Feline leukemia virus infection – studies on epidemiology, pathogenesis, and diagnosis

Prof. Dr. Katrin Hartmann
Clinic of Small Animal Medicine
Centre for Clinical Veterinary Medicine, Faculty of Veterinary Medicine, LMU Munich

Coinvestigators

Dr. Michèle Bergmann	Clinic of Small Animal Medicine, LMU Munich
Prof. Dr. Regina Hofmann-Lehmann	Department of Clinical Diagnostics and Services, Faculty of Vetsuisse, University of Zurich, Switzerland

Summary

Feline leukemia virus is a common retrovirus in cats. Although the prevalence and importance of FeLV as a pathogen has decreased, our research indicates that this decrease has stagnated in some European countries. Effective testing, eradication programs, and routine use of FeLV vaccines are most important in prevention of infection. However, diagnosing FeLV can be very challenging due to different courses of infection that can change over time and might be even more complicated due to several available tests varying in their diagnostic value. Our research focuses on FeLV epidemiology and pathogenesis, as well as on evaluation and comparison of various methods to diagnose different courses of FeLV infection. In this context, we currently evaluate a new antibody point-of-care (POC) test that detects not only FeLV antigen but also anti-FeLV antibodies and thus all stages of FeLV infection.

Research Objectives

Feline leukemia virus is a gammaretrovirus that is common in cats worldwide and can lead to severe disease (e.g., lymphoma, bone marrow suppression). It spreads through close contact between virus-shedding and susceptible cats primarily via saliva. Prevalence of progressive FeLV infection varies considerably between geographic areas (2-3% in the United States, 1-16% in Europe, 3-28% in South Africa, and 1-25% in Asia and Australia/New Zealand). Although the prevalence and importance of FeLV as a pathogen has decreased over time (e.g., in Germany from 6 to 1% between 1993-2002) primarily because of effective testing, eradication programs, as well as vaccination programs, previous studies indicate that the decrease in prevalence has now stagnated in many countries. Therefore, awareness of this important infection and its prevention should not be neglected. Together with other international experts from the Advisory Board of Cat Diseases (ABCD), we recently performed a multi-center study on the prevalence of FeLV in cats taken to veterinary facilities in 32 European countries. Prevalence of progressive FeLV infection was 2.3% (141/6005; 95% CI: 2.0%-2.8%) with the highest prevalence in southern Europe, e.g., Portugal, Hungary, and Italy/Malta (up to 8.8%), while in many northern and middle European countries, prevalence was low, e.g., in Germany only 0.3%. In order not to underestimate the true FeLV prevalence, a current study focuses not only on prevalence of viremia but also on the presence of FeLV proviral DNA and anti-FeLV antibodies in cats from European countries.

There are different courses of FeLV infection, progressive, regressive, abortive and rarely focal (atypical) infection, that have been characterized in experimental studies. The different courses of infection are difficult to distinguished, and field cats do not always follow the predefined courses and can present with contradictory test results. The course of FeLV infection is based on how the immune system interacts with the virus, particularly in the early phase of FeLV infection, generally the first twelve weeks of infection. In a few cats, the balance between virus and immune system will be unstable lifelong and cats can present with contradictory test results. Since FeLV infection can impact cat´s health and requires long-term management, FeLV status should generally be

known in every cat. In addition, FeLV status should be known prior to FeLV vaccination because it is useless to vaccinate an already infected cat. Diagnosis of FeLV is complicated not only due the complex pathogenesis, but even more due to the availability of many different tests. POC tests that measure free FeLV p27 antigen are highly sensitive and specific but they can only diagnose progressive infection. Our research evaluates new diagnostic possibilities such as a new POC test detecting FeLV p 27 antigen and anti-FeLV p15E antibodies and thus all stages of infection; a further goal is to determine diagnostic POC test interference with vaccination antibodies.

Key Findings

Our research indicates that FeLV is still an important infection in Europe especially affecting cats from southern European countries. In Germany, prevalence of progressive FeLV infection is decreasing likely due to testing, eradication programs, and FeLV vaccination. In order to reliably determine the FeLV status of each cat, simultaneous measurement of FeLV antigen and anti-FeLV antibodies would be ideal. Therefore, a new POC test detection FeLV antigen as well as anti-FeLV antibodies has been developed and is currently evaluated.

Selected Publications

1. Hartmann K, Hofmann-Lehmann R. What's new in feline leukemia virus infection. Vet Clin North Am Small Anim Pract 2020; 50: 1013-36.
2. Hofmann-Lehmann R, Hartmann K. Feline leukaemia virus infection: A practical approach to diagnosis. J Feline Med Surg 2020; 22: 831-46.
3. Little S, Levy J, Hartmann K, Hofmann-Lehmann R, Hosie M, Olah G, Denis KS. 2020 AAFP Feline Retrovirus Testing and Management Guidelines. J Feline Med Surg 2020; 22: 5-30.
4. Studer N, Lutz H, Saegerman C, Gönczi E, Meli ML, Boo G, Hartmann K, Hosie MJ, Moestl K, Tasker S, Belák S, Lloret A, Boucraut-Baralon C, Egberink HF, Pennisi MG, Truyen U, Frymus T, Thiry E, Marsilio F, Addie D, Hochleithner M, Tkalec F, Vizi Z, Brunetti A, Georgiev B, Ludwig-Begall LF, Tschuor F, Mooney CT, Eliasson C, Orro J, Johansen H, Juuti K, Krampl I, Kovalenko K, Šengaut J, Sobral C, Borska P, Kovaříková S, Hofmann-Lehmann R. Pan-European Study on the Prevalence of the Feline Leukaemia Virus Infection - Reported by the European Advisory Board on Cat Diseases (ABCD Europe). Viruses 2019; 11: E993.
5. Bergmann M, Schwertler S, Speck S, Truyen U, Hartmann K. Antibody response to feline panleukopenia virus vaccination in cats with asymptomatic retrovirus infections: a pilot study. J Feline Med Surg 2019; 21: 1094-101.
6. Hartmann K. Role of retroviruses in feline lymphoma. EJCAP 2015; 25: 4-15.
7. Hartmann K. Efficacy of antiviral chemotherapy for retrovirus-infected cats: What does the current literature tell us? J Feline Med Surg 2015; 17: 925-39.
8. Lehmann M, Weber K, Rauch G, Hofmann-Lehmann R, Hosie MJ, Meli ML, Hartmann K. Wirksamkeit von siRNA auf die Vermehrung des felinen Leukämievirus in vitro. Berl Munch Tierarztl Wochenschr 2015; 128: 209-17.

Funding

Funder	Project title	Start date	End date
Pharmaceutical company	Evaluation of the performance of a point-of-care anti-p15E antibody test to detect feline leukemia virus (FeLV) infection	2018	2021