

Seroprevalence of FeLV and FIV Infections in Domestic Cats in Korea

Soo-won Park, Doo-hyung Lee, Young-hwan Ko, Ji-hyun Hong and Chang-woo Lee¹

College of Veterinary Medicine, Seoul National University

Abstract: Seroprevalence of feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) infections were surveyed in 875 domestic cats derived from 4 major cities and 4 provinces in Korea. Of those tested, 715 were healthy and 160 were sick. FeLV and FIV were tested with AGEN[®] FeLV-FIV, a commercial combo test kit. Ten out of 875 cats (1.1%) were seropositive for FeLV and none out of 875 cats (0%) was positive for FIV, respectively. The positive rates for FeLV were 3.8% in sick cats and 0.6% in healthy cats. The cats at the age of more than 1 year showed higher incidence rates than the younger ones. There were no significant relationships either with the environment or with the sex. The prevalence of seropositive FeLV was 0.7% in mixed cats and 1.6% in pedigree cats. With respect to the regional prevalence of the FeLV, the highest seroprevalence (9.5%) was found in Gyeongsang province.

Key words : FeLV, FIV, domestic cat, Korea, seroprevalence.

Introduction

Feline leukemia virus (FeLV) was first described by Jarrett¹⁰ in Scotland. And feline immunodeficiency virus (FIV) was first isolated by Pedersen *et al*²¹ in the United States. FeLV and FIV are retroviruses of cats which are found worldwide under natural conditions^{10,21,24}. Both FeLV and FIV infections cause several immunocompromised syndromes which make serious problems in cats all over the world^{15,19,23}. Seroepidemiological surveys conducted in the United Kingdom showed that the prevalence of FeLV was 5% in healthy cats and 18% in sick cats, and the prevalence of FIV was 6% in healthy cats and 19% in sick cats⁸. Infection rate of FeLV in Europe, the United States, Canada, Taiwan, northern Vietnam and Japan ranged from 0% to 18%^{1,3-5,11-13,15-17,22,23}. Seroepidemiological surveys conducted in several countries have revealed that the prevalence of FIV infection in cats varies from 0 to 15% in healthy cats and from 3 to 44% in diseased cats^{7,9,14,16-18}.

In Korea, the prevalence of FeLV and FIV infection in stray cats has been reported²⁶. The present infectious status of these feline retroviruses in Korea is unknown. Also there were no reports which were surveyed with the commercial combo diagnostic kit, which can be used at clinical sites. Therefore, the prevalence of those FeLV and FIV infections in domestic cats in this country remains still obscure. The purpose of this study was to investigate the prevalence of FeLV and FIV infections in pet cats, and to emphasize the necessity of the prevention of those infections in Korea.

Materials and Methods

Blood samples

During the investigation period from March to October 2004, a total of 875 serum or plasma samples were collected

from 38 private local animal hospitals distributed in 4 major cities and 4 provinces in Korea (Table 1). The blood samples were collected from both sick and healthy cats of different breeds, different ages and both gender. Among 875 serum samples 160 samples were collected from the sick cats visiting the hospitals, and the others were collected from the healthy cats. History taking and physical examinations were done for the sick cats. The clinical signs of sick cats were anorexia, weight loss, fever, diarrhea, vomiting, dehydration, dermatitis, rhinitis, conjunctivitis, neurologic abnormalities and otological disorders. With regard to their environment 805 cats were strictly housed indoor and the other 70 cats had access to courtyard.

A total of 875 blood samples were obtained from 439 mixed cats and 436 pedigree cats (Table 2). The age of cats varied from 6 weeks to 12 years (Table 3). The number of the male cats was 407 and that of the female cats was 468.

Assay kit

The samples were tested with AGEN[®] FeLV-FIV, a commercial combo assay kit as indicated in the attached manual. The kit was designed to be used in practice sites. The kit is very simple to use and a sample can be tested within about

Table 1. Regional distribution of cats in Korea

Area	No. of involved animal hospitals	No. of samples	Percentage
Seoul	14	571	65
Busan	8	117	14
Daegu	5	54	6
Daejeon Chungcheong	2	18	2
Kyunggi	3	53	6
Kangwon	1	20	2
Gyeongsang	5	42	5
Total	38	875	100

¹Corresponding author.

E-mail : anilover@plaza.snu.ac.kr

15 minutes. The test kit can be stored at room temperature and it is based on the principle of immunochromatography. It contains monoclonal anti-FeLV p27 antibodies and synthetic peptide equivalent to the immunodominant peptide of the FIV gp40 transmembrane protein⁶.

Table 2. Breed distribution of cats

Breed of cats	No. of cats	Percentage
Mixed(DSH)	439	50.2
Persian	163	18.6
Turkish Angora	73	8.3
Siamese	45	5.1
Russian Blue	36	4.1
Scottish Folder	21	2.4
Abyssinians	19	2.2
Himalayan	13	1.5
Norwegian Forest	11	1.3
American Curl	10	1.1
Siberian	10	1.1
Chinchilla	9	1.0
ASH	8	0.9
Birman	4	0.5
British SH	4	0.5
Maine Coon	4	0.5
Bengal	1	0.1
Burmese	1	0.1
ESH	1	0.1
Ragdoll	1	0.1
Somalis	1	0.1
Sphynx	1	0.1
Total	875	100

Table 3. Age distribution of cats

Age (year)	No. of cats	Percentage
< 1	339	38.7
1	235	26.9
2	123	14.1
3	67	7.7
4	41	4.7
5	17	1.9
6	9	1.0
7	12	1.4
8	4	0.5
9	2	0.2
10	2	0.2
11	1	0.1
12	1	0.1
13	2	0.2
Unknown	20	2.3
Total	875	100

Results

Among 875 samples tested 1.1% (10 samples) was positive for FeLV and none was positive for FIV (Table 4).

With respect to the regional prevalence of the FeLV, the highest seroprevalence (9.5%) was found in Gyeongsang province; both Daegu and Kyunggi figured 1.9%, Busan and Seoul figured 0.9% and 0.5% respectively; the other regions revealed none infection (Table 5).

The prevalence of seropositive FeLV was 3.8% in sick cat population and 0.6% in healthy cat population (Table 6).

The positive rate of FeLV was 0.7% in mixed cats and 1.6% in pedigree cats (Table 7).

The positive rate of FeLV infection was 10% in Siberian, 5.5% in Turkish Angora, 1.2% in Persian and 0.7% in mixed cats (Table 8).

Table 4. Seroprevalence of FeLV and FIV infections in domestic cats in Korea

Pathogen	No. of samples	No. of positive	Percentage
FeLV	875	10	1.1
FIV	875	0	0

Table 5. Regional prevalence of FeLV seropositive cats

Area	No. of samples	No. of seropositive	Percentage
Seoul	571	3	0.5
Busan	117	1	0.9
Daegu	54	1	1.9
Daejeon · Chungcheong	18	0	0
Kyunggi	53	1	1.9
Kangwon	20	0	0
Gyeongsang	42	4	9.5
Total	875	10	1.1

Table 6. Prevalence of seropositive FeLV in sick and healthy cats

Status	No. of cats	No. of seropositive	Percentage
Healthy	715	4	0.6
Sick	160	6	3.8
Total	875	10	1.1

Table 7. Positive rate of FeLV infection in mixed cats and pedigree cats

Breed	No. of cats	No. of seropositive	Percentage
Mixed	439	3	0.7
Pedigree	436	7	1.6
Total	875	10	1.1

Table 8. Breed distribution of FeLV seropositive cats

Breed of cats	No. of cats	No. of seropositive	Percentage
Mixed(DSH)	439	3	0.7
Persian	163	2	1.2
Turkish Angora	73	4	5.5
Siamese	45	0	0
Russian Blue	36	0	0
Scottish Folder	21	0	0
Abyssinians	19	0	0
Himalayan	13	0	0
Norwegian Forest	11	0	0
American Curl	10	0	0
Siberian	10	1	10.0
Chinchilla	9	0	0
ASH	8	0	0
Birman	4	0	0
British SH	4	0	0
Maine Coon	4	0	0
Bengal	1	0	0
Burmese	1	0	0
ESH	1	0	0
Ragdoll	1	0	0
Somalis	1	0	0
Sphynx	1	0	0
Total	875	10	1.1

Table 9. Age distribution of FeLV infections in domestic cats in Korea

Age (year)	No. of cats	No. of positive	Percentage
< 1	339	2	0.6
1~3	425	7	1.6
>3	91	1	1.1
Unknown	20	0	0
Total	875	10	1.1

Table 10. Sex distribution of FeLV seropositive cats

Sex	No. of cats	No. of seropositive	Percentage
Male	407	4	1.0
Female	468	6	1.3
Total	875	10	1.1

The FeLV positive rate was higher in cats at the age of more than 1 year compared with younger cats (Table 9).

The positive rate of FeLV in male was 1.0% (4/407) and 1.3% (6/468) in female (Table 10).

The rates of FeLV infection in the indoor cats and the cats with access to courtyard were 1.1% (9/805) and 1.4% (1/70), respectively (Table 11).

Table 11. Environmental distribution of FeLV seropositive cats

Environment	No. of cats	No. of seropositive	Percentage
Indoor	805	9	1.1
Access to courtyard	70	1	1.4
Total	875	10	1.1

Discussion

In this study the prevalence of FeLV and FIV infections were investigated in domestic cats in Korea. Ten out of 875 cats (1.1%) were seropositive for FeLV. A previous report in Korea figured none FeLV positive cats²⁶. In other countries, the seroprevalence of FeLV was reported to be 13.3% in the United States²⁰, 3.8% in Belgium³, 13.4% in Germany⁴, 5-18% in the United Kingdom⁸, 2.9% in Japan¹⁶ and 1.3% in Taiwan¹³. The positive rate of FeLV in Korea was relatively lower than that of FeLV in other countries. Lower incidence of FeLV infection in this country compared with other countries might be attributable to the lower cat population and relatively younger age of the population.

The incidence of FeLV infection in Gyeongsang province was as high as 9.5% of 42 samples. At this moment we cannot consider this incidence as a true incidence because the number of the samples is only 42. But this is strange enough to necessitate the further survey in this region. FeLV spreads in a contagious manner, with no breed predisposition², but in this study the positive rates of FeLV in Siberian (10%; 1/10) and Turkish Angora (5.5%; 4/73) breeds were higher than other breeds. The FeLV positive rate was higher in cats at the age of more than 1 year compared with younger cats. Naturally the older cats must have had more chances to be exposed to the infected cats, and this will explain the higher FeLV positive rate in older cats. In this survey, there was no sex predisposition to FeLV infection, which was consistent with the reports of other countries^{8,12,16,20}. The incidence of FeLV infection was much higher in the sick cat population than in the healthy cat population. This coincides with the fact that the FeLV compromises the immune systems in cats^{2,20}. Even the incidence of FeLV seropositive cats is low in Korea, they are distributed in different regions of the country. So it is emphasized to make every effort toward preventing the spreading of the FeLV.

The FIV positive cat was not detected in this study despite the previous report of FIV infections in stray cats with the incidence of 1.0% in this country²⁶. The null incidence of FIV can be attributable to the higher ratio of the indoor cats compared with the cats which had access to the outdoors. FIV is well known to be spread by bite wounds²⁵.

Conclusion

Among 875 serum samples tested with AGEN[®] FeLV-FIV, a commercial combo assay kit, 1.1% (10 samples) was serop-

ositive for FeLV and none was seropositive for FIV.

The seropositive rate of FeLV showed a regional and breed predisposition.

The sick cat population had a higher FeLV seropositive rate than the healthy population.

There was no sex predisposition in FeLV seropositive rate.

The older cats had a higher FeLV seropositive rate than the young ones, and the cats with access to courtyard had a higher seropositive rate than the cats housed indoors.

It is emphasized to make every effort toward preventing the spreading of the FeLV.

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한국에서 고양이의 FeLV와 FIV 감염 유병률

박수원 · 이두형 · 고영환 · 홍지현 · 이창우¹

서울대학교 수의과대학

요약 : 우리나라의 4개 도시(서울, 부산, 대구, 대전)와 4개 지방(경기도, 충청도, 강원도, 경상도)의 동물병원에 내원하는 875두의 고양이를 대상으로 FeLV와 FIV에 대한 유병률을 조사 하였다. 그 중 715두는 건강하였고 160두는 질병을 갖고 있었다. FeLV와 FIV에 대한 유병률은 AGEN[®] FeLV-FIV kit (AGEN Biomedical)를 사용하여 조사하였다. FeLV는 조사대상 875두 중 10두 (1.1%)의 유병률을 나타내었고, FIV는 전혀 검출되지 않았다. 질병을 가진 고양이 집단의 FeLV 유병률은 3.8%로서 건강한 고양이 집단에 비해 훨씬 높았다. 1-3세의 고양이는 어린 고양이에 비해 유병률이 현저히 높았다. FeLV 유병률은 사육환경과 성별에 따른 차이를 나타내지 않았다. 지역별 비교에서는 경상도에서의 유병률이 42두 중 4두로 9.5%를 나타내어 가장 높았다. 전국적인 FeLV의 유병률은 다른 나라에 비해 아직 높지 않지만 여러 지역에서 검출되기 때문에 예방을 위한 다각적인 노력이 필요할 것이 강조되었다.

주요어: 고양이 백혈병 바이러스, 고양이 면역결핍바이러스, 애완고양이, 유병률