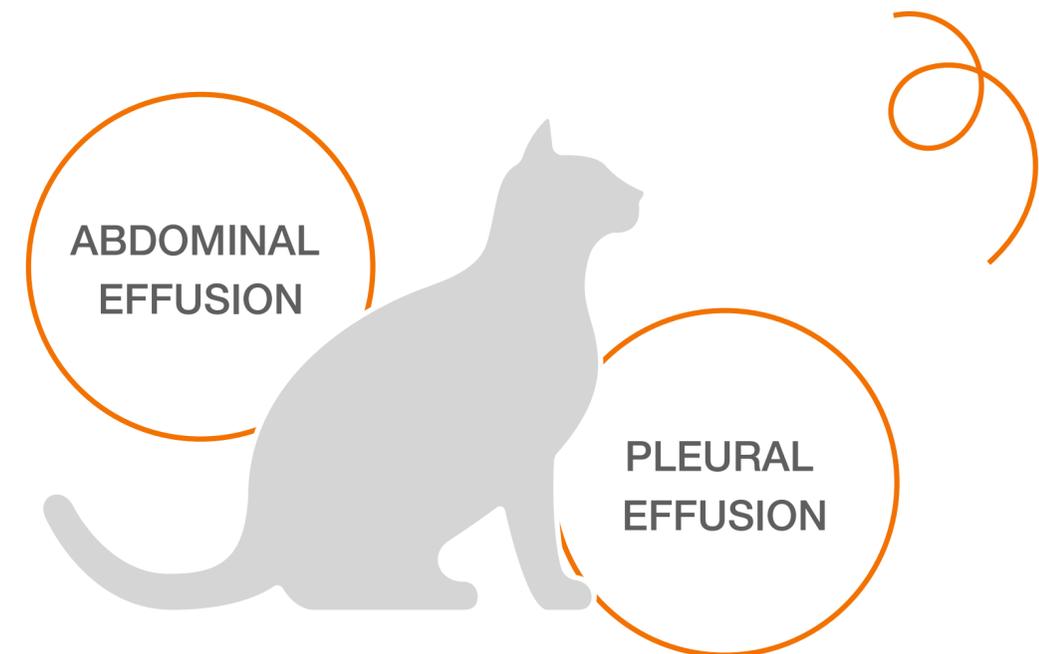
Approximately

75%

of cases of Feline Infectious Peritonitis (FIP) are of the wet form, caused by vasculitis due to immune complex deposition in vessel walls and body cavity effusions.



Clinical signs commonly associated with wet FIP include abdominal effusion and/or pleural effusion, often accompanied by periodic fevers unresponsive to antibiotic treatment. Approximately 75% of cases of Feline Infectious Peritonitis (FIP) are of the wet form, caused by vasculitis due to immune complex deposition in vessel walls and body cavity effusions. Abdominal effusion is the most easily detected form of effusion, though effusions in the chest and pericardial cavities can also occur. Some cats with pleural effusion may experience rapid breathing or even difficulty breathing. Some cases present only with abdominal or pleural effusion, while others have both.



[FIP Symptom]

75%
Wet FIP

- 1 The abdomen progressively swells, with ultrasound or X-ray indicating the presence of abdominal fluid accumulation (ascites);
- 2 Breathing becomes increasingly rapid, with ultrasound or X-ray showing the presence of pleural effusion and/or pericardial effusion (pleural effusion);
- 3 Presence of both abdominal and pleural effusion simultaneously

Wet Feline Infectious Peritonitis (FIP) is a disease that is strongly suspected in cats exhibiting any of the three illnesses listed above.

25%
Dry FIP

Cats that show signs of dry Feline Infectious Peritonitis (FIP) include decreased appetite, weight loss, lethargy, and recurrent fevers that are resistant to antibiotics.

The albumin:globulin (A:G) ratio, serum biochemistry, ultrasonography, complete blood count (CBC), and mesenteric lymph node enlargement are important diagnostic tools for dry FIP.

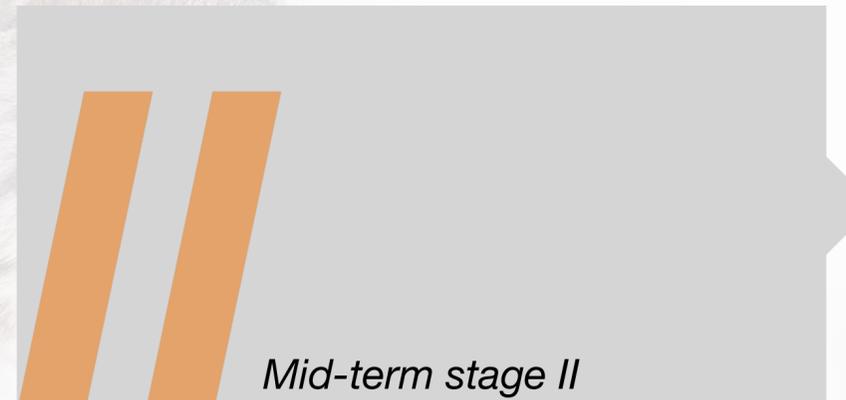
Serum alpha-1 acid glycoprotein (AGP) levels and serum Feline Coronavirus (FCoV) antibody titers may help in the diagnosis if the results of blood tests and ultrasonography are unclear.



1.3 The different stages of wet FIP



It is important to suspect Feline Infectious Peritonitis (FIP) in cats under 2 years old if they have symptoms including lethargy, appetite loss, weight loss, stunted growth, and dry fur in addition to recurrent fever that does not respond to medications. Constipation or diarrhoea are examples of clinical symptoms that can appear in some FIP instances. Increases in neutrophils, white blood cells, lymphocytes, serum total protein, and hyperglobulinemia with an A:G ratio of ≤ 0.6 are common outcomes of FIP. Fluid buildup in the chest and/or abdomen is a common feature of the wet type of FIP. Although it is possible to remove fluid from the chest cavity, it is not advised to remove a significant amount of abdomen fluid unless the cat's breathing is being affected.



The aforementioned symptoms will progressively increase as the condition advances, which will cause the patient's appetite to further decline and limit their ability to eat. In addition, hyperbilirubinemia, which results in dark yellow urine, and chronic non-regenerative anaemia ($HCT \leq 24\%$) may be brought on by this. Breathing problems may arise from a pleural effusion or an increase in ascites. It is recommended to seek medical assistance as soon as possible if abdominal breathing develops, as draining the pleural effusion might be required.

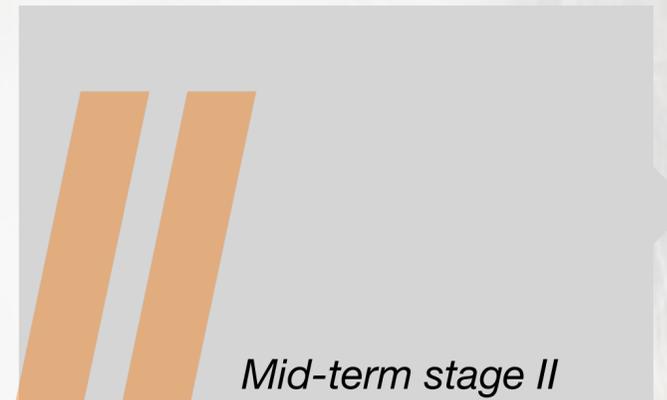


Cats in the later stages will eventually lose their ability to feed themselves on their own as the disease progresses rapidly. Furthermore, when the Hematocrit (HCT) level drops to 14% or lower, it is advised to give them a blood transfusion since they may develop severe anaemia. Additionally, jaundice will get severe. Wet Feline Infectious Peritonitis (FIP) has a shorter course, hence early diagnosis is essential. Wet FIP's clinical symptoms are typically reversible with appropriate treatment, leading to a complete restoration of quality of life. It is imperative to highlight, nonetheless, that a cytokine storm may strike many cats in the advanced phases, resulting in irreversible harm such multiple organ failure and neurological damage.

1.4 The different stages of dry FIP



The wet and dry forms of Feline Infectious Peritonitis (FIP) exhibit nearly identical clinical signs. What makes dry FIP different is that it doesn't cause fluid to build up in the chest or belly. Rather, it causes granulomas to grow in several organs and may also result in the enlargement of the kidneys, liver, and testicles. Dry FIP is also frequently associated with renal medullary rim symptoms, extensive peritonitis in the abdominal cavity, and enlargement of the mesenteric lymph nodes.



As the disease progresses, some cases of dry FIP can develop eye lesions, primarily characterized by uveitis. This condition leads to the clouding of the eyeball due to a significant exudation of fibrous and inflammatory cells in the anterior chamber fluid, making the iris patterns indistinct. Occasionally, yellow-white small precipitates form, and as the inflammatory products increase, floating white turbid substances and yellow-white granulomatous nodular spots can be observed in the vitreous body.



When the hematocrit (HCT) level drops to 14% or less, it is recommended to give a blood transfusion right once because the illness has the potential to deteriorate and cause severe anaemia. In addition, cats who are infected may experience neurological signs, aseptic meningitis or encephalitis, and jaundice. Some examples of these neurological signs are hindlimb weakness, nystagmus (eye tremors), static muscular tremors, reduced capacity to jump, body stiffness, slower movement, and unstable posture.



Cats with advanced cases of dry Feline Infectious Peritonitis (FIP) may have difficulty swallowing, stiffness in the body, movement disorders, orientation issues, cognitive impairments, paralysis, seizures, and shock. They may also completely lose their ability to jump. This is the last stage of the disease, where there has been significant damage to the central nervous system and a poor outlook for recovery.

1.5 The treatment for FIP

Conventional antiviral therapies have been proven ineffective against Feline Infectious Peritonitis (FIP), and while immunosuppressants like steroids can temporarily improve the quality of life for cats, they do not alter the disease's outcome.

Xraphconn, the world's first innovative oral treatment specifically targeting FIP, was developed by Mutian after two years of research. In recent years, experts and scholars from Japan, Germany, and Europe have conducted clinical studies on Xraphconn and published papers,

with a vast amount of research indicating an effectiveness rate of up to 98% and a cure rate of 90% for FIP.





1.6 References

We express our heartfelt appreciation to these researchers for their valuable contributions.

- > Oral Mutian®X stopped faecal feline coronavirus shedding by naturally infected cats
<https://doi.org/10.1016/j.rvsc.2020.02.012>
- > Rapid Resolution of Non-Effusive Feline Infectious Peritonitis Uveitis with an Oral Adenosine Nucleoside Analogue and Feline Interferon Omega
<https://doi.org/10.3390/v12111216>
- > Prognostic Prediction for Therapeutic Effects of Mutian on 324 Client-Owned Cats with Feline Infectious Peritonitis Based on Clinical Laboratory Indicators and Physical Signs
<https://doi.org/10.3390/vetsci10020136>
- > Therapeutic Effects of Mutian® Xraphconn on 141 Client-Owned Cats with Feline Infectious Peritonitis Predicted by Total Bilirubin Levels
<https://doi.org/10.3390/vetsci8120328>

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- > Clinical Follow-Up and Postmortem Findings in a Cat That Was Cured of Feline Infectious Peritonitis with an Oral Antiviral Drug Containing GS-441524
<https://doi.org/10.3390/v14092040>
 - > Fecal Feline Coronavirus RNA Shedding and Spike Gene Mutations in Cats with Feline Infectious Peritonitis Treated with GS-441524
<https://doi.org/10.3390/v14051069>
 - > Curing Cats with Feline Infectious Peritonitis with an Oral Multi-Component Drug Containing GS-441524
<https://doi.org/10.3390/v13112228>

1.7 The Therapeutic effect of Xraphconn

Medication for

1-3 days

Significant clinical improvement, gradually regaining appetite and activity levels.

Medication for

2-3 weeks

The ascites and/or pleural effusion associated with wet FIP have completely resolved, and other clinical symptoms have fully alleviated. The cat's appearance is indistinguishable from that of a healthy cat.

Medication for

6-12 weeks

Discontinue medication and observe once all clinical signs and laboratory data reach healthy levels.

Stopping medication for

4 weeks

Approximately 3-5% of cases may still experience disease relapse. Among relapsed cases, 98% occur within 4 weeks after stopping medication. If no relapse is seen within 4 weeks after stopping medication, it can be declared as clinically cured.

WET

Effective Rate

Xraphconn has an efficacy rate of up to **98%** for wet-type abdominal transmission. Cats with the condition usually see significant improvement within 1-3 days of treatment and recover to a state indistinguishable from healthy cats within 2-3 weeks.

Death

While medication significantly reduced viral loads in some cats, antiviral drugs could not reverse the many complications caused by inflammatory storms. **Approximately 5% of cats, mostly kittens under 2 kg or severe cases, died within one week of treatment.**

Cure Rate

The average number of days for the disappearance of median effusion in cats with wet-type transabdominal was 11.5 days. **Approximately 90% of affected cats achieved clinical cure after the first 7-12 weeks of treatment**, but about 1-2% of cats experienced disease relapse after discontinuation of medication. They typically required a second round of treatment with higher drug doses to achieve final cure.

DRY

Effective Rate

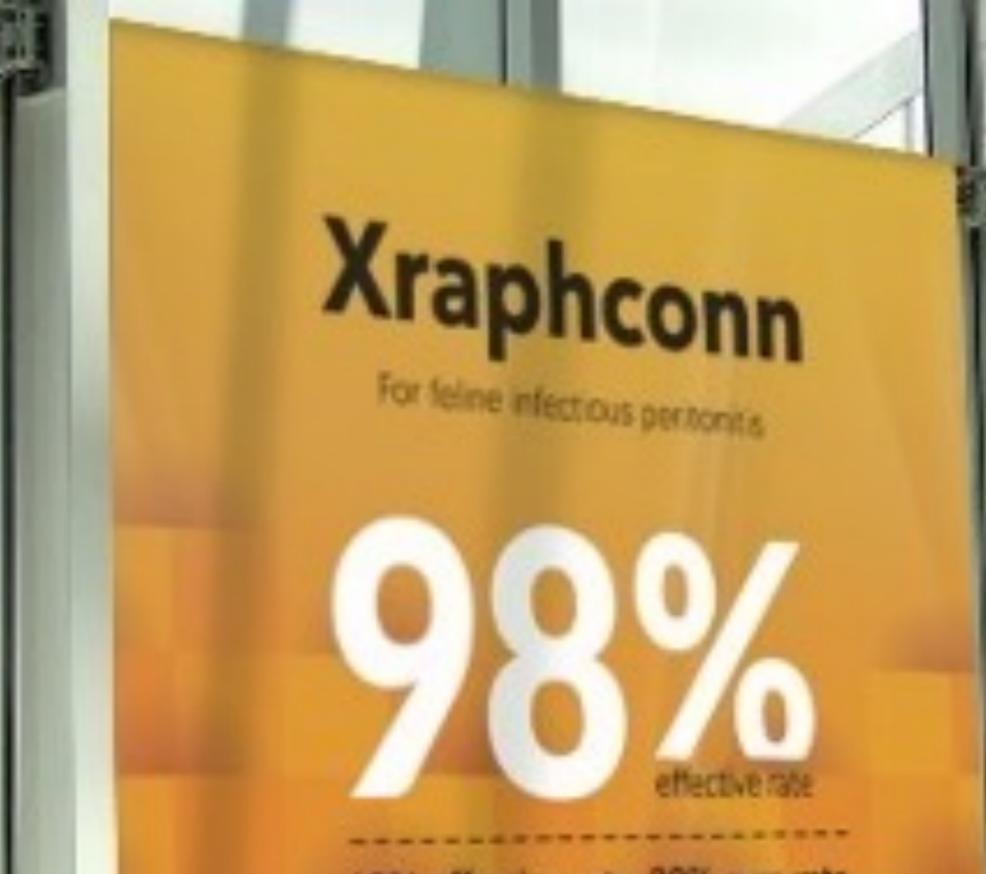
Xraphconn has an efficacy rate of up to **98%** for dry-form transmission. Cats with the disease usually see significant improvement within 1-3 days of medication and recover to a state indistinguishable from healthy cats within 1-2 weeks.

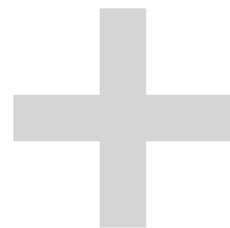
Death

Approximately 15% of cats with dry FIP develop neurological symptoms before treatment, presenting as weakness in the hind limbs, unstable posture, decreased or lost ability to jump, tremors at rest, and seizures. Due to the difficulty of drugs penetrating the blood-brain barrier, about 1/3 of cats with this type of FIP ultimately remain unable to alter the prognosis of death.

Cure Rate

Dry form FIP has a much longer disease course than the wet form, and is more difficult to diagnose. **Many cats already show neurological symptoms or eye lesions before medication, so the initial cure rate for dry form FIP is about 85%.** Approximately 3-5% of cats will experience a recurrence of the disease after stopping medication. They typically require a second or even multiple rounds of treatment with higher drug doses to be cured.



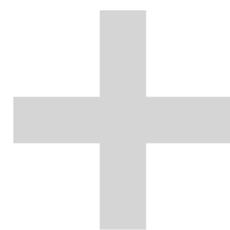


[Description]

Xraphconn® is a tablet that combats the feline infectious peritonitis virus. used to treat cats suffering from various forms of feline infectious peritonitis(FIP). MT0901 is the main active ingredient. These are inactive ingredients: Microcrystalline Cellulose, Polyvinylpolypyrrolidone cross-linked, Magnesium stearate.

[Specification]

12.5mg/ tablet;
25mg/ tablet;
50mg/ tablet;
14 tablets/box



[Description]

Xraphconn®II injection is a Colorless and transparent liquid of low viscosity, non-toxic without excitant, non-corrosive and not an environmental pollutant. Each 6ml bottle contains 120mg of the active ingredient. and other inactive ingredients: dissolved water, phosphate buffer saline, PEG 400, propylene glycol, etc

[Specification]

6ml/120mg