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An Investigation of the Feline Immunodeficiency Virus (FIV) and Feline Leukemia Virus (FeLV) Infections in Cats in Western Turkey

Nural Erol¹ & Serdar Pasa²

ABSTRACT

Background: Feline Leukemia Virus (FeLV) and Feline Immunodeficiency Virus (FIV) are among the most important pathogens of cats. Despite being common world-wide, data on the prevalence of these viruses in western Turkey are very limited in the literature. The objective of this study was to investigate the presence and the prevalence of the FIV and FeLV infections in the house and stray cats in the Aegean region of western Turkey. Effects of the risk factors such as age, gender, and lifestyle on the prevalence of the infections as well as the relationship between the general health status of the animals and infection rates were investigated.

Materials, Methods & Results: Blood samples were taken from the house and stray cats brought to the clinics of the Faculty of Veterinary Medicine at the Adnan Menderes University or the private veterinary clinics in the provinces of Aydin and Izmir, Turkey, during the period of the study from May 2009 to June 2010. The serum samples were tested using commercially available Enzyme-Linked Immunosorbent Assay (ELISA) kits to detect p27 antigen of FeLV, neutralizing antibodies against the gp70 protein of the FeLV, and antibodies against p17 and p24 antigens of FIV. Two hundred and ten cats were tested for FeLV antigen and FIV-specific antibodies whereas 172 cats were tested for antibodies against FeLV. Overall positivity rates for the FeLV antigen, antibodies against FeLV, and antibodies against FIV were 7.6% (16/210), 58.1% (100/172), and 19.5% (41/210), respectively. Seropositivity rates for antibodies against FeLV and FIV changed significantly from one province to another ($P < 0.05$). Seropositivity for the antibodies against FIV were higher in male than the female animals ($P < 0.05$) and in house than the stray cats ($P < 0.001$). Animals with clinical symptoms when brought to the clinic had significantly higher FeLV antigen and the antibody titers against FIV than the apparently healthy animals ($P < 0.001$). Seropositivity for antibodies against FIV but not the rates of positivity for FeLV antigen and antibodies against FeLV were influenced by the age of the animal.

Discussion: The results obtained in this study suggested that the FeLV and FIV infections were relatively common in western Turkey. The statistically significant risk factors for the FIV infection included the province of residence, gender, life style, health status and age. Since prevalence of the FIV infection may significantly vary among Turkey's different geographical regions, prevalence studies that maybe important in the combat of the infections should be carried out independently in each province. Only province of residence and health status were risk for factors for the FeLV infections. Antibodies against FIV were more prevalent in the cats that were male, older than three years of age, lived in houses, and had clinical symptoms when brought to the clinics. The animals that presented with clinical symptoms when brought to the clinic had higher rates of positivity for FeLV antigen and FIV-specific antibodies ($P < 0.01$). These results suggest that sick animals are at higher risk for infection with these viruses and that the viruses may be involved in the aetiology of a variety of diseases. Analysis of the clinical findings, test results and reports in the literature suggest that these infections may present with various clinical symptoms and should be taken into careful consideration for differential diagnosis of animals in the clinic.

Keywords: FIV, FeLV, retroviruses, virus infection, feline, prevalence, Turkey.

INTRODUCTION

Feline immunodeficiency virus (FIV) and Feline Leukemia Virus (FeLV) are retroviruses causing slow virus infections [10] that are among the most important diseases of cats [1]. FeLV infection is chronic and results in oncogenic, immunosuppressive and immunoproliferative changes including formation of tumors in the hematopoietic organs. FIV infection also involves suppression of the immune system in addition to symptoms such as weight loss, anemia, anorexia, lymphadenopathy, and tumor formation [2,3]. Due to their immunosuppressive characteristics, the infections with these viruses weaken the immune resistance of the cats and may result in opportunistic infections and other secondary diseases. The infections lead to high mortality rates either directly or indirectly by exacerbating the symptoms of other diseases [4,5].

FIV and FeLV infections are widespread throughout the world. The prevalence of the FeLV infection in the world ranges from 0% to 38% whereas the prevalence of the FIV infection has been reported to vary between 0% and 50% [1,3,6,11-13,20-23]. Data on the prevalence of FeLV and FIV infections in western Turkey are very limited in the current literature although prevalences of these infections in other regions of Turkey have been reported [23,24].

The objective of this study was to investigate the prevalence of FeLV and FIV infections in the house and stray cats in the Aydin and Izmir provinces of western Aegean region of Turkey. Effects of the risk factors such as location, age, gender, and lifestyle on the prevalence rates as well as the relationship between the infection prevalence and health status of the animals were investigated.

MATERIALS AND METHODS

Blood samples were taken from 210 cats brought to the clinics of the Faculty of Veterinary Medicine at the Adnan Menderes University or the private veterinary clinics in the Aydin and Izmir provinces (Table 1). Sixty of the animals were house cats cared at homes and rarely taken to the streets whereas 150 of them were unowned freely-roaming stray cats fed by volunteer animal caretakers.

The samples were collected from Didim and Kusadası counties of Aydin province and Selcuk, Mordogan, Urla and Guzelbahce counties of the Izmir province during the period of the study from May 2009

to June 2010. None of the cats included in the study were vaccinated against FIV or FeLV. The cats were examined and the clinical symptoms were recorded. They were categorized as sick (those brought to the clinics for treatment of various diseases) or healthy (those brought for vaccination or sterilization). Data on age were available in 158 of the animals (Table 2). All of these 158 animals were tested for the FIV-specific antibodies and FeLV antigens whereas 133 of them were tested for the FeLV-specific antibodies only.

The serum samples were tested to detect p27 antigen of FeLV, neutralizing antibodies against the gp70 protein of the FeLV, and antibodies specific for p17 and p24 antigens of FIV using three different commercial Enzyme-Linked Immunosorbent Assay (ELISA) kits^{1,2,3}.

One to three mL blood were taken from the cats and collected into polystyrene tubes with kaolin to test for the antibodies against FIV and FeLV. The sera were obtained by centrifugation and were stored at -20°C until analyzed. Two hundred and ten cats were tested for FeLV antigen and antibodies against FIV whereas 172 cats were tested for antibodies against FeLV only.

The tests were performed following manufacturer's instructions and the plates were read at the wavelength of 450 nm using a spectrophotometer⁴. Prevalence of the FIV and FeLV infections, and effects of location, gender, lifestyle, age and health status of the animals on infection prevalence were analyzed using chi-square test in the SPSS 10.0 software package⁵ [19].

RESULTS

Prevalence of the FIV and FeLV infections in cats in the Aydin and Izmir provinces are summarized in Table 1. In total, positivity rates were 7.6% (16/210) for FeLV antigen, 58.1% (100/172) for antibodies against FeLV, and 19.5% (41/210) for antibodies against FIV.

Seropositivity rates for antibodies against FeLV and FIV were significantly higher in Izmir than the adjacent Aydin province ($P < 0.05$). Gender of the animals was a significant risk factor only for seropositivity for the antibodies against FIV; the male animals had higher seropositivity than the females (27.5% vs 13.4%, $P < 0.05$). Seropositivity rate for antibodies against FIV were significantly higher in house than the stray cats (33.3% vs. 14%, $P < 0.001$). Positivity rates for both FeLV antigen and the antibodies against FIV were significantly higher in sick than the apparently healthy animals ($P < 0.001$).

Among the 25 cats with clinical symptoms when brought to the clinic and positive for the antibodies against FIV, six had symptoms such as recurrent chronic stomatitis, tooth loss, bad breath, anemia, weight loss, and lymphadenopathy that are frequently found in cats with FIV infections. In addition the following clinical symptoms were noted (with the number of animals with the symptoms in parentheses): urinary tract disorders (n = 6), respiratory tract problems (n = 4), chronic dermatitis due to fungal infections (n = 3), and tumors such as lipoma or pancreatic carcinoma (n = 2). The remaining four had ascites, jaundice, piyometra as well as anorexia and vomiting.

Ten of the 16 cats that were positive for the FeLV antigen showed clinical symptoms. Respiratory system disorders were noted in five of these sick animals. Anemia, middle ear infection, uremia, dermatitis and ascites were noted in the remaining five animals.

Positivity rates of infections categorized by age of the animals are presented in Table 2. Effects of age on positivity rates for FeLV antigen and antibodies against FeLV were not statistically significant. However, effect of the age on the seropositivity rate of antibodies against FIV was statistically significant. Older animals were more likely to carry antibodies against FIV ($P < 0.001$).

Table 1. Prevalence of the FeLV and FIV infections in cats categorized by the geographic location, gender, life-style, and the general health status of the animals in the Aegean region of western Turkey, during the period from May 2009 to June 2010.

Category		FeLV antigen				FeLV antibody				FIV antibody			
		n	Pos	%	χ^2	n	Pos	%	χ^2	n	Pos	%	χ^2
Province	Aydın	122	6	4.9	3.0	94	35	37.2	37.2*	122	17	13.9	5.8*
	İzmir	88	10	11.4		78	65	83.3		88	24	27.3	
Gender	Female	119	8	6.7	0.3	100	58	58	0	119	16	13.4	6.5*
	Male	91	8	8.8		72	42	58.3		91	25	27.5	
Life style	House cats	60	6	10	0.7	55	28	50.9	1.7	60	20	33.3	10.2***
	Stray cats	150	10	6.7		117	72	61.5		150	21	14	
Health status	Sick	65	10	15.4	8.1**	53	33	62.3	0.5	65	25	38.5	21.5***
	Healthy	145	6	4.1		119	67	56.3		145	16	11	
Total		210	16	7.6		172	100	58.1		210	41	19.5	

Pos: positive samples; χ^2 : chi-square test statistics. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 2. Prevalence of the FeLV and FIV infections in cats categorized by age in the Aegean region of western Turkey, during the period from May 2009 to June 2010.

Age	FeLV antigen				FeLV antibody			FIV antibody			
	n	Pos	%	χ^2	n	Pos	%	n	Pos	%	χ^2
≤8 months	37	2	5.4	4.1	28	16	57	37	2	5.4	29.0*
1 year	22	1	4.5		18	9	50	22	2	9.1	
2 years	40	5	13		35	26	74	40	6	15	
3 years	23	2	8.7		20	9	45	23	8	35	
4-6 years	27	4	15		23	14	61	27	15	56	
≥7 years	9	2	22		9	7	78	9	3	33	
Total	158	16	10		133	81	61	158	36	23	

Pos: positive samples; χ^2 : chi-square test statistics. * $P < 0.001$.

DISCUSSION

FIV and FeLV are the cause of slow virus infections that may result in serious health problems in cats. Both viruses affect the immune system, and cause immunosuppression. Although these viruses are common world-wide [1,3,6,11-13,20-22], data on their prevalence in western Turkey bordering eastern Europe have not been reported. In this study, prevalence of the FeLV antigen, and antibodies against FeLV and FIV were investigated.

Seropositivity rates for antibodies against FeLV and FIV were both significantly higher in the Izmir than the nearby Aydin province ($P < 0.05$, Table 1), suggesting that prevalence of the FIV infection may significantly vary among Turkey's different geographical regions, and thus, prevalence studies that maybe important in the combat of the infections should be carried out in each province. Gender had a significant effect on seropositivity rates for antibodies against FIV (13.4% in the female vs. 27.5% in the male, $P < 0.05$) suggesting that the male animals may be a risk factor for spreading the infection. This result is consistent with previously published reports [3,9,14,23]. However, there was no statistically significant difference in the FeLV infection rate between the two genders. These results agree with the findings of Lee *et al.* [11]. Seropositivity rates for antibodies against FIV were significantly higher in the house than the stray cats ($P < 0.001$) but the positivity for FeLV antigen and antibodies against FeLV did not differ between these two groups of animals.

Effects of the general health status on the positivity rates for FeLV antigen and FIV-specific antibodies were significant. The animals that presented with clinical symptoms had higher rates of positivity for FeLV antigen and FIV-specific antibodies ($P < 0.01$). Antibodies against FIV were detected in 11% of the apparently healthy and 38.5% of the sick cats brought to the clinics with various symptoms. These results are in general agreement with the previous epidemiological studies conducted in several countries that revealed the prevalence of 0% to 11.3% FIV infection in the healthy and 3.4% to 50% in the sick cats [3,11,20,21].

The clinical symptoms seen in cats positive for the anti-FIV antibodies included recurrent chronic stomatitis, tooth loss, bad breath, lymphadenopathy, anemia, and weight loss, urinary and respiratory tract disorders, chronic dermatitis and tumor formations. These symptoms are in agreement with the clinical findings reported by others [2,8,12].

Epidemiological surveys conducted in several regions of the world revealed that the prevalence of FeLV infection in cats varies from 0% to 15.6% in the healthy and 2% to 38% in the sick cats [3,11,20,21]. In this study, 15.4% of the sick and 4.1% of the apparently healthy animals were positive for the FeLV antigen. Clinical symptoms were found in 10 of the 16 cats that were positive for the FeLV antigen in the present study. Respiratory tract disorders were present in five of these cats. Anemia, middle ear infection, uremia, dermatitis and ascites were found in the remaining five cats.

These results suggest that the FIV and FeLV infections directly or indirectly affect the health of the cats. Although the infections can be presented with obvious clinical symptoms in some cases, diagnosis of the infections may frequently be missed in the clinic. Thus, it is suggested that these infections be taken into careful consideration during clinical examinations of the animals and periodic tests should be offered. Periodic virological testing of the house cats may be important in the protection of nearby animals and taking the necessary measures to prevent spread as well as the progression of the disease.

In this study, age of the animal had a significant influence on the positivity rate for anti-FIV antibodies but not FeLV antigen or FeLV-specific antibodies. The positivity rates for the anti-FIV antibodies were especially high in cats older than three years of age. These results agree with the previous studies reporting increased prevalence of FIV infection at older ages [3,12]. However, the effect of age on FeLV infection is subject to controversy in the literature. Some authors have reported increased [4,7] whereas others reported no change [3] in FeLV infection rate in older animals.

CONCLUSION

In summary, results obtained in this study suggest that infections by FIV and FeLV, two of the most important pathogens of cats, are relatively common in western Turkey bordering Europe. The seroprevalence rates of the virus change significantly from one province to another. Seropositivity rates for the anti-FIV antibodies are significantly higher in male house cats with clinical symptoms. Sick cats are more likely to carry FeLV antigens than the apparently healthy cats. The results obtained in this study should be helpful in clinical diagnosis and designing further plans to combat these diseases in Turkey and neighboring countries.

SOURCES AND MANUFACTURERS

¹FIV Antibody ELISA, B.V. European Veterinary Laboratory - E.V.L. Woerden, Netherlands.

²FeLV-p27 antigen ELISA, B.V. - E.V.L. Woerden, Netherlands.

³Feline Leukemia Virus-gp70 antibody ELISA, B.V. - E.V.L. Woerden, Netherlands..

⁴Multiscan® spectrum (Thermo Labsystems). Helsinki, Finland.

⁵SPSS 10.0, Release 1999. Chicago, IL, USA.

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Ethical approval. This study was approved by the Animal Ethical Committee of the Adnan Menderes University (Approval No: B.30.2.ADU.0.06.00.00/124-HEK/2007/024).

Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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