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The Prevalence of Felv and Fiv Infection in Cats and Hematological Changes and Clinical Signs in Felv/Fiv Infected Cats from Vladivostok, Russia

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Abstract | The prevalence of FeLV and FIV infection was investigated among 44 domestic cats from Vladivostok, Russia, using commercially available PCR assays for FeLV and FIV diagnostics. The overall prevalence of FeLV was 15.9%. Higher prevalence of FeLV was registered in young cats and neutered male cats. One case of FIV+FeLV co-infection was detected (2.3%). The results of multivariate logistic regression were not show any interactions between age, sex and outdoor access and FeLV prevalence. Hematological analysis showed that most FeLV infected cats have increased levels of ESR and neutrophilia, whereas anemia and neutropenia was not detected.

Keywords | FeLV. FIV, Cats, Clinical signs, Haematological signs

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INTRODUCTION

Feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) are retroviruses with global distribution. Both FeLV and FIV can affect domestic and wild felids contributing to the development of severe immunosuppression and causing diseases feline leukemia and feline immunodeficiency, respectively. Both FeLV and FIV infections are often cause morbidity and mortality in the feline family. FeLV was firstly described in 1964 and FIV was described in 1987 (Jarett et al., 1964; Pedersen et al., 1987). The prevalence of FeLV and FIV among domestic cats population varies due to studied area, cats' living conditions and sexual and age population structure. For example, the seroprevalence of FIV and FeLV viruses has been the object of intense study, yielding an impressive number of reports from different parts of the world. For example, the seroprevalence in Europe and North America was higher than seroprevalence in the southern regions; this was clearly demonstrated, especially for FIV (Gleich and others 2009, Chhetri et al., 2013). Reported European seroprevalences ranged from 0 % to 12.5 % for FIV and from 1 % to 33.3 % for FeLV (Sukura et al., 1992, Peri et al., 1994, Duarte et al., 2012) The previous Russian study revealed seroprevalences of 11.3 % and 3.8 % for FIV and FeLV, respectively

Opposite to this, the prevalence of FeLV was 1 % and was 3% in cats' population from Harbin (Pan et al., 2017).

Clinical signs are often unspecified and variable due to immunosuppression effect of viruses. There is relatively small data on distribution and prevalence of FeLV and FIV infection in cats from Russia. Most study based on ELISA assay detection of infection, however PCR is more sensitive method for FeLV/FIV diagnostic.The aim of this

study was to determine the prevalence of FeLV and FIV infection using the PCR method and hematological parameters in infected cats in Vladivostok, Russia.The aims of this study were (1) to estimate the FIV and FeLV seroprevalences and associated risk/protective factors; 2) estimate clinical and heamatological parameters in infected animals.

MATERIALS AND METHODS

Study Design

Blood samples from 44 cats were examined for the presence of FeLV and FIV infections in Vladivostok, Russia. Clinical data and blood samples were collected during 1-year period. The examined animals consistent 24 females and 20 males. Cats were also divided in three age groups: kittens (<12 months, n=13), young (1-3 years of ages; n=9) and adult (>3 years; n=22).

PCR Assay

Detection of FeLV and FIV infections were provided using commercially available PCR tests (LEIKIIS, Interlabservice, Russia).

Following the commercial DNA extraction kits (Syntol, Russia) the proviral DNA was extracted from 200 µl of whole blood sample, eluted with EDTA. The amplification was provided using CFX96 Touch Real time PCR Detection System Bio Rad.

Hematological and Biochemical Assay

Hematological tests (ERC, LCT, Hb, Ht, EOS, LYM, MON, segmented and non segmented neutrophils, ESR) and biochemical parameters (creatinine, urea, GGT) were performed for all cats.

Statistical Analysis

The statistical analysis was performed in STATA MP 4. Associations between each of the potential risk factors including age (kitten; young; adult), sex (male, neutered male, female, neutered female, female), outdoor access (indoor/ free outdoor access), living condition (client-owned/ shelter) and FeLV and FIV test status were performed using multivariable regression.

RESULTS

The overall prevalence of FeLV infection in cats was 15.9%, the higher prevalence was registered in young cats, follow adult animals and kittens (Table 1). Most cats were neutered females, the FeLV prevalence in this sexual group was 12.5%; the prevalence of FeLV infection among neutered males was20%. FeLV infection was not found in sexually intact animals.

Table 1: Results of overall prevalence of FeLV infection in cats

Parameter	Number of cats examined	Number of FeLV/FIV positive	Prevalence of FeLV
Age			
Kittens(1-12 months)	13	1	7.7
Young(1-2 years of ages)	9	2	22.2
Adult (elder than 3 years of ages)	22	4	18.2
Sex			
female	24	3	12.5
male	20	4	20

One case of mix infection FeLV+FIV was registered in one adult female cat. All infected animals have free outdoor access excluding one female kitten infected FelV from her mother. The resultsof multivariate regressionwas not detected factors predisposed for FeLV/FIV infection.

Out of 7 FeLV positive cats, 51.4 % cats show clinical signs including periodontitis (n=2), eczema (n=1); ovaries atrophy (n=1).

Totally 57.1% (n=4) FeLV positive cats have increased levels of ESR which varied from 23 to 53 mm/h. Two of the seven FeLV positive cats have normal levels of ESR; cats with decreased ESR levels were not registered.

All FeLV infected cats had normal number of leukocytes and normal values of haemoglobin.

Five of seven FeLV positive cats (71.4%) had normal levels of HMT and one cat had decreased level of HMT.

Two of seven FeLV infected cats (28.6%) had decreased percent of eosinophils; other cats showed normal values of eosinophils.

Segmented neutrophils. All FeLV positive cats have increased values of segmented neutrophils which varied from up 54 to 70 * 10^{9} l. Concerning non-segmented neutrophils, all FeLV positive cats had normal values of non-segmented neutrophils.

All FeLV positive cats also had normal number of erythrocytes and lymphocytes.

Levels of GGT were normal in all FeLV positive cats. One cat of sex FeLV infected had increased levels of urea and creatinine; other cats had normal levels of both parameters.

DISCUSSION

Feline leukemia viruses and feline immunodeficiency viruses have worldwide distribution among domestic and wild felids. (Hartmann, 2011). In the studied population, FeLV or FIV positivity was registered more frequently in crossbreeds than in purebred cats, representing about 90% of all positive results. The FeLV and FIV positivity rates in this sample from Vladivostok are less than those reported from many other countries worldwide. The seroprevalence of FeLV and FIV among cats in North America were 2.3% and 2.5%, respectively, with 0.3% of tested cats showing positivity for both viruses (Levy et al., 2006). Similarly, the prevalence of FIV in the United Kingdom (UK) was 19%. In addition, one case ofFeLV- FIV mixed infection was detected.

FeLV infection is transmitted via oronasal route through sharing foods, mutual grooming. The common risk factors of acquiring of FeLV infection include male sex, indoor access and adult age. However the risk factors are variable in literature data. For example, in study provided by Hofmann & Lehmann, 2018, young age was the risk factor of FeLV infection. In study provided by Poffo et al. (2017) factors associated with FeLV infection were not observed. Other factors associated with FeLV infection include thin body condition and purebreed (Hofmann & Lehmann, 2018; Stavisky et al., 2017).

FIV infection is transmitted by bites, however risk factors are similar for FeLV infection (Collado et al., 2012; Stavisky et al., 2017).

In our study we didn't indicateanyrisk factors of FeLVand FIV infection; our results correlate with study provide by Poffo et al. (2017) . However, critical point of view shows that age is a major risk factor of both infections, followed by sex. The negative correlation between FeLV/FIV prevalence and both parameters can relate due to adult age and neutered status of most cats examined.

FeLV infection associated with wide spectrum of oncological and non-neoplastic diseases due to immunodeficiency and immunosupressive effect of FeLV (Louwerens et al., 2005; Reinacher, 1989). However clinical signs are differ and latent FeLV infection is also occurred. In our study 51.4% cats had unspecific clinical signs including eczema, periodontitis and ovaries atrophy. Other cats did not show any clinical signs, so we can conclude that they were t in the asymptomatic phase of the infection (Hartmann 2011, Hartmann 2012, Liem et al., 2013) .

The most frequently observed changed hematological parameters included increased ESR levels indicating a persistent inflammatory state; compare with our study, high ESR levels were found in FeLV infected lions (Roelke et al., 2009). Increased segmented neutrophils values were also frequently observed in presented study. In contrast with our results, neutropeniawas observed in FeLV positive cats in studies provided by Gleich and Hartmann, 2009. In study provided by Rudan et al. (2017) most FeLV positive cats had increased neutrophil values. Besides,among FeLV positive cats anemia was not appeared in this study, however some reports indicated anemia associated with FeLV A and C subtypes.We can conclude that this hematological parameter is unspecific and can by vary due to the stage of disease. Biochemical parameters were normal in most cats. One cat had increased creatinine and urea levels, this animal also had enlarged kidney, according with other reports we can conclude that FeLV infection induce kidney lesion (Anderson et al., 1971; Baross et al., 2017).

CONCLUSIONS

The results presented in our study show a high local prevalence of FeLV in cats and low prevalence of FIV. The most cats were asymptomatic. Most infected cats also have increased ESR levels. The negative correlation was appeared between FeLV prevalence and cats' age, sex. It would be interesting to continue the study for investigation of FeLV potential risk factors and dynamics in cats from Vladivostok.

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CONFLICT OF INTEREST

Authors declare that they have no conflict of interests.

AUTHORS CONTRIBUTION

All authors worked equally in the MS.

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