Diagnostic update

Feline leukemia virus (FeLV): understanding disease pathogenesis and classification based on diagnostic testing results

Not all feline leukemia virus (FeLV) infected cats are the same. There are different stages of infection, different outcomes, and different disease manifestations. Some infected cats will go on to live a nearly normal lifespan, while others do not. If each FeLV-infected cat is different, how do you evaluate them beyond a positive screening result? This diagnostic update outlines the biology of FeLV and current recommendations for screening and follow-up testing, which can help veterinarians make informed decisions about their FeLV-positive patients.

When should cats be tested for FeLV?

Every cat's FeLV status should be known, as FeLV is linked to a range of clinical signs that can impact both lifespan and quality of life. Knowing a cat's FeLV status supports better management of infected cats and helps veterinarians give practical guidance to owners on how to reduce the risk of disease transmission.[1]

The Feline VMA recommends FeLV testing in the following situations:[1]

+ When cats or kittens are first acquired
+ Before initial FeLV vaccination
+ After potential exposure to FeLV-positive or unknown-status cats
+ Whenever a cat becomes ill, even if it previously tested negative

FeLV prevalence

FeLV infects cats worldwide. A 2017 publication outlines the seroprevalence of this virus in the United States and Canada.[2]

Figure 1: FeLV prevalence across the United States and Canada.

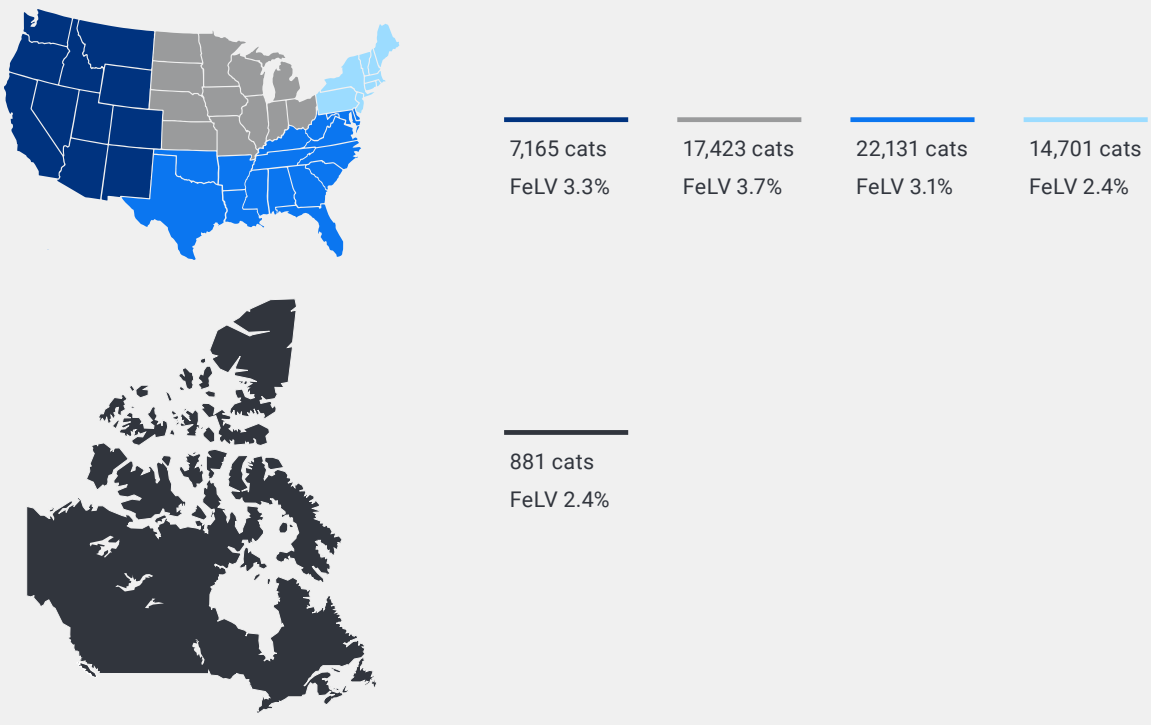
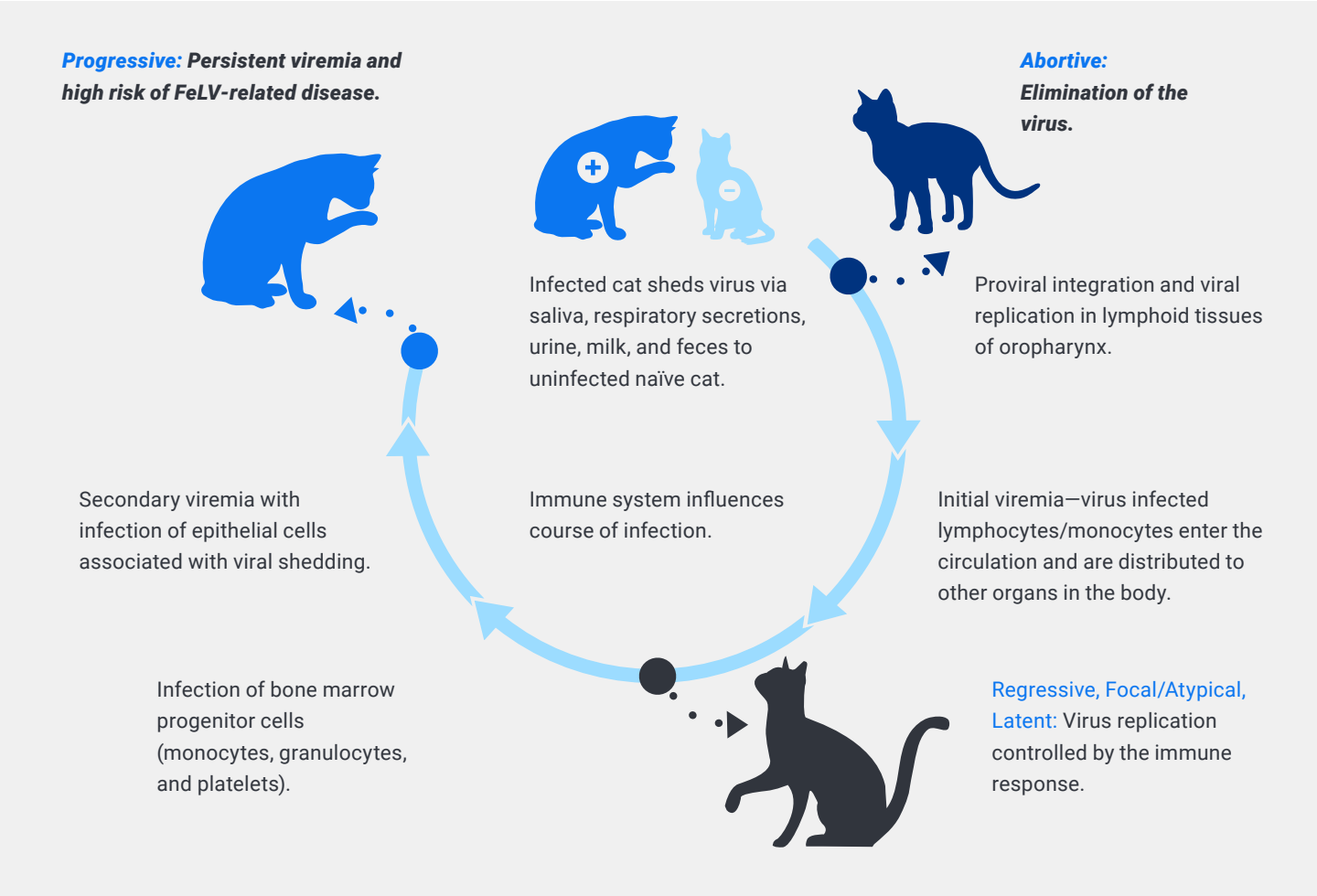


Figure 2: Course of FeLV infection.

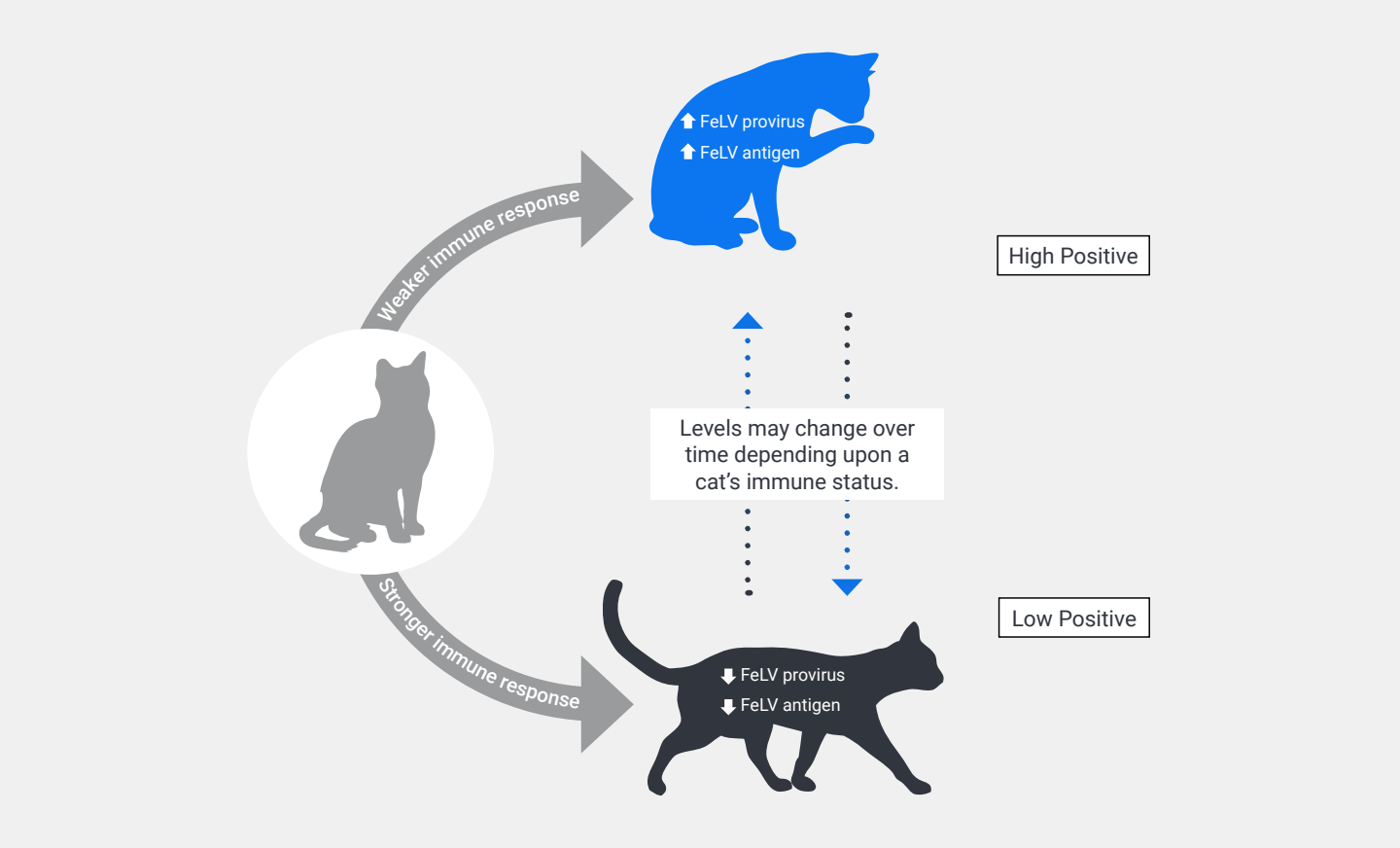


FeLV biology

Transmission of FeLV 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, studies have shown that older cats can become infected, and therefore, FeLV should not be considered a disease of only the young.[3]

The clinical course of FeLV infection is largely determined early postinfection through virus-host interactions. A stronger host immune response helps to control the extent of the viral infection, resulting in lower levels of viral integration (proviral DNA) and lower levels of FeLV p27 antigen for detection. Changes in a cat's health status can disrupt this balance achieved by the immune system, potentially leading to higher quantities of proviral DNA and p27 antigen (figure 2).[4]

Figure 3: Interaction of virus and host immune response lead to different levels of FeLV provirus and FeLV antigen. When evaluated with diagnostics, the amount of provirus and antigen detected can differentiate cats between High Positive and Low Positive.



Diagnosing FeLV: Initial screening

Diagnosis of FeLV infection typically begins with a positive result on a screening test, such as the SNAP™ Feline Triple™ Test and SNAP™ FIV/FeLV Combo Test, which evaluate for the p27 antigen.

Discordant results between whole blood, plasma, and serum can occur, especially in cats with a low viral load.[5] Cats with both high and low viral loads can have consistently positive results on a SNAP™ test with whole blood, plasma, and serum, necessitating additional testing by quantitative real-time PCR and ELISA to determine their infection status.[5]

Diagnosing FeLV: The role of follow-up testing

To determine a cat's FeLV infection status, following an initial FeLV positive test result, submit an EDTA whole blood specimen to IDEXX Reference Laboratories for the FeLV Antigen by ELISA with FeLV Quant RealPCR™ Test panel. The combination of ELISA antigen testing and quantitative PCR results allows for accurate classification of the infection status as High Positive, Low Positive, or Cryptic/Negative.

When a cat tests positive for both p27 antigen (SNAP test) and proviral DNA (Quant RealPCR™ test), the FeLV Quant RealPCR™ Test is used to differentiate between High Positive and Low Positive status. This distinction is based on a viral load threshold of 1 x 10^6 copies/mL of proviral DNA in the blood.

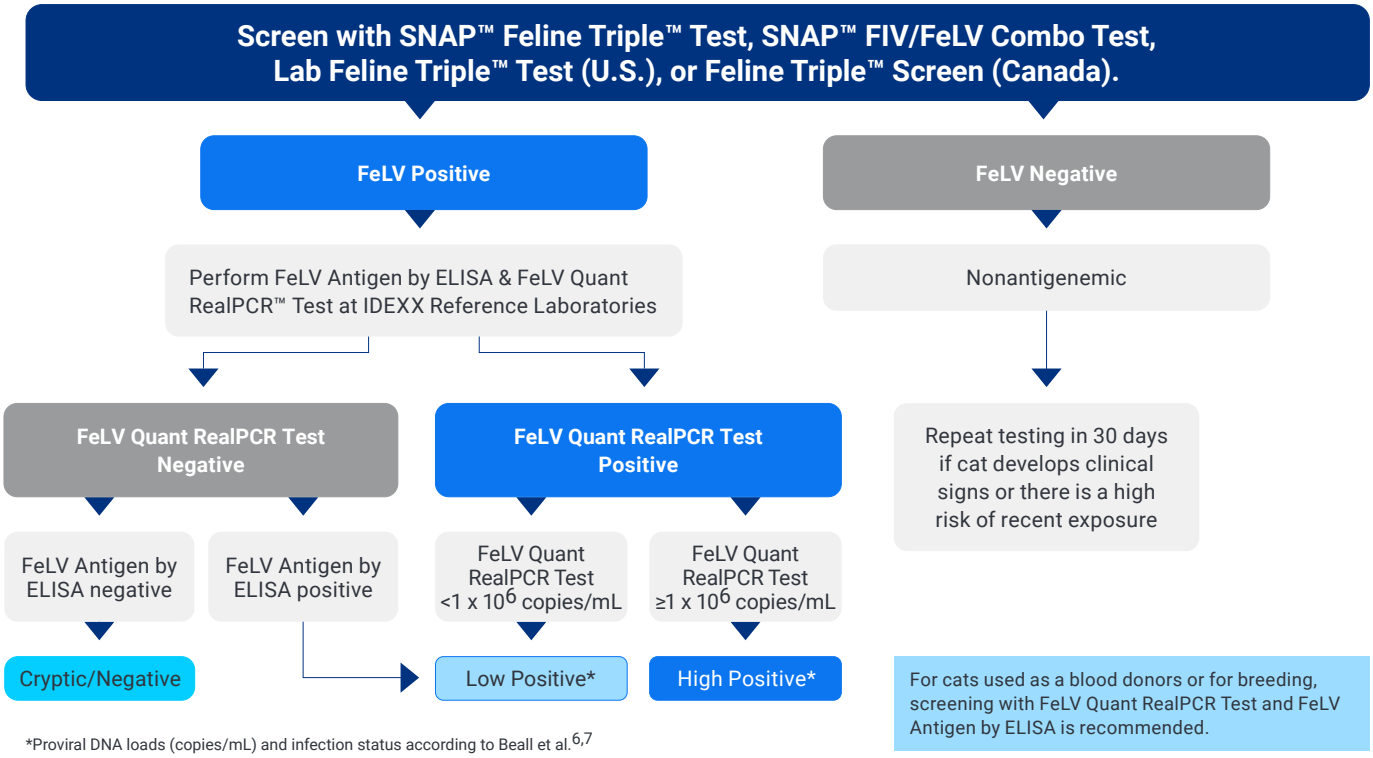
If a cat is SNAP positive but Quant RealPCR negative, the FeLV Antigen by ELISA helps determine whether the cat is Low Positive or Cryptic/Negative. A positive ELISA result provides further evidence of the presence of FeLV-specific antigen and supports a Low Positive classification, while a negative ELISA result suggests a Cryptic/Negative status.

What if the screening test is negative?

In populations with low disease prevalence, a negative SNAP test result is usually reliable due to the test's high sensitivity and high negative predictive value, especially when the cat's exposure history is well-known.

However, if the exposure history is unclear or incomplete, it's best to retest in 30 days. The FeLV Antigen by ELISA with FeLV Quant RealPCR Test panel is strongly recommended for any cat considered for blood donation or used for breeding, to ensure accurate classification and minimize risk of disease transmission.[6]

Figure 4: Algorithm to determine FeLV infection status.



*Proviral DNA loads (copies/mL) and infection status according to Beall et al.[6,7]

Why does infection status matter?

Classifying a cat's FeLV infection status helps to align diagnostic findings with the course of the disease. Cats with a High Positive status are likely to have Progressive infections with a lower probability of long-term survival, particularly if clinical illness is present.[8,9] Cats with a Low Positive status are likely to have Regressive or Focal infections with a higher probability of long-term survival. Cats with the Cryptic/Negative status have demonstrated evidence of proviral loads and virus-associated antigen that are often below detection and may represent Abortive infections or indicate a false-positive result on the SNAP™ test and absence of infection.

Understanding this enables veterinarians to do the following:

+ Predict course of disease (Progressive, Regressive, Aocal/Atypical, Abortive)
+ Set appropriate survival expectations
+ Guide ongoing management

Table 1: Relationship between infection status and course of infection.

Infection status	Course of infection
High Positive	Progressive
Low Positive	Regressive,* Focal/Atypical, Latent
Cryptic/Negative†	Abortive, Uninfected

*Regressive infections are usually defined as proviral DNA positive and antigen negative.

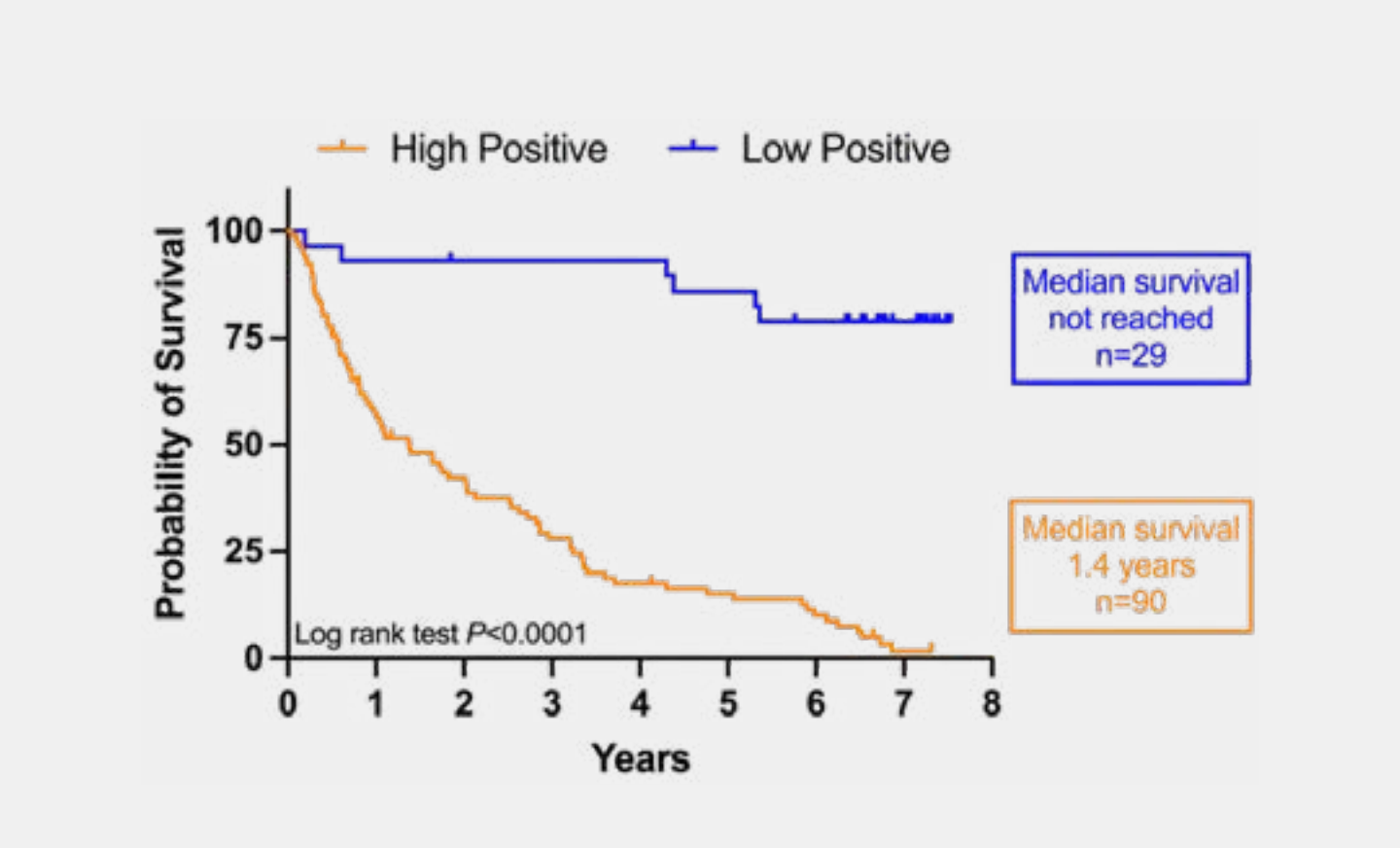
†Cryptic/Negative designation was adopted from the HIV literature for those instances where ultrasensitive testing methods are needed to detect extremely low quantities of nucleic acid or antigen.

A new study relates FeLV infection status to the course of disease

A study completed in 2024 provides insight into prognosis and disease progression of cats testing positive for FeLV on initial point-of-care screening tests.[8] The study followed 127 cats for up to 8 years after initially testing positive for FeLV at admission to an animal shelter (Austin Pet's Alive!). At the time of admission, cats were screened for FeLV p27 antigen on EDTA anticoagulated whole blood with the SNAP™ FIV/FeLV Combo Test (SNAP). Cats that were positive on the screening test were prospectively enrolled in the study. Blood specimens from each cat were collected monthly for six months. At each point, whole blood, plasma, and serum were tested on the SNAP™ test, alongside plasma on a reference laboratory FeLV ELISA (PetChek™). Additionally, the FeLV Quantitative RealPCR™ Test for proviral DNA was performed on EDTA whole blood to aid in infection status (High Positive, Low Positive, Cryptic/Negative). After the 6-month monitoring phase, the cats entered a lifetime survival phase, during which the study team contacted owners every 3 months (over 7–8 years post-enrollment) to request information about the health status of their cats.[8]

Of the 127 enrolled cats, 90 were classified as high positive, 29 were Low Positive, and 8 were Cryptic/Negative. Survival time was defined as the difference between date of death or date of last contact and date of study enrollment. As of December 2024, 93 cats were deceased, and 28 cats were still alive. Overall median survival was 2.8 years, which is consistent with other survival studies, but this study went deeper and found significant differences between survival times in cats with different infection statuses. The median survival of High Positive cats was 1.4 years, with 2% alive at the time of the publication. A 14% 5-year survival rate was found among the High Positive cats. Median survival was not reached for cats in the Low Positive and Cryptic/Negative categories over the course of the study, with 66% and 88% of cats, respectively, alive at the time of the publication.[8]

Figure 5: Kaplan-Meier curves comparing survival of FeLV High Positive and Low Positive cats.



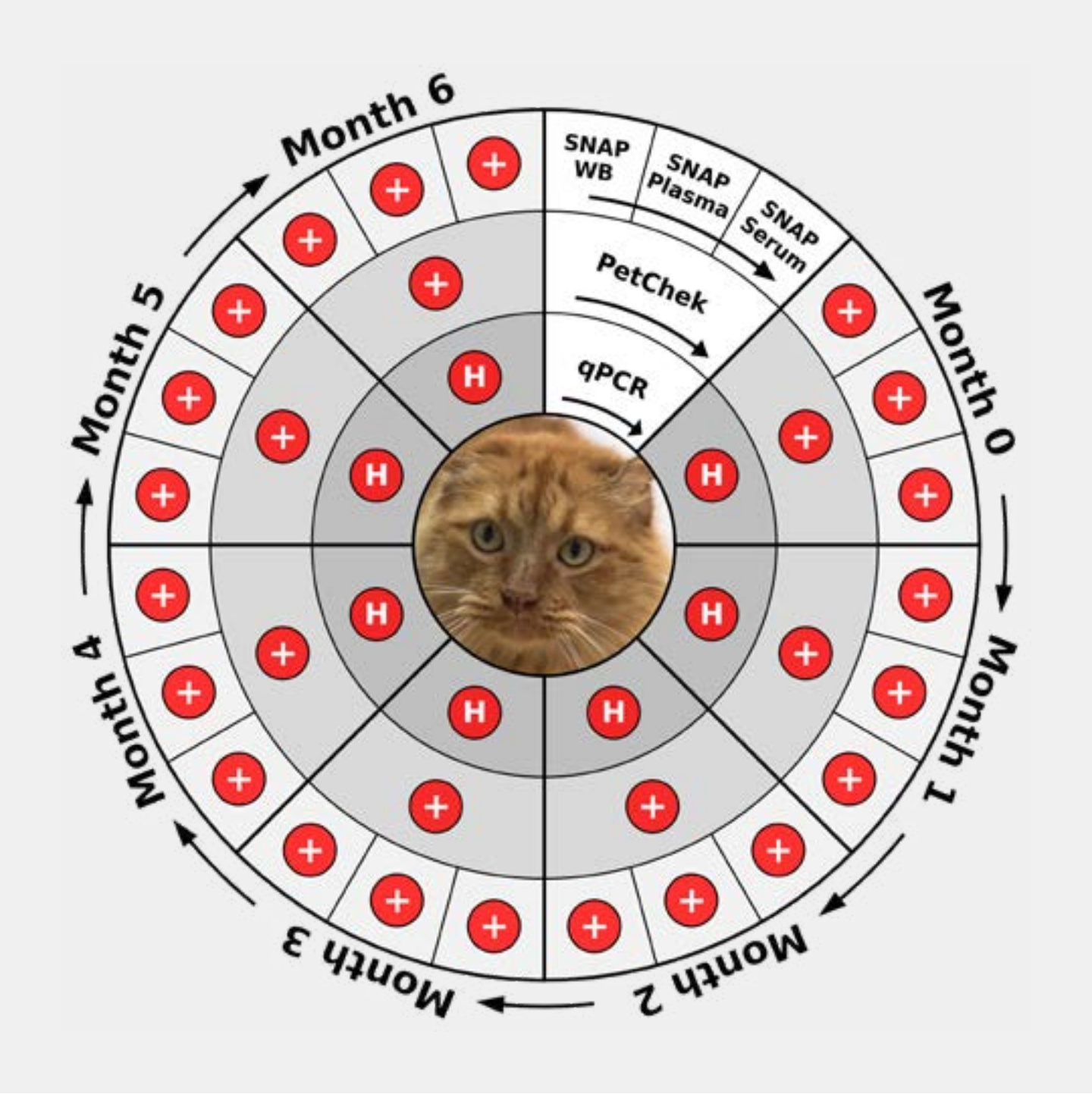
This study supports the integration of a FeLV ELISA and FeLV quantitative PCR test into FeLV diagnostic protocols. Insights gained from this follow-up testing allows shelters, veterinarians, and adopters to better predict disease course, tailor care, and make more informed decisions regarding FeLV-positive cats. The data suggests, FeLV positive cats, especially Low Positive cats, can lead quality lives with regular veterinary care.

Case studies

High Positive

This cat originally tested positive for FeLV when he was approximately 6 years old and is an example of a High Positive cat with a prolonged long-term survival. When following his infection status over 6 months after the initial diagnosis, he remained positive across all tests and specimen types and remained in the High Positive status. With good management, he lived to be over 12 years of age.

Figure 6: 6-year-old High Positive cat that survived over 6.3 years post-diagnosis with consistently positive diagnostic results.



Low Positive

This kitten initially tested positive for FeLV at 2 months of age and was enrolled in the study at 3.6 months. At enrollment, he tested negative on both PetChek™ and SNAP™ tests but had a Low Positive RealPCR™ result, indicating small amounts of proviral DNA—consistent with a Low Positive classification.

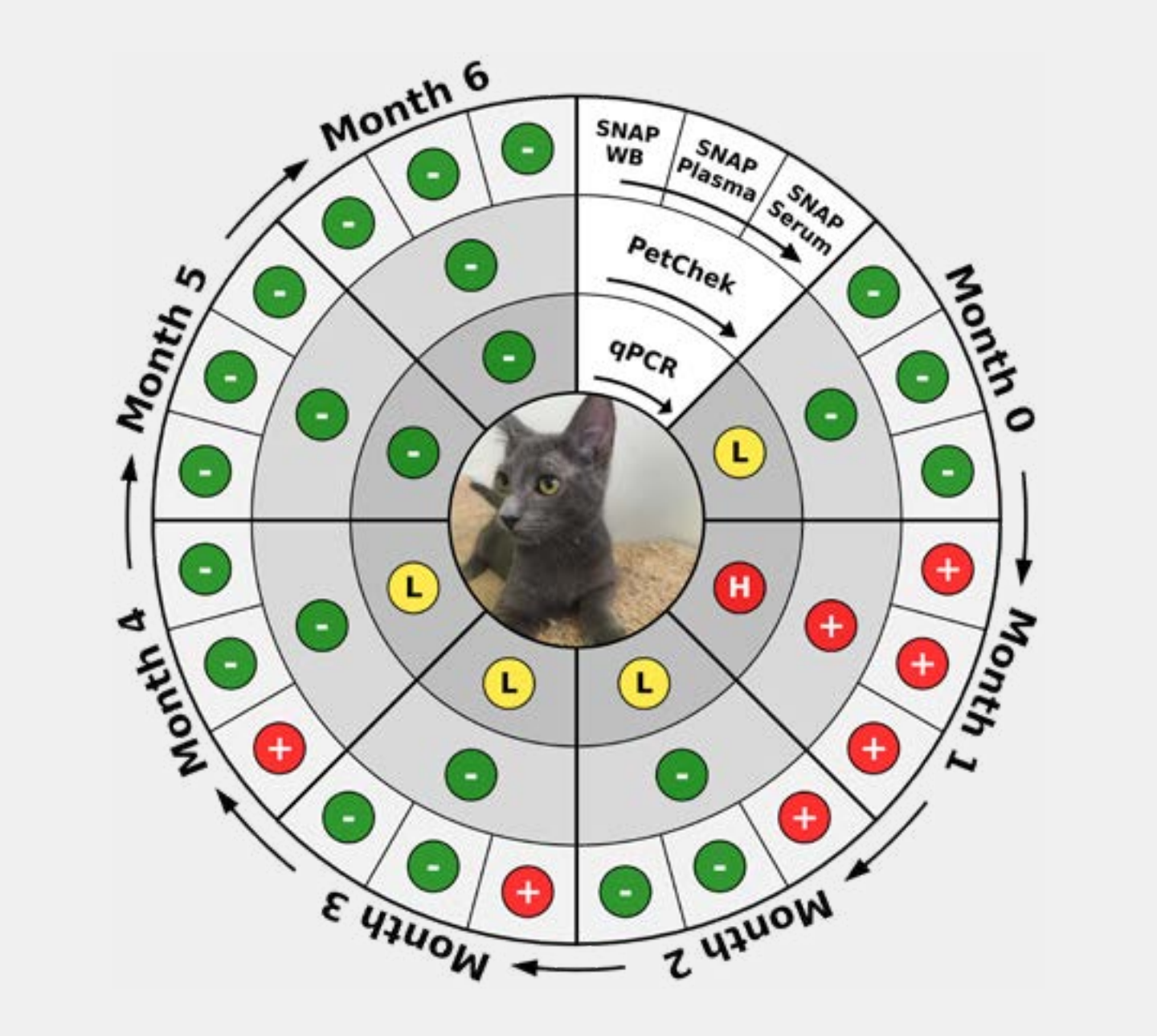
One month later, results shifted: The SNAP test was positive on all specimen types, the PetChek test was positive, and the RealPCR test showed a High Positive result. Over subsequent months, results fluctuated again—he tested positive only on the SNAP test using whole blood and showed low proviral levels on the RealPCR test. By the end of the 6-month monitoring period, all test results were negative.

These findings illustrate that an effective immune response can suppress FeLV replication, lowering proviral and antigen levels below assay detection limits. Although the virus persists in hematopoietic and lymphoid tissues, these cats often control viral activity, are less likely to shed the virus, and tend to live longer.

This case underscores the importance of testing with EDTA whole blood and clarifies that the initial positive result was not a false positive.

The cat continues to thrive 7 years after his initial diagnosis.

Figure 7: 4-month-old Low Positive cat that survived over 7.9 years post-diagnosis with a mix of positive and negative diagnostic results.



Ordering information

Test code	Test name and contents
26355	**FeLV Antigen by ELISA with FeLV Quant RealPCR™ Test** Includes quantification of FeLV viral particles if PCR positive.
263551	**FeLV Antigen by ELISA with FeLV Quant RealPCR™ Test Add-on** Includes quantification of FeLV viral particles if PCR positive.
26354	**FeLV Quant RealPCR™ Test** Includes quantification of FeLV viral particles if PCR positive. **Note:** Serology (SNAP™ tests or reference laboratory ELISA) is recommended for initial screening for FeLV infections.
263541	**FeLV RealPCR™ Quantification Add-on** This test can be used to request quantification of a previously reported positive (nonquantitative) FeLV RealPCR™ Test.

Specimen requirements: 2 mL EDTA whole blood (LTT), keep refrigerated. If requesting a panel that includes an FeLV Antigen by ELISA, please submit 1mL plasma (preferred) or serum in addition to the whole blood specimen.

Turnaround time: 1–4 days

References

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