



+ + +

Screening for feline infectious diseases

FIV, FeLV, and feline heartworm clinical reference guide

IDEXX

Table of contents

American Association of Feline Practitioners (AAFP).....	3
Disease prevalence data and maps.....	4
Feline immunodeficiency virus (FIV) infection.....	5
Diagnostic algorithm for diagnosis of FIV.....	6
Feline leukemia virus (FeLV) infection.....	7
Diagnostic algorithm for diagnosis and staging of FeLV infection.....	8
Perform follow-up testing with FeLV Antigen by ELISA and FeLV Quant RealPCR* Test.....	9
Retrovirus-positive cats need regular veterinary care.....	10
Disease management.....	11
Feline heartworm infection.....	12
Feline heartworm (FeHW) diagnostic algorithm.....	14
Heartworm treatment.....	15



American Association of Feline Practitioners (AAFP) recommendations

The retrovirus status of every cat should be known.

FelV and FIV infections are associated with a variety of clinical signs and can affect both longevity and the quality of life of cats. Understanding the retrovirus status of every cat allows better management of infected individuals and allows veterinarians to provide practical advice to owners to minimize the spread of these diseases.¹

The AAFP recommends testing cats and kittens at the time they are acquired, prior to initial vaccination for FelV (or FIV in regions the vaccine is available), following potential exposure to infected cats or cats of unknown status, and when presenting for illness, even if they have previously tested negative.

All at-risk cats should be tested annually.

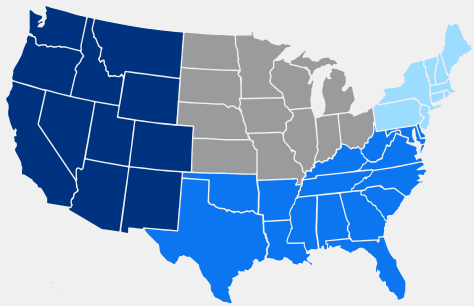
At-risk cats are those who:

- + Spend time outdoors.
- + Live with or come in contact with cats of unknown retrovirus status.
- + Live with or come in contact with known retrovirus-positive cats.
- + Present with bite wounds, evidence of fighting, abscesses.

Disease prevalence data and maps

FeLV and FIV infect cats worldwide.

A 2017 publication outlines the seroprevalence of these viruses in the United States and Canada.²



7,165 cats
FeLV 3.3%
FIV 3.9%

17,423 cats
FeLV 3.7%
FIV 3.3%

22,131 cats
FeLV 3.1%
FIV 4.0%

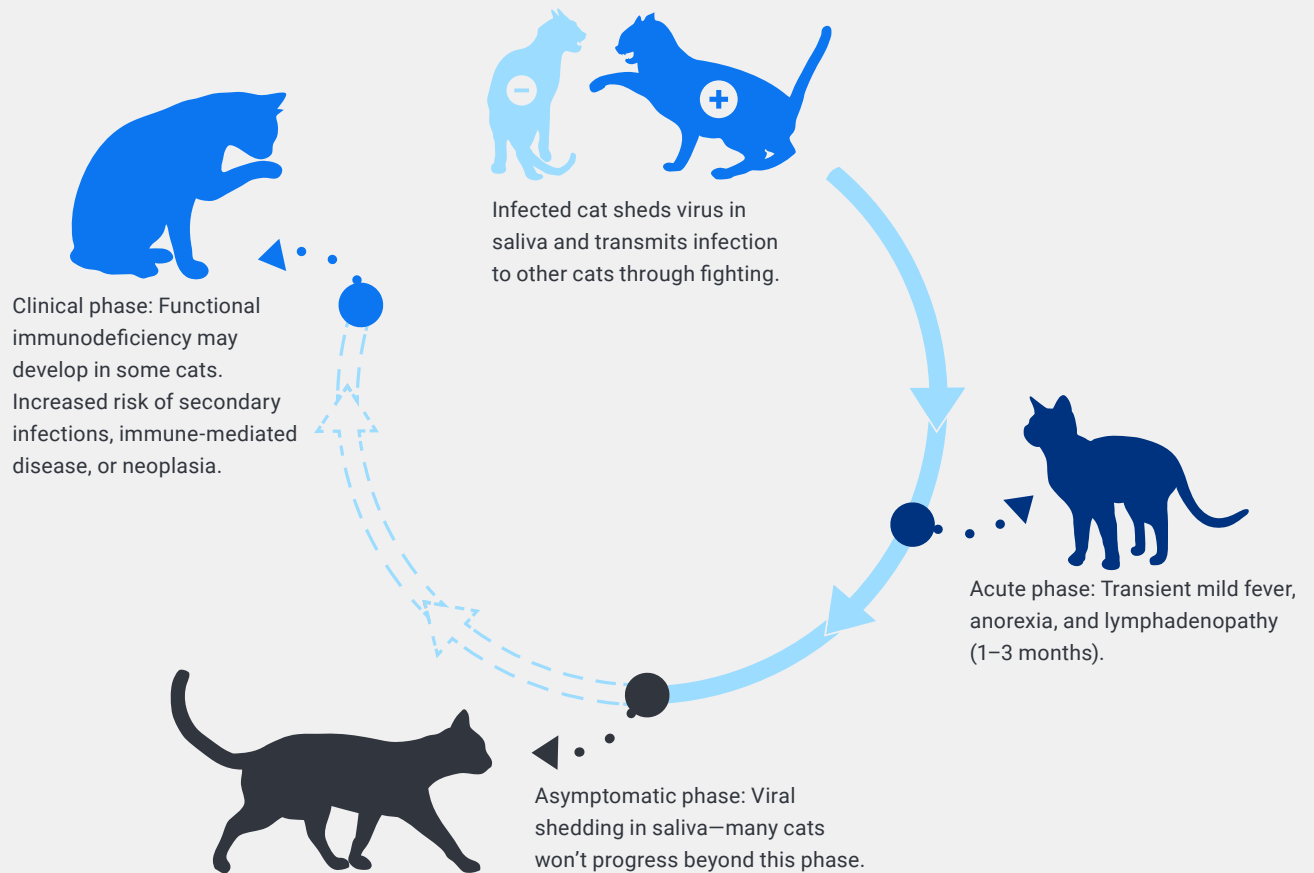
14,701 cats
FeLV 2.4%
FIV 3.3%



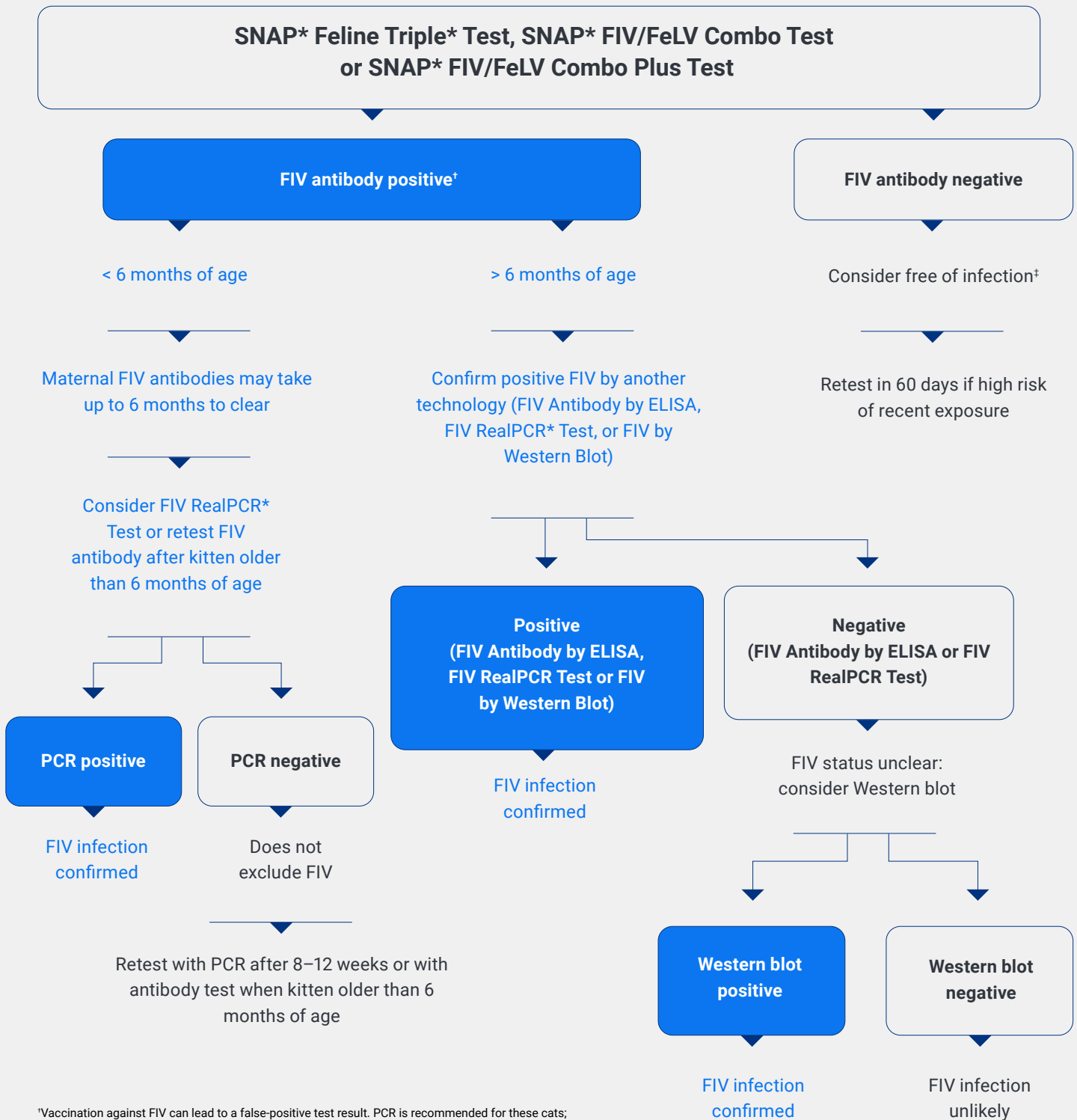
881 cats
FeLV 2.4%
FIV 1.2%

Feline immunodeficiency virus (FIV) infection

FIV is shed in high concentrations in the saliva, therefore most cases of FIV come through an infected cat passing it to another through bite and/or fight wounds. That makes outdoor cats especially vulnerable.¹ Transmission of FIV from infected queens to their kittens has been reported in laboratory-reared kittens.³



Diagnostic algorithm for diagnosis of FIV



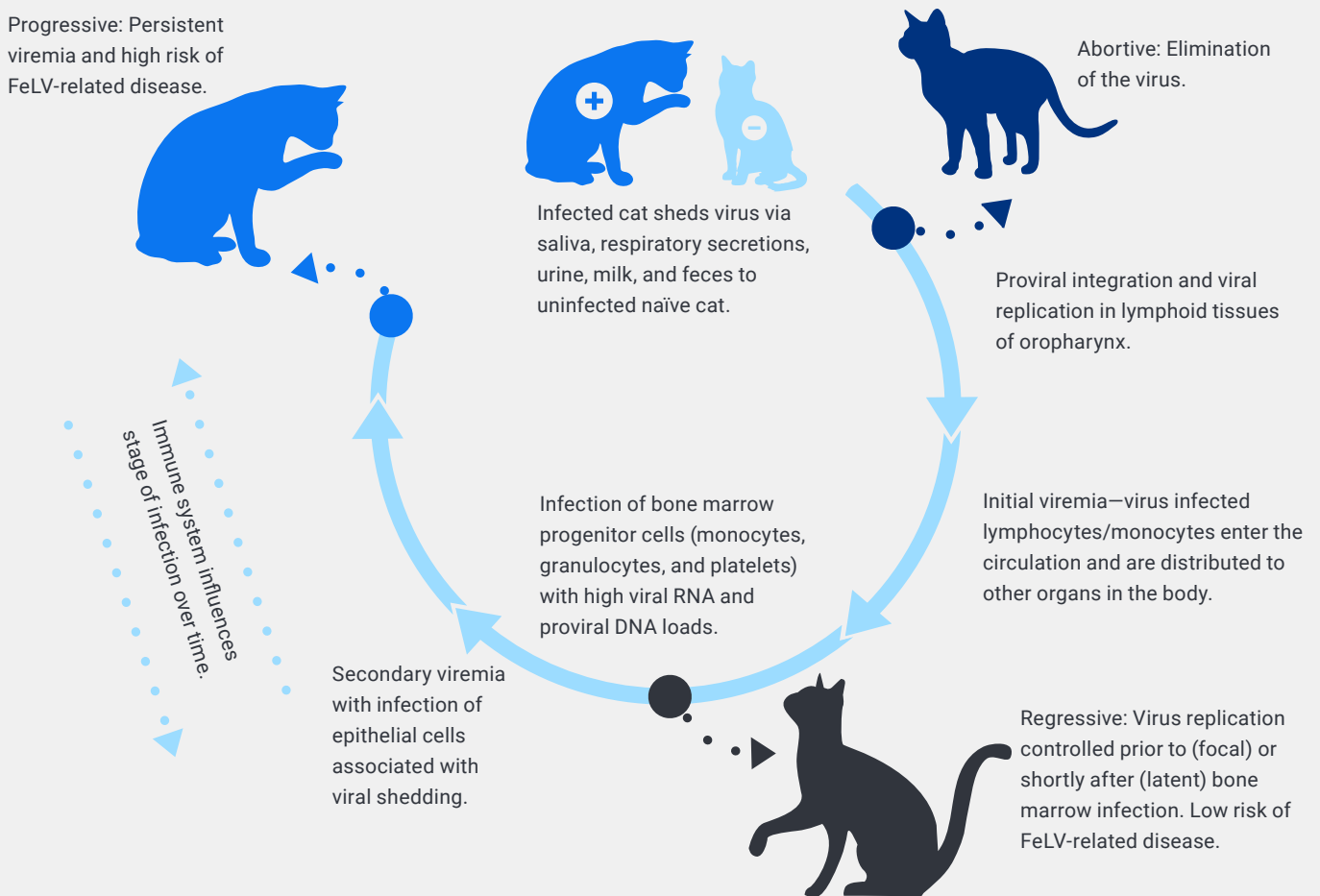
*Vaccination against FIV can lead to a false-positive test result. PCR is recommended for these cats; currently, FIV vaccine availability limited to Australia and New Zealand.

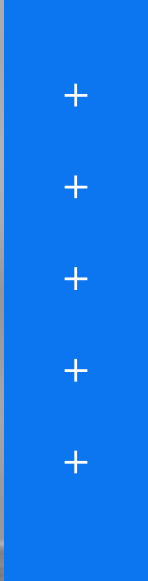
†In terminal phase of the disease or in early infection, false-negative antibody result possible; consider PCR.

Feline leukemia virus (FeLV) infection

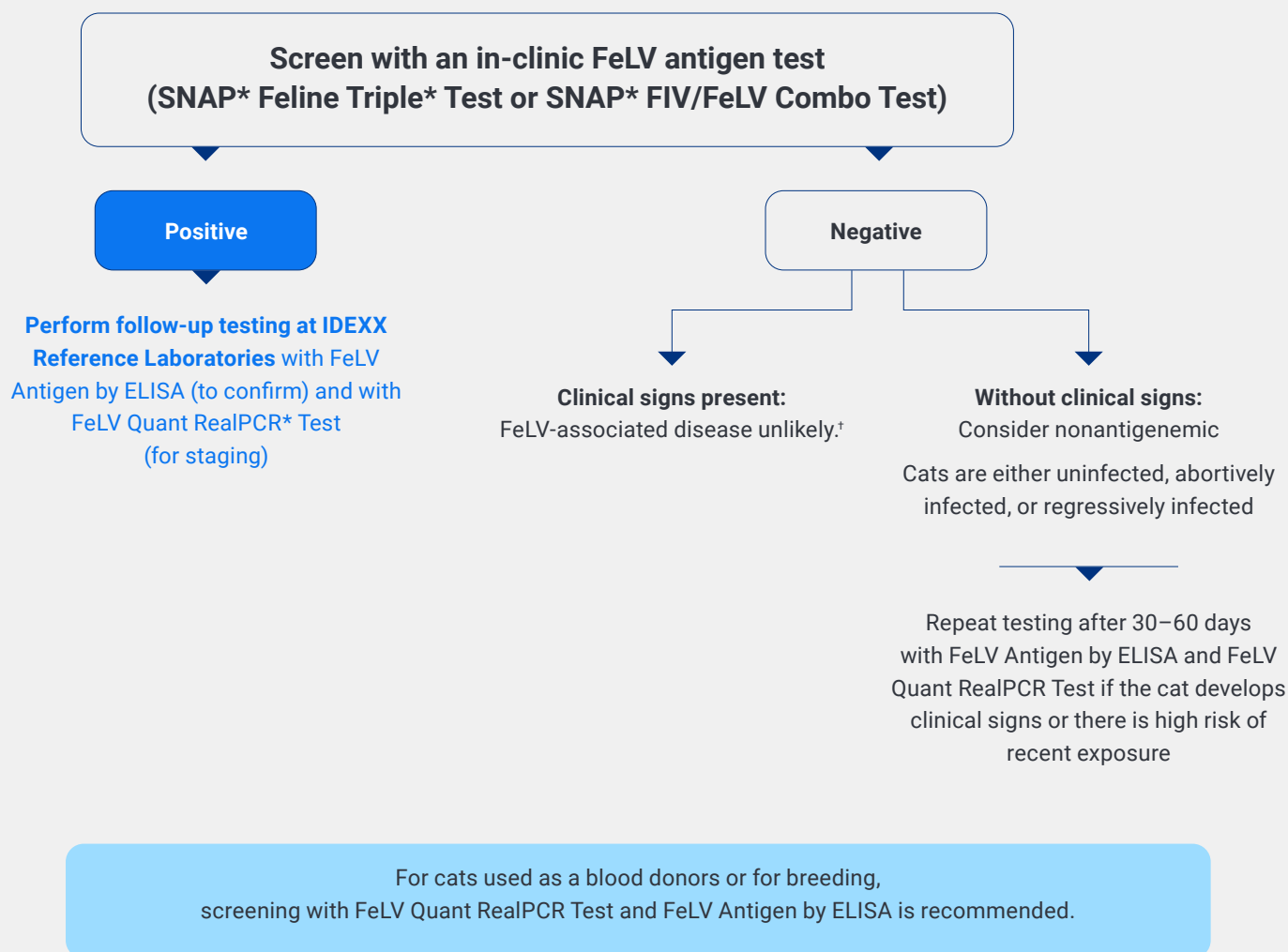
Transmission of feline leukemia virus: Transmission occurs between cats in close contact with each other primarily through the oral nasal route or bite wounds. Vertical or horizontal transmission can also occur between a queen and her kittens. Kittens and young cats are more susceptible to FeLV infection while there is more resistance among older cats. However, there have been studies showing that older cats can become infected, and therefore, FeLV should not be considered a disease of only the young.⁴

The clinical course of FeLV infection is largely determined in the early phase of the infection by the virus-host interactions. However, this balance can shift later in the course of infection and the cat can change to another stage of infection.⁵ Progressive infection is characterized by higher levels of FeLV provirus and antigen, while lower levels of FeLV provirus and antigen are associated with regressive infection.^{6,7}





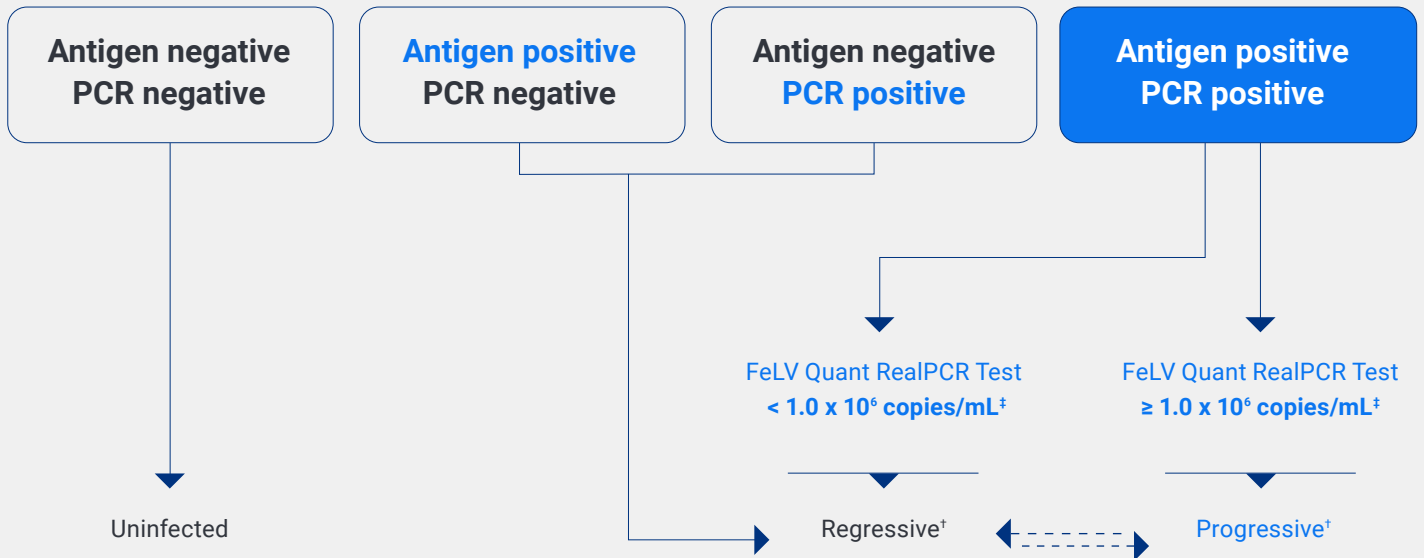
Diagnostic algorithm for diagnosis and staging of FeLV infection



†Lymphoma and bone marrow suppression has been described occasionally in regressively infected cats. The FeLV Quant RealPCR Test can be considered.

Perform follow-up testing with FeLV Antigen by ELISA and FeLV Quant RealPCR* Test

Staging of infection based on test results



Did you know?

If you get a positive result for FeLV antigen, then we recommend you follow up with the FeLV Antigen by ELISA and FeLV Quant RealPCR Test, which when combined, they provide information for staging and assist with determining prognosis.

ELISA gives a yes/no for confirmation of FeLV antigen detection. The FeLV Quant RealPCR Test quantifies the viral load, which helps stage the infection as either a progressive or regressive infection, providing important prognostic information.

*Cats can shift between progressive and regressive infection over the course of the disease. If clinical signs develop, retesting with quantitative real-time PCR is recommended to confirm evidence of progression versus comorbidity with another disease.

†Proviral DNA load (copies/mL) according to Beall et al.^{6,7}

Retrovirus-positive cats need regular veterinary care

Detect changes in their health status with preventive care exams every 6 months. These exams should include:

- + Detailed history to determine if the cat is showing clinical signs at home that require specific considerations. Physical exam with thorough assessment of oral cavity, lymph nodes, eyes, and skin.
- + Appropriate prophylaxis for internal and external parasites.
- + Nutritional assessment and evaluation of body condition score (BCS) and muscle condition score (MCS).
- + Vaccination based on individual risk assessment. Retrovirus-positive cats can develop severe clinical disease associated with upper respiratory infection or panleukopenia. Therefore, vaccination should be performed regularly based on published guidelines.⁸
- + Diagnostic testing: CBC, chemistry with SDMA, complete urinalysis, and add a total T₄ in older cats.



Disease management

With proper care and management, retrovirus-positive cats can live long and happy lives, especially those with FIV or regressive FeLV.

Husbandry

- + Provide good-quality diet.
- + Avoid overcrowding.
- + Keep indoors.
- + Monitor for signs of illness.
- + Enrich environment.

Risk reduction

- + Reduce stress.
- + Minimize fighting.
- + Reduce infections.

Veterinary healthcare

- + Regular examinations.
- + Parasite screening.
- + Annual diagnostic testing.
- + Vaccination.

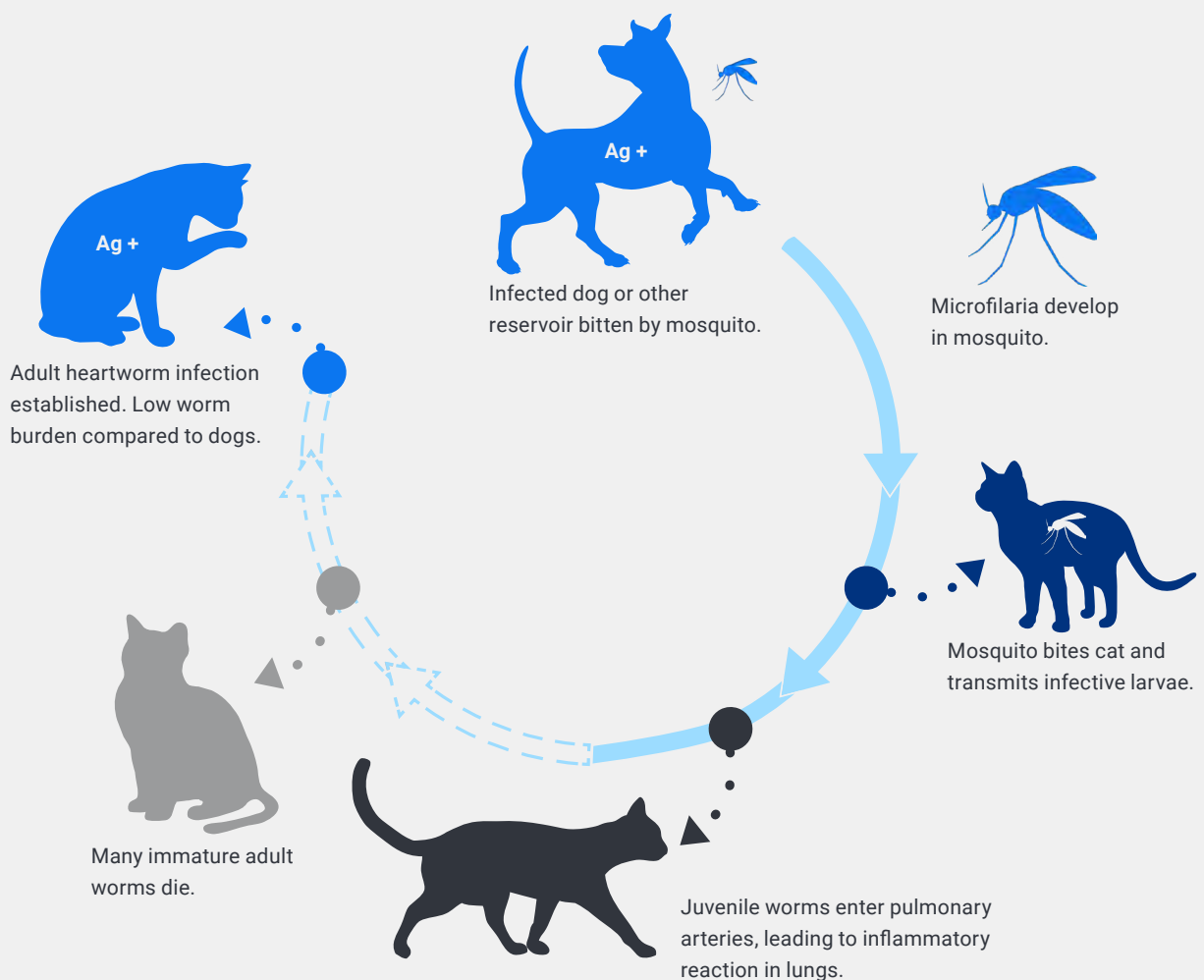
Feline heartworm infection

Feline heartworm infections are diagnosed worldwide in regions with tropical or temperate climates.^{9,10} The number of cats infected is thought to be 9%–18% of the prevalence of dogs in endemic areas.¹¹ One recent study showed the prevalence of heartworm disease in at-risk cats in endemic areas is statistically similar to the prevalence in dogs when using antigen and antibody testing in parallel.¹² The occurrence and distribution of *Dirofilaria* spp. is dependent on various environmental factors, such as environmental temperature, density of vectors, and introduction of new mosquito species, and new reservoirs, such as wild canid populations.^{13,14}

In response to climate change, created by humans, heartworm disease is being found in areas where the climate was not originally suitable for the spread of the parasites and their vectors.^{11,15}

Anywhere dogs are susceptible to heartworm, cats are at risk too!

Pathogenesis and life cycle



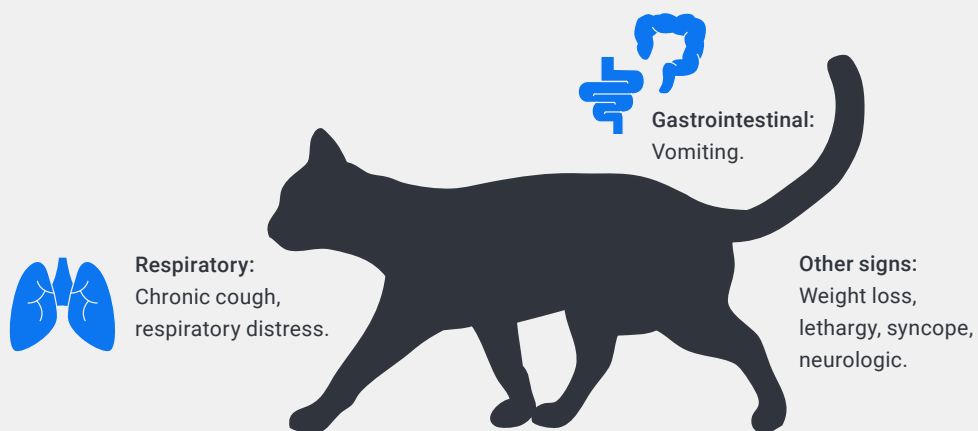
Clinical signs and diagnosis

- + Clinical signs are nonspecific and some cats may be asymptomatic.
- + Respiratory and gastrointestinal signs are common.
- + Sudden death may occur due to heartworm-associated respiratory disease (HARD).
- + Heartworm infection in cats may be difficult to diagnose by clinical signs alone.

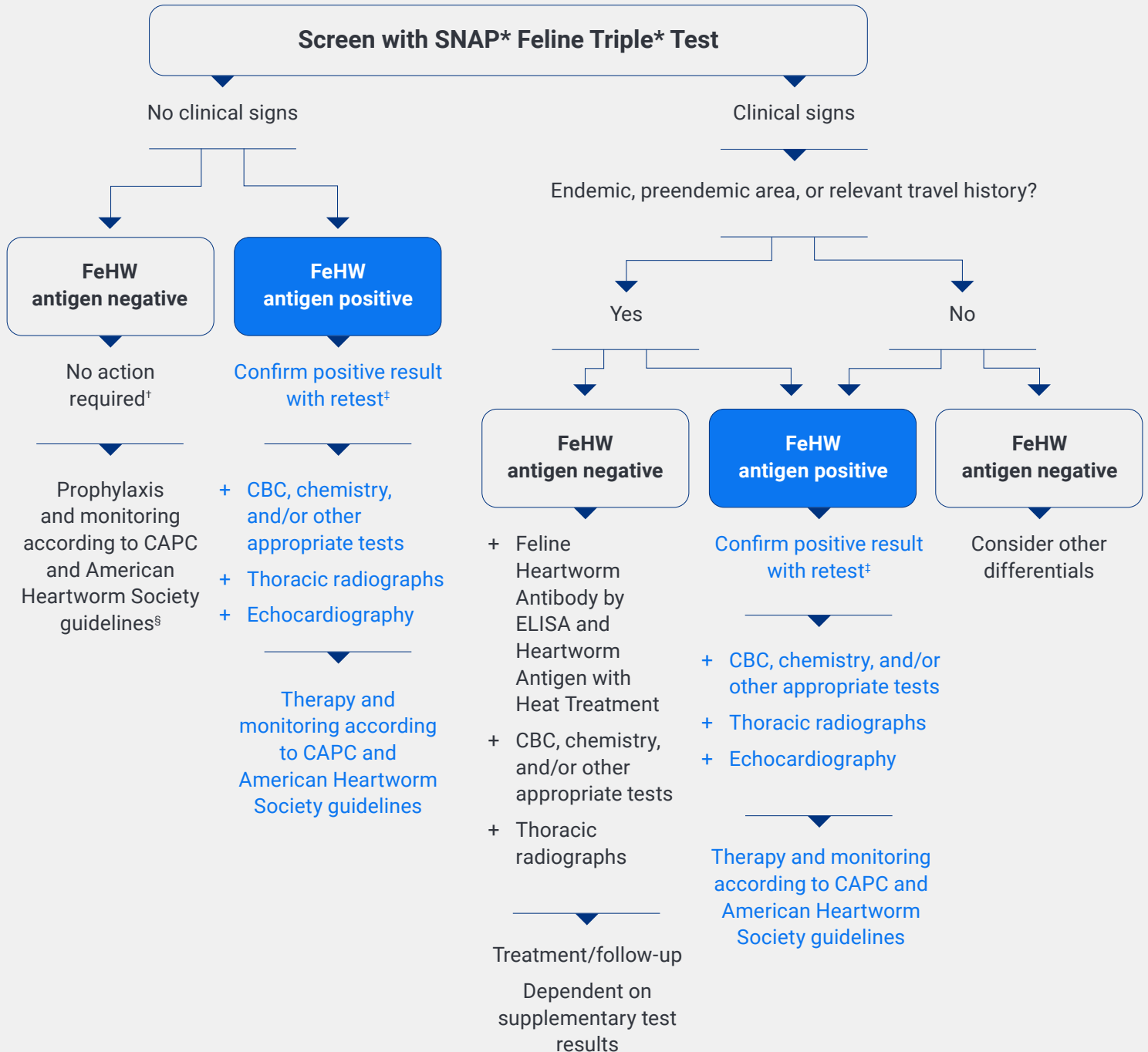
Antibody tests detect antibodies produced by the cat in response to the presence of heartworm larvae. These tests may detect infections as early as 8 weeks after transmission by the mosquito. Studies have shown a wide range in sensitivity for antibody tests.⁸

Antigen tests are the “gold standard” in diagnosing heartworms in dogs, but because low worm burden infections and immature infections are more common in cats, these tests can be negative in cats even if they show clinical signs, such as HARD. In the cat, detectable antigenemia develops at about 5.5–8 months postinfection.

A positive heartworm antigen test provides a diagnosis for adult feline heartworms. The disadvantage of an antigen test is that it cannot detect heartworm infection prior to the adult phase, at about 5.5–8 months postinfection. An antibody test detects exposure as early as 2 months after transmission by the mosquito. However, an antibody test cannot differentiate between cats that have been exposed and are currently infected versus cats that have been exposed but have cleared the infection. When used together, antibody and antigen tests increase the probability of making a diagnosis of heartworm infection in cats. Thoracic radiographs and echocardiogram can help further clarify if a cat has an active infection.



Feline heartworm (FeHW) diagnostic algorithm



*In endemic and preendemic areas or cats with relevant travel history, consider the Feline Heartworm Antibody by ELISA.

†The Heartworm Antigen by ELISA with Heat Treatment is recommended.

§CAPC is the Companion Animal Parasite Council.

Heartworm treatment

Treatment

Adulticide therapy is not recommended in cats. If a cat has no clinical signs, no specific treatment is required while giving the cat time to recover and clear the infection spontaneously. Cats with respiratory or GI clinical signs can be managed with steroids, broncho dilators and supportive therapy as needed. Aspirin and NSAIDs have failed to produce a significant benefit.

Surveillance of infected cats

Serologic retesting with antigen and antibody tests at 6- to 12-month intervals to monitor infection status is recommended for all infected cats whether or not they have clinical signs that are treated medically or if surgical techniques are performed to remove the adult worms. Once adult heartworm infection has been diagnosed, monitoring will be most informative if both antibody and antigen testing are performed.

Prevention

Monthly heartworm preventives are an effective option for at-risk cats, such as cats living in areas where heartworm is endemic in dogs or if there is risk of exposure to mosquitos. Even indoor cats may be at risk of mosquito exposure as mosquitoes can invade the home. For additional information on heartworm treatment options, visit American Heartworm Society's 2020 Feline Guidelines Summary.¹⁵





IDEXX

References

1. Little S, Levy J, Hartmann K, et al. 2020 AAHP Feline Retrovirus Testing and Management Guidelines. *J Feline Med Surg*. 2020;22(1):5–30. doi:10.1177/1098612X19895940
2. Burling AN, Levy JK, Scott HM, Tucker SJ, Wood EG, Foster JD. Seroprevalences of feline leukemia virus and feline immunodeficiency virus infection in cats in the United States and Canada and risk factors for seropositivity. *JAVMA*. 2017;251(2):187–194. doi:10.2460/javma.251.2.187
3. Sellon RK, Hartmann K. Feline immunodeficiency virus infection. In: Sykes JE, Greene CE. *Infectious Diseases of the Dog and Cat*. 4th ed. Elsevier, 2012:136–149. doi:10.1016/j.vetimm.2011.06.003
4. Hartmann K. Clinical aspects of feline immunodeficiency and feline leukemia virus infection. *Vet Immunol Immunopathol*. 2011;143(3-4):190–201. doi:10.1016/j.vetimm.2011.06.003
5. Hofmann-Lehmann R, Hartmann K. Feline leukaemia virus infection: A practical approach to diagnosis. *J Feline Med Surg*. 2020;22(9):831–846. doi:10.1177/1098612X20941785
6. Beall MJ, Buch J, Clark G, et al. Feline leukemia virus p27 antigen concentration and proviral DNA load are associated with survival in naturally infected cats. *Viruses*. 2021;13(2):302. doi:10.3390/v13020302
7. Beall MJ, Buch J, Cahill RJ, et al. Evaluation of quantitative enzyme-linked immunosorbant assay for feline leukemia virus p27 antigen and comparison to proviral DNA loads by real-time polymerase chain reaction. *Comp Immunol Microbiol Infect Dis*. 2019;67:101348. doi:10.1016/j.cimid.2019.101348
8. Stone AE, Brummet GO, Carozza EM et al. 2020 AAHA/AAFP Feline Vaccination Guidelines. *J Feline Med and Surg*. 2020;22(9):813–830. doi:10.1177/1098612X20941784
9. Jones S, Graham W, von Simson C, et al; Executive Board of the American Heartworm Society. Current Feline Guidelines for the Prevention, Diagnosis, and Management of Heartworm (*Dirofilaria immitis*) Infection in Cats. American Heartworm Society. 2020. Accessed December 21, 2023. https://d3ft8sckhnqim2.cloudfront.net/images/pdf/2020_AHS_Feline_Guidelines_11_12.pdf?1605556516
10. Pennisi MG, Tasker S, Hartmann K, et al. Dirofilarioses in cats: European guidelines from the ABCD on prevention and management. *J Feline Med Surg*. 2020;22(5):442–451. doi:10.1177/1098612X20917601
11. Venco L, Genchi M, Genchi C, Gatti D, Kramer L. Can heartworm prevalence in dogs be used as provisional data for assessing the prevalence of the infection in cats? *Vet Parasitol*. 2011;176(4):300–303. doi:10.1016/j.vetpar.2011.01.013
12. Hays KM, Rodriguez JY, Little SE, et al. Heartworm prevalence in dogs versus cats: multiple diagnostic modalities provide new insights. *Vet Parasitol*. 2020;277S:100027. doi:10.1016/j.vpoa.2020.100027
13. Montarsi F, Ciocchetta S, Devine G, et al. Development of *Dirofilaria immitis* within the mosquito *Aedes (Finlaya) koreicus*, a new invasive species for Europe. *Parasit Vectors*. 2015;8:177. doi:10.1186/s13071-015-0800-y
14. Simón F, Siles-Lucas M, Morchón R, et al. Human and animal dirofilariasis: the emergence of a zoonotic mosaic. *Clin Microbiol Rev*. 2012;25(3):507–544. doi:10.1128/CMR.00012-12
15. Genchi C, Kramer LH. The prevalence of *Dirofilaria immitis* and *D. repens* in the Old World. *Vet Parasitol*. 2020;280:108995. doi:10.1016/j.vetpar.2019.108995