Diagnosing FeLV and FIV

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Introduction

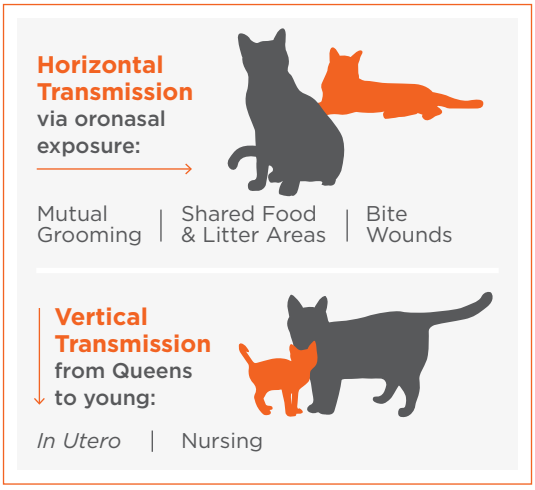
Feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) are among the most common causes of infectious diseases in cats.[1] Of 2.5 million cats tested in North America between 2008 and 2016, FeLV Antigen prevalence was 4% and FIV Antibody prevalence was 5%.[2] FeLV is typically progressive and fatal; infected cats can develop anemia, cancer or a weakened immune system, among other ailments.[3] FIV decreases the function of the immune system; infected cats remain infected for life, are more likely to acquire other types of infections, and have an increased risk of developing certain types of blood cancers.[2] The objective of this paper is to better understand the importance of FeLV and FIV diagnostic testing and to report the accuracy of the point-of-care VETSCAN® FeLV/FIV Rapid Test and WITNESS® FeLV/FIV Rapid Test.

FeLV and FIV Transmission

FeLV-positive cats transmit the virus both horizontally and vertically.[4] This highly contagious virus is passed horizontally via oronasal exposure with an infected animal.[4] Salivary or urinary waste exchange between cats in close interaction (such as mutual grooming or shared food and litter areas) are thought to be the primary means of horizontal transmission, although infection via a bite is also possible.[4] FeLV can be passed vertically from queens to their young *in utero* or through nursing.[4] In fact, it is probable that the "single greatest source" of transmission is from FeLV-positive females to their offspring.[3]

FIV-positive cats transmit the virus horizontally through bite wounds that introduce saliva containing virus and FIV-infected white blood cells.[1] Vertical transmission of FIV from infected queens to their kittens has been demonstrated experimentally.[5,6] However, vertical transmission appears to be uncommon in naturally infected cats.[7,8] Please see Figure 1 regarding horizontal and vertical transmission.

Figure 1: Modes of Viral Transmission



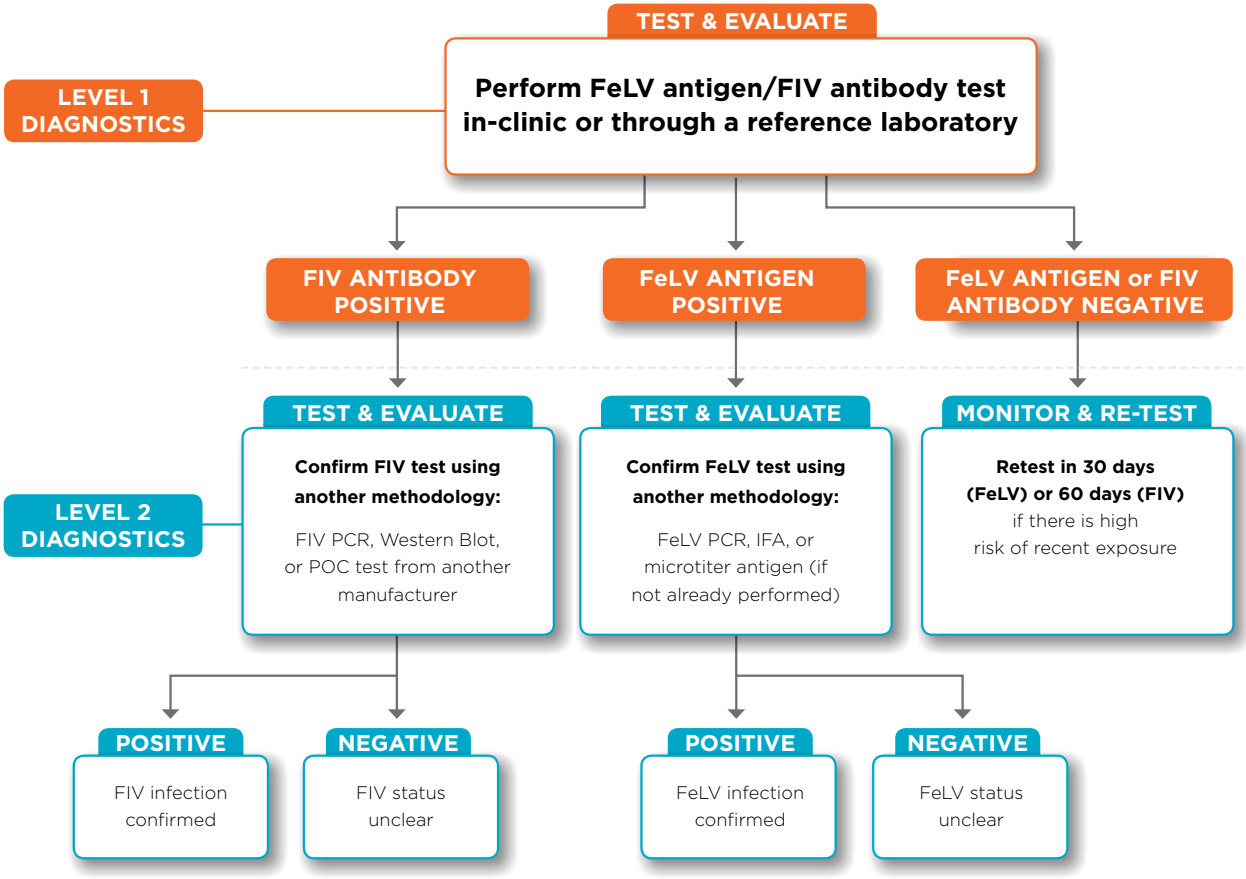
Why Test for FeLV and FIV?

Because of the many possible modes of transmission, serious effects to the health of an infected cat, and the absence of a cure, prevention is a mainstay of control of retroviral infections. Although vaccines are available for FeLV in many countries and for FIV in some countries, identification of infected cats remains an important factor for preventing new infections.[1] The American Feline Association of Feline Practitioners® (AAFP) recommends cats to be tested as soon as possible after they are acquired, following exposure to an infected cat or a cat of unknown infection status, prior to vaccination against FeLV or FIV, and whenever clinical illness occurs.[1]

FeLV and FIV Diagnosis

The AAFP states that it might not be possible to determine a cat's infection status based on testing at a single point in time, so repeat testing using different methods could be required.[1] Both point-of-care and reference laboratory tests are available for FeLV and FIV. The VETSCAN FeLV/FIV Rapid Test and WITNESS FeLV/FIV Rapid Test are both point-of-care tests used for the detection of FeLV antigen and FIV antibodies in feline whole blood, serum or plasma. Reference lab tests include FeLV/FIV PCR, FIV Western Blot, and FeLV IFA (See Figure 2 for Diagnostic Algorithm and test definitions).

Figure 2. Diagnostic Algorithm for Retrovirus Infection[4]



Level 1 diagnostics might be sufficient in circumstances where the test results are consistent with the patient's signalment and clinical signs.

Level 2 diagnostics can be appropriate to clarify infection status in some patients. This diagnostic algorithm will correctly identify the true infection status for most cats. Regressive feline leukemia virus (FeLV) infections, recent exposure, atypical responses and changes in the immune response over time complicate the interpretation and reliability of tests performed at a single point in time. The true status of cats with discordant results can be difficult to resolve.

FIV = feline immunodeficiency virus
IFA = immunofluorescent antibody
POC = point-of-care
PCR = polymerase chain reaction

Results from studies, including data submitted to the USDA, to demonstrate the accuracy of both VETSCAN FeLV/FIV Rapid Tests and WITNESS FeLV/FIV Rapid Tests

VETSCAN FeLV/FIV Rapid Test Study Design and Results (FeLV study)[9]

For the purpose of this study, 107 samples (47 infected cats and 60 healthy controls) from Zoetis' study archives were randomized and tested for the presence of the FeLV antigen. PCR and IFA testing were used as comparative reference methods to determine the sensitivity and specificity of VETSCAN FeLV/FIV Rapid Test and IDEXX SNAP® FIV/FeLV Combo Test. Prior to point-of-care testing, samples were also examined using the enzyme linked immunosorbent assay (ELISA) test, ViraCHEK® FeLV, to confirm the antigen status. No FIV data were recorded for this study.

The FeLV sensitivity and specificity rates of VETSCAN FeLV/FIV Rapid Test when compared to SNAP FIV/FeLV Combo Test, were 97.4% and 100% respectively.[9] (See Table 1 for additional test comparisons).

Table 1. FeLV Sensitivity and Specificity of VETSCAN FeLV/FIV Rapid Test vs. other testing methods[9]

PERFORMANCE	VETSCAN FeLV/FIV Rapid Test			
Sensitivity	94.7% (95% CI: 82.3%-99.4%)	83.0% (95% CI: 72.2%-93.7%)	95.0% (N/A**)	97.4% (N/A**)
Specificity	97.4% (N/A*)	100% (95% CI: 94.0%-100%)	100% (N/A**)	100% (N/A**)
COMPARISONS	vs. IFA	vs. PCR	vs. ViraCHEK FeLV	vs. SNAP FIV/FeLV Combo

*95% CI not available for IFA only results because IFA was not performed on SPF negative samples.
**95% CI on sensitivity and specificity not available for comparative tests.

Study Conclusions

The results of this study suggested that VETSCAN FeLV/FIV Rapid Test is highly accurate in detecting FeLV antigen in serum of experimentally infected cats. When compared to IFA, ViraChek FeLV and SNAP FIV/FeLV Combo, the performance of VETSCAN FeLV/FIV Rapid Test significantly correlated.

WITNESS FeLV/FIV Rapid Test Study Design and Result (FeLV study)†

This study compared the performance of WITNESS FeLV/FIV Rapid test and SNAP FIV/FeLV Combo Test for the detection of FeLV antigen in experimentally infected cats. Serum samples from 47 FeLV-infected cats were tested 56 days post infection; 92 uninfected cats served as controls. Infection with FeLV was confirmed using IFA and PCR. Performance to detect FIV antibodies was not conducted in this study.

Table 2. WITNESS FeLV/FIV Rapid Test and SNAP FIV/FeLV Combo Test[10]

PERFORMANCE	WITNESS FeLV/FIV		SNAP FIV/FeLV Combo	
Sensitivity	100% (95% CI: 94.1-100%)	91.5% (95% CI: 81.0-97.1%)	100% (95% CI: 94.1- 100%)	91.5% (95% CI: 81.0- 97.1%)
Specificity	97.8% (95% CI: 93.2-99.5%)	100% (95% CI: 97.1-100%)	97.8% (95% CI: 93.2-99.5%)	100% (95% CI: 97.1- 100%)
COMPARISONS	vs. IFA	vs. PCR	vs. IFA	vs. PCR

†Both performed equivalently in identifying FeLV antigen in experimentally infected cats.

Study Conclusion

WITNESS FeLV/FIV and SNAP FIV/FeLV Combo point-of-care tests performed equivalently in identifying FeLV antigen in experimentally infected cats.

Additional VETSCAN and WITNESS FeLV/FIV Rapid Test Study Conclusions

Additional studies using USDA submission data have also demonstrated high sensitivity and specificity for both VETSCAN FeLV/FIV Rapid Test and WITNESS FeLV/FIV Rapid Test (Table 3).

Table 3. VETSCAN FeLV/FIV Rapid Test and WITNESS FeLV/FIV Rapid Test Accuracy[11-13,††]

PERFORMANCE	VETSCAN FeLV/FIV		WITNESS FeLV/FIV Accuracy	
Sensitivity	94.6%	99.2%	92.9%	96.5%
Specificity	99.4%	99.2%	93.8%	93.4%
COMPARISONS	FeLV	FIV	FeLV	FIV

††FeLV compared to ELISA, FIV compared to ELISA and IFA.

Conclusion

The AAFP recommends for cats to be tested for FeLV and FIV as soon as possible after they are acquired, following exposure to an infected cat or a cat of unknown infection status, prior to vaccination, and whenever clinical illness occurs.[1]

Sensitivity and specificity outcomes of the comparative studies of VETSCAN FeLV/FIV and WITNESS FeLV/FIV Rapid Test demonstrated the reliability of these point-of-care tests for identifying the FeLV antigen in infected cats.[9] Other studies using USDA-submitted data have demonstrated that both VETSCAN® FeLV/FIV Rapid Test and WITNESS FeLV/FIV Rapid Test are highly sensitive and specific tests for the detection of FeLV antigen and FIV antibodies.[10-12]

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