# Feline Leukemia Virus

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<th>Animal Group(s) Affected</th>
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<td>Felids</td>
<td>High quantities of virus shed in nasal secretions &amp; saliva; also shed in urine, feces, and milk, as well as semen and vaginal fluids from infected cats; most often transmitted to exotic felids via contact with or ingestion of domestic feral cats</td>
<td>Early – cats may have no signs. Anorexia, enlarged lymph nodes, persistent fever, gingivitis, stomatitis, persistent diarrhea, neurologic signs, eye conditions, abortions, reproductive failures</td>
<td>Depends on individual cat’s immune response; typically asymptomatic and transient in exotic felids</td>
<td>No controlled studies proving effectiveness of immune modulators and interferon against the virus.</td>
<td>The retrovirus does not survive long outside the body under normal conditions</td>
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**Fact Sheet compiled by:** Danelle M. Okeson  
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**Fact Sheet Reviewed by:** Ellen Bronson; Connie J. Ketz-Riley

**Susceptible animal groups:** Felids. The first confirmed case of FeLV-associated lymphoma in a non-domestic felid occurred in a cheetah. Recent evidence suggests that the critically endangered Iberian lynx (*Lynx pardinus*) may be particularly susceptible to FeLV. The virus is otherwise not considered endemic in exotic felids, although antigen-positive animals have been documented, as well as seropositive, asymptomatic animals. FeLV has been isolated in leopard cat, European wildcat, and cougar.

**Causative organism:** A retrovirus, more specifically an oncornavirus/

**Zoonotic potential:** Not a zoonosis

**Distribution:** Rare but documented antigen-positive exotic cats have been found worldwide. In a study of more than 18,000 domestic cats, 2.3% of cats were FeLV antigen positive on ELISA testing. Prevalence was higher (3.6%) among cats allowed outdoors. Prevalence was highest among sick feral cats; 15.2% of tested ill feral cats were FeLV positive.

**Incubation period:** Infected cats may experience a prolonged period of clinical latency.

**Clinical signs:** In domestic cats, a variety of disease conditions are associated with retroviral infection including anemia, chronic inflammatory conditions, lymphoma, susceptibility to secondary and opportunistic infections, cutaneous abscesses, oral inflammation, and reproductive problems. Knowledge and understanding of the outcome of FeLV infection in domestic cats has changed. In the past, approximately one third of cats were believed to become persistently viremic and up to two thirds to eventually clear the infection. Newer research suggests that most cats remain infected for life following exposure but may revert to an aviremic state (regressive infection). In the case of a regressive infection, no antigen or culturable virus is present in the blood, but FeLV proviral DNA can be detected in the blood by polymerase chain reaction (PCR).
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Therefore, two clinically relevant outcomes of FeLV exposure can be considered:

1) **progressive infection** – domestic cats typically succumb to FeLV-associated diseases within a few years. However these retrovirus positive cats may live without related illness for several years. “A decision about euthanasia should not be made based on a positive test alone.” (AAFP)

2) **regressive infection** – cats have an effective immune response, virus replication is contained, and there is no viral shedding. These cats have little risk of developing FeLV associated disease. Exotic cats typically belong to this group.

**Post mortem, gross, or histologic findings:** Cats infected with FeLV that develop progressive infection may develop FeLV-related diseases including lymphoid malignancies, non-regenerative anemia, and myeloproliferative disorders. Findings may also include diseases secondary to immunosuppression, such as severe bacterial infections and toxoplasmosis.

**Diagnosis:**

Antigen testing – ELISA: This screening test detects the core viral antigen p27. This antigen is produced in large quantities in most infected domestic cats and most will test positive within 30 days of exposure. However, when results of antigen testing are negative but recent infection cannot be ruled out, testing should be repeated a minimum of 30 days after the last potential exposure.

Antigen testing – IFA: Antigen testing using immunofluorescent antibody (IFA) testing also detects p27 antigen within infected blood cells via bone marrow or blood smears. However, false negatives may occur in the following scenarios with domestic cats: leukopenic cats, cats with regressive infection, or cats that resist bone marrow infection. False positives may occur with sample preparation error, when background fluorescence is high, or when results are interpreted by inexperienced lab personnel.

Confirmatory testing: Cats that test positive on screening tests should be further tested with confirmatory tests. A second soluble antigen test should be performed, preferably using a test from a different manufacturer. (Virus culture is the gold standard, but not readily available in North America.) Practitioners should be aware that cats developing regressive infection may be only transiently antigenemic and may revert to negative status on soluble antigen tests. Confirmatory testing with PCR: Polymerase chain reaction (PCR) can detect FeLV RNA or DNA within one week of viral exposure in domestic cats; even when FeLV p27 antigen is not yet detectable. PCR testing detects either viral RNA or cell-associated DNA (provirus) in blood, bone marrow, and tissues.

**Material required for laboratory analysis:** Whole blood for antigen testing; blood, bone marrow, or tissues for PCR testing.

**Relevant diagnostic laboratories:** Most commercial veterinary laboratories, most state veterinary diagnostic labs, Cornell University

**Treatment:** Immune modulators and interferon inducers are used in retrovirus-infected domestic cats, including FeLV-infected cats. Although reports of uncontrolled studies frequently suggest dramatic clinical improvement, these effects generally have not been reproduced in controlled trials. Preliminary laboratory studies have identified four drugs with anti-FeLV activity that may warrant further study into their mechanisms of action and feasibility for veterinary use.
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**Prevention and control:** In domestic cats, identification and segregation of infected cats is considered the single most effective method for preventing new infections with FeLV. Feral cats should be excluded from contact with exotic cats in zoos. While retroviruses are generally unstable outside their host, they can remain viable in dried biological deposits for more than a week.

As with domestic cats, zoos should determine the FeLV status of all exotic cats. Cats should be tested for FeLV infection at quarantine and routine exams. If exotics are to be vaccinated, testing before initial vaccination is also recommended. However, since routine screening tests detect antigen, not antibody, vaccination does not typically interfere with FeLV testing.

Several injectable inactivated vaccines with adjuvants and a recombinant vaccine without adjuvants (designed for transdermal administration) are commercially available in the United States. The vaccine is not currently recommended as a core vaccine for exotic cats in zoos, but may be used in situations of high-risk, such as extensive exposure to infected feral cats.

When FeLV vaccination is determined to be appropriate, a two-dose primary series is recommended, with the first dose administered as early as 8 weeks of age followed by a second dose administered 3-4 weeks later. A single booster vaccination should be administered 1 year following completion of the initial series and repeated annually in cats that remain at risk of exposure.

**Suggested disinfectant for housing facilities:** Common hospital disinfectants and detergents will inactivate the retrovirus.

**Notification:** Not a reportable disease

**Measures required under the Animal Disease Surveillance Plan:** None

**Measures required for introducing animals to infected animal:** The virus can be shed through casual contact such as grooming. Exotic felids have not been shown to maintain the infection. If a zoo felid is confirmed FeLV-infected, it may infect conspecifics, but the risk may be low.

**Conditions for restoring disease-free status after an outbreak:** Retroviruses are unstable outside their host and are quickly inactivated by detergents and common hospital disinfectants. However, retroviruses can remain viable in dried biological deposits for more than a week.

**Experts who may be consulted:**
American Association of Feline Practitioners guidelines on Retrovirus management are available online:

**References**


