



Animal Health Diagnostic Center

AHDC Contacts

Phone: 607-253-3900

Web: diagcenter.vet.cornell.edu

Fax: 607-253-3943

E-mail: diagcenter@cornell.edu

AHDC FACT SHEET

FCoV (Feline Enteric Coronavirus)

Cornell's Feline Enteric Coronavirus (FCoV) test is a kinetics ELISA (KELA) assay that detects antibodies to coronavirus in serum, plasma, thoracic or peritoneal exudates of cats, but can not differentiate between antibodies of virulent and avirulent strains. We are unaware of any test that has that capability.

This test is run at a standard dilution on multiple wells on antigen and control antigen (to detect non-specific activity.) Five standards are run with every assay, and a standard curve is established. The sample titers are fit to the standard curve, thus reducing variability between different runs of the assay.

Titers with a value greater than 1:8 are considered coronavirus antibody positive. Positive titers are reported at values from 9 to >2000. In one study we found that cats with clinical signs of FIP or histopath confirmed FIP had a range of KELA titers from a low of 1:30 to greater than 1:2000. Titer level is a poor prognosticator of disease. However, with clinical signs consistent with FIP any positive titer from our laboratory may be significant. The majority of FIP confirmed cats have titers greater than 1:100 on our assays. Conversely, we have had many healthy cats that have maintained high titers for years.

A negative from our lab is significant, as no antibody to coronavirus has been detected. Over 200 diagnostic samples negative on our FIP assay were run on the competitive ELISA. They showed no competition, confirming them as coronavirus antibody negative samples.

Over the years we have looked at cats infected with many different coronaviruses, including cats vaccinated with canine corona vaccines, and cats vaccinated with the Primucell FIP vaccines. Our assay detected coronavirus antibody in each case.

- There is no FIP Specific antibody assay that can predict that a cat has or will develop FIP.
- There is no single FIP producing coronavirus.
- You can not compare titers between different labs.
- Any coronavirus infecting a cat has the potential to become virulent.
- Coronavirus titer level does NOT correlate with the probability of having or developing FIP.
- A rising titer in a healthy cat does not correlate with the probability of the cat developing FIP.
- Titer level does not correlate with the probability of a cat shedding virus.
- In one study, every coronavirus positive cat shed virus in the feces occasionally.
- The Cornell FCoV k-ELISA assay does tell you if a cat is coronavirus antibody positive or negative.
- Most cats with titers greater than 1:100 on our assay remain coronavirus antibody positive.
- One FIP loss in a multicat household or cattery does not mean that other cats will break with disease.
- PCR (polymerase chain reaction) tests have the same limitations as most serology assays. They may be too specific, thus missing some positive cats. The AHDC at Cornell is now offering a feline coronavirus PCR for use on abdominal and pleural effusions in a clinically ill cat.
- Quantitative PCRs which look for the amount of virus in feces can tell which cats are shedding at the time of testing, but do not predict which cat sheds continuously. Breeders will need to understand that multiple fecal PCRs will be necessary to determine which cat sheds constantly. PCR on a fecal pellet is a snapshot of the status of the cat at the time the sample was collected.



Animal Health Diagnostic Center

AHDC Contacts

Phone: 607-253-3900

Web: diagcenter.vet.cornell.edu

Fax: 607-253-3943

E-mail: diagcenter@cornell.edu

AHDC FACT SHEET

Feline Coronavirus (FCoV) RT-PCR

Feline Coronavirus (FCoV) is a common viral infection in cats. It generally causes asymptomatic infection, but can cause mild diarrhea. As yet poorly understood changes in the virus can give rise to mutants that lead to the development of feline infectious peritonitis (FIP). Most cats infected with a FCoV eliminate virus following infection, but some cats may develop a persistent infection. These cats are generally asymptomatic, can shed large amounts of virus in feces, and serve as a continual source of infection for other cats in the environment. Continual circulation of FCoV within a cat population may increase the chance that a virulent FIP strain might emerge. While the pathogenesis of FIP is poorly understood, it is now believed that detection and removal of persistently infected and shedding cats in a multicat household can reduce the risk of FIP emergence within that population.

In response to the increased interest within the cat breeding and cat owning community, the Animal Health Diagnostic Center at Cornell University now offers a fecal RT-PCR test for FCoV. This test can be used to identify asymptomatic FCoV shedding cats so steps can be taken to isolate them from other cats or to prevent their introduction to a resident population. Samples required for the fecal RT-PCR screening test are 2-5 grams fresh feces. When screening an individual cat in a multicat household it is important to positively identify the source of the fecal sample. Mixing of fecal samples from multiple cats may result in an inaccurate result. Feces should be stored in a clean plastic bag to prevent dehydration.

In clinical FIP suspect cats, the test can also identify FCoV in ascites fluid, whole blood, plasma, serum or fresh tissues (kidney, liver, or spleen). Samples from FIP-suspects should include 1-2 ml of fluid (ascites, whole blood, serum, or plasma) or 1-2 grams of fresh tissues.

All samples should be shipped in a leak-proof container to the laboratory by overnight courier on ice packs for optimal test outcomes.

Fecal FCoV RT-PCR tests should be interpreted cautiously. Single positive or negative tests are meaningless as cats may shed intermittently or may be recently infected. To be identified as a chronic shedding carrier, a cat should be fecal virus positive on multiple tests over an 8-month period. A cat that tests negative on monthly tests over a 5-month period of time may be considered a non-shedder. (Addie D.D., Jarrett O. 2001 Use of a reverse-transcriptase polymerase chain reaction for monitoring the shedding of feline coronavirus by healthy cats. *Veterinary Record*. Vol 148. pp. 649-653.)

In a cat with clinical signs consistent with FIP, FCoV RT-PCR positive results on fluids or tissues may indicate active FIP. FCoV RT-PCR positive results in tissues from a clinically normal cat are only indicative of infection with FCoV.



Animal Health Diagnostic Center

AHDC Contacts

Phone: 607-253-3900

Web: diagcenter.vet.cornell.edu

Fax: 607-253-3943

E-mail: diagcenter@cornell.edu

AHDC FACT SHEET

Canine Lyme Diagnosis

Canine ELISA test: Only valid for dogs that have not experienced vaccination with one of the Lyme vaccines. This test does not distinguish between antibodies to vaccination and infection.

- ✓ Results reported as Negative are 99+% specific (antibody levels less than 100 ELISA units)
- ✓ Results reported as Positive are 99+% sensitive (antibody levels greater than 200 ELISA units)
- ✓ Results ranging from 100-200 ELISA units are reported as Equivocal and require a Western Blot to confirm infection and/or vaccination status.

Canine Western Blot: a confirmatory assay

- ✓ The test will detect antibody to either infection or vaccination, or both.
- ✓ Vaccinal antibody may wane by as few as 10 months or may remain high for over 8 years (with no booster beyond the initial vaccinations).
- ✓ Waning responses are more common than long term elevated titers to vaccination.
- ✓ The degree of antibody response to vaccination appears to be an individual dog response, not a result of the type of vaccine used.
- ✓ Dogs that have been vaccinated, even once, should be tested by Western Blot to distinguish vaccinal from infection responses.
- ✓ Infected dogs must have 3 of 5 specific bands to be classified as positive. This requirement assures that no false positives are inferred.

Clinical diagnosis:

- ✓ There are four principal criteria for diagnosing Lyme disease in dogs:
 - History of exposure to *Ixodes* ticks in an endemic area
 - Typical clinical signs
 - Positive serology with a properly validated assay
 - Apparent response to antibiotic therapy when the disease is caused by infection
- ✓ Clinical Signs associated with Lyme disease:
 - Abnormalities of the musculoskeletal and joint system with anorexia and lethargy.
 - Sudden onset lameness with hot swollen joints.
 - Depression, myalgia, swollen lymph nodes and mildly elevated rectal temperatures.
 - Glomerulonephritis with protein losing nephropathy is a rare but often fatal outcome of lyme disease.
- ✓ Rule outs should include rheumatoid, infectious or immune-mediated arthritis, osteopathies, degenerative joint disease and other infectious diseases including Rocky Mountain Spotted Fever, ehrlichiosis and bacterial endocarditis.
- ✓ Most infected dogs never show any significant signs of Lyme disease. In endemic areas, up to 90% of dogs may be infected. However, only 5 to 10% of these become symptomatic.
- ✓ Most dogs resolve clinical signs spontaneously but some dogs exhibit multiple episodes.
- ✓ Antibiotic therapy may reduce the load of organisms in infected dogs but does not eliminate all of them.
- ✓ The organism sequesters in fascia, connective tissue, and muscle. Infected dogs remain Lyme positive for years even following appropriate antibiotic therapy.
- ✓ We suggest testing dogs prior to vaccination, so that you know if the dog has an existing infection.
- ✓ Dogs that are antibody positive for infection should have concurrent antibiotic therapy if they are ever treated with steroids.



Equine Lyme Disease Testing

SUGGESTIONS FOR SUBMITTING SAMPLES:

1. Please use a different accession form for each OWNER, please indicate breed as this will help us correctly match up future submissions on the same horses.
2. If testing is routine surveillance of animals please tell us. We will NOT pair these samples with previous submissions.
3. If testing is to check on response to treatment –
 - a. The initial post treatment test should not be obtained until 4 months after treatment initiation. Generally, significant changes in antibody titers are not detectable before this.
 - b. Please provide us with the previous Lyme Accession number as it will help us locate the initial sample for comparison.
 - c. Tell us you are checking treatment response.
 - d. Please request the Western Blot if you know you will want those results as we do not automatically do this. Otherwise we will run the ELISA paired, and NOT add the Western even if the results are in the equivocal range.
4. If the horse has been **vaccinated** for Lyme **ALWAYS** request the Western Blot and give us the date (month/year) of the Lyme vaccine. Western Blot is the only way to determine the origin of Lyme-specific antibody in vaccinated horses.
5. We will continue to add Western Blots to those samples with results in the equivocal range unless you request otherwise.
6. If you know you want Western Blots on all positive samples – please let us know and we will automatically add the WB to all equivocal and positive samples from your practice.
7. If the horse is symptomatic, you may wish to request the Western Blot in all cases.

EQUINE LYME SERODIAGNOSIS:

Equine ELISA: Equine ELISAs are prone to false positive results. The ELISA is run only as a screening test.

- **Western Blot** is required to confirm horses that have ELISA results in the equivocal range (130 – 380 ELISA Units.)
- **Western Blot** is required to determine the origin of Lyme-specific antibody in vaccinated horses.
- About 52% of horses tested in ELISA give equivocal results and require Western Blot confirmation.
- Horses must have 4 of the 5 bands to assure that no false positives are reported.
- Horses are often symptomatic early in infection (when they test equivocal on both ELISA and Western Blot) and may respond well to antibiotics at that stage.