

Frequency of feline leukemia virus (FeLV) in southern aburrá valley, Colombia (2013-2018)

Abstract

The feline leukemia virus (FeLV), causes a fatal disease for the Felidae family and is one of the main retroviral diseases in felines, and therefore has a diagnostic and preventive interest in animal health.

Objective: of the study was to determine the frequency of FeLV by being diagnosed in four municipalities in the south of the Aburrá Valley, Colombia, using the records of the area diagnostic centers.

Materials and methods: A retrospective descriptive study was carried out between 2013-2015, which included 1718 diagnostic tests of domestic cats in the urban area of Medellín, Envigado, Sabaneta and Caldas, from the clinical diagnosis centers of the Aburrá Valley. Simultaneous diagnosis of leukemia was performed on serum and plasma samples by commercial ELISA immunoassay (IDEXX Laboratories®, Snap Combo Plus®, Maine and USA). The data were processed in Statgraphics Centurion XV®, with a confidence level 95%, performed tests of Ji^2 and Tukey.

Results: 376 were positive. Medellín with 21.89%, represented the city with the highest percentage of positive infected (194/376), followed by Envigado, Sabaneta and Caldas, with positive individuals (114, 33 and 35), respectively. The age of infected individuals ranged from 2 to 36 months, with a higher prevalence of mestizo males with a percentage of 17.92% (308/1718), males were more frequent and positive (202/895).

Conclusion: The prevalence of FeLV in the study was 21.86%, being of epidemiological importance in the south of the Aburrá Valley, Antioquia, Colombia.

Keywords: feline, immunochromatography, leukemia, morbidity, viral

Introduction

Retroviruses cause in cats (*Felis silvestris catus*) and other cats a persistent infection.¹ The virus of the feline leukemia virus (FeLV), is one of three agents retroviral more pathogenic in cats, with a persistent global distribution,² the lentivirus infection, infected approximately 5% of healthy cats.¹ This virus primarily affects cats domestic, although it has been described that it also acts in other members of the family Felidae,³ there is a racial predisposition, but described that cats juveniles between one to six years are more susceptible immunologically to virus.^{4,5} It has been established that the proportion of infection by FeLV, is correlated with the amount of cats that are site specific (population density),^{4,6} consequently leads to disease have higher prevalence in shelters of street fauna, farms and homes where there is more than two cats.^{4,7,8} Regarding sex, literature reported increased frequency of infection in males, due to their nomadic habits, which facilitate the conditions of transmission of the virus.^{6,9} Populations of domestic cats in the Aburra Valley are not documented, however, could oscillate with a population of 80,000 felines by 2013. The largest increase of the population can be caused by the current trend of the adoption of the species, due to their low need of space.⁸ Although the FeLV and feline immunodeficiency virus presents prevalence rates and significant frequencies epidemiologically, there are few studies in Colombia,^{6,10} especially in large cities such as Medellin, the second largest of Colombia, where there is a description of the prevalence of FeLV. Feline leukemia is a disease that has been described worldwide, with prevalence of 2.3% USA, 15.6% Spain, 24% Italy, 75.8% in Brazil, 16.6% Guatemala and 2.1% Venezuela;^{4,6,11} in Colombia the information is scarce, only the descriptions made

by Tique et al.,⁶ with a prevalence of 23.3% in the municipality of Montería, Córdoba; other studies in Colombia reported a prevalence of 9-13%.¹² In general, the literature describes the prevalence of FeLV is 1%,^{3,4} but it is considered that in areas enzootic can reach 40%.^{6,13} Spread of FeLV is by contact with secretions and saliva of an infected cat, described that the most frequent form is the lamido.^{9,14} Therefore, consequent and reasonable to think that free-living cats, are responsible for facilitating the transmission.⁵ Inside the box of FeLV States of immunosuppression, with serious pancytopenias, non-regenerative anemia's and neoplasms can be seen lymphoid.^{4,11} The diagnosis of FeLV is performed with the use of a commercial kit combined Snap (IDEXX Laboratories®, Snap Combo Plus®, Maine, USA), in which the presence of VIF can also be determined, it is an ELISA test, with a sensitivity of 98.2% and specificity of 100%.¹⁵ Which warrants an early and timely diagnosis of the two diseases, which may occur as a concomitant.¹¹ Described as cats with VIF, likewise, have up to four times more likely to have FeLV.⁶ It is important to establish that the test for FeLV, determines the presence of the Antigen, but is not necessarily related to the presence of the disease, therefore, many of the results of this study, only describes the presence of FeLV in the Valley Aburrá, not the presence of leukemia disease. In Colombia, the virus prevalence studies are limited and those found are exploratory,^{4,15} with prevalence rates above 20%, in Bogota and Monteria.^{3,6,7} However, there is no study of frequency in major cities in the Valley of Aburrá (Envigado, Sabaneta and Caldas), Colombia, for this reason the objective of this study was to determine the frequency of the diagnosis of FeLV in cats of the four municipalities of the South of the Aburrá Valley for the period 2013-2018

Materials and methods

Type of study: A descriptive study was conducted retrospectively between January 2013 to August 2015.

Study population: 1,718 records of Snap Combo Plus® tests (IDEXX Laboratories®, Maine, USA) were collected from domestic felines, from veterinary clinics and adoption shelters, which were processed at the veterinary diagnostic centers of the Aburrá Valley, Colombia. All races and ages were included, the results were classified in four geographical environments: East Medellin (neighborhoods: Villahermosa, Buenos Aires, La Candelaria, Manrique, Aranjuez), West Medellín (neighborhoods: Laurels, Estadio, Belén, La América, San Javier) and the municipalities of: Envigado, Sabaneta and Caldas. The inclusion factors were all the felines subjected to FeLV is diagnostic test, regardless of whether they had signs of the disease or not, only an analysis of diagnostic results provided by the diagnostic laboratories was carried out, at no time were they subjected to the present study copies. The limitation was that only the information provided by the diagnostic centers could be collected and at no time could individuals be evaluated or information collected from the entire population of that area, being the limitation of the present FeLV study in the Aburrá Valley, Colombia.

Ethics and legal aspects committee: The patients were undergoing all procedures required by the rules stipulated in the code of ethics, chapter VI of the law 84 of 1989, 2016 Act 1774, article 3 and title III, Chapter 6 of the 576 Act of 2000 of the Republic of Colombia granted to the respective optional who sent samples to laboratories, as part of his practice, this study is not manipulated animals.

Immunodiagnosis: Diagnosis of leukemia was ELISA in serum and plasma by commercial immunoassay (IDEXX Laboratories®, Snap Combo Plus®, Maine, USA). The samples were sent to five clinical veterinary reference laboratories, register of certification from the Ministry of health of Antioquia and certification Institute Colombiano Agropecuario (ICA), processing of samples of pets. Test Snap Combo Plus® FeLV/FIV (IDEXX Laboratories®, Snap Combo Plus®, Maine, USA), detects the protein p27 of the FeLV, serum and plasma, with a 93.3% sensitivity and a specificity of 100% (IDEXX Laboratories®). Were evaluated all records of cats whose blood was subjected to the test under the optional authorization.

Statistical analysis: Data was collected in Excel®, Microsoft®, program and then processed in the program Statgraphics Centurion XV® with a 95% confidence level, qualitative data were processed with test J^2 and quantitative data were evaluated test ANOVA and Tukey tests then. The variables evaluated were race, age, sex, and presence of FeLV.

We evaluated the frequency using the following formula:
Frequency=number of animals FeLV positive/evaluated population x100.

Results

Evaluated 1718 records of blood tests at reference laboratories in the Aburrá Valley between 2013-2015, where it was found that the city of Medellín with 58.96%, is the one that presents the greatest number of records for the diagnosis of FeLV; followed by: Envigado, Sabaneta and Caldas, respectively Table 1. Being the frequency of positivity of 21.88% (376 cats) in total. The proportions between males and females of the present study were similar 895 (52.09%)

for males and 823 (47.90%) for females, being a very homogeneous proportion of individuals analyzed for the present study (Table 1); In addition, the sex ratios between the registers of the different zones were very similar, although it should be noted that the proportions according to sex vary between the different municipalities, as can be seen in Table 1, the general percentages are very similar without significant statistical difference between sexes and the variable positivity. With respect to the racial distribution for the present study, it was found that the race most frequently evaluated for this test was the mestizo race with 1414 records (82.30%), followed by Persian 113 (6.57%) and Siamese with 84 (4.88%) of the records respectively, this should be in light of the policies of adoption of mestizo animals and the culture of little purchase of breed animals, which is currently undergoing the evaluation of the area, which shows a huge difference between mestizo and feline cats of race (Table 2).

Table 1 Proportion of cats according to the geographical area discriminated by sex and percentage in 1718 records

Study area	M	±F%	H	±F%	Total	±F%
Eastern Medellin	405	23.57	391	22.75	796	46.33
Western Medellin	115	6.69	102	5.93	217	12.63
Envigado	209	12.21	181	10.53	390	22.7
Sabaneta	91	5.29	68	3.95	159	9.25
Caldas	75	4.36	81	4.71	156	9.08
Total	895	52.09	823	47.9	1718	100

*M H (male), F (female), ±F (frequency).

Table 2 Frequency correlation between race and FeLV in domestic felines of the Aburrá Valley

Breed	n (total)	±F%	FeLV (+)	±F%
Angora	15	0.87	5	0.29
Balines	25	1.45	5	0.29
Bengal	10	0.58	1	0.05
British	4	0.23	0	0
Exotic	32	1.86	3	0.17
Maine Coon	14	0.81	7	0.4
Half Blood	1414	82.3	308	17.92
Persian	113	6.57	23	1.33
Ragdoll	6	0.39	2	0.11
Sabanah	1	0.05	0	0
Siamese	84	4.88	22	1.28
Total	1718	100	376	21.88

*n, (total number of individuals); ±F, Frequency; (+), Positive to the ELISA diagnostic test.

Regarding the frequency of FeLV for the study, it was 21.88% (376/1718), with the city of Medellin with 194 positive records, the highest frequency, with 11.29% (194/1718) of positive felines throughout the population, being the city of Medellin and its two areas studied East Medellin with 150 positives and western Medellín with 44; the area with the highest feline population was evaluated with 1013 animals (58.96%), the municipalities that are in frequency proportion are Envigado, Caldas and Sabaneta, with 114, 35 and 33 positive individuals respectively (Table 3). Regarding FeLV is seropositivity ratios for Medellín; it was found that the Oriental commune has the

highest proportion of positive animals with 39.89%, followed by Envigado with 30.31%, while the municipality of Sabaneta shows a lower proportion with only 8.77% from the positivity to the test. It is important to comment that the proportions can have very different values if they are analyzed in favor of their own municipality, being the frequency of FeLV for Medellín of 19.15% (194/1013), that of Envigado of 29.23% (114/390), Sabaneta of 20.75% (33/159) and Caldas 22.43% (35/156), making the most frequent for FeLV according to its proportion to the municipality of Envigado. For the analysis of the records according to the positivity for FeLV, in females and males it was found that 202 males were positive (22.56%), while the females were only 174 (21.14%), which shows that there is no statistical difference between sexes ($P \leq 0.05$), knowing that for the present study the proportions of records for FeLV between males and females is very similar, being the females surpassed by the males in only 1.43%, which does not represent to be significant for the author. In the evaluation of the age, it was found that the average was 2.36 ± 0.5 years, for males it was 3.34 ± 0.76 years and for female's 1.38 ± 0.20 years respectively. The averages of age indicate that the population of cats in the area is juvenile with an interval between 2-3 years, being the average age of cats positive to FeLV was 2.92 ± 0.1 year. No statistically significant difference was found between FeLV positivity and age in the present study ($P > 0.05$). Regarding the racial distribution, the present study showed that the most frequent race infected and positive to FeLV is mestiza (creole) with 308/1718 (17.92%), followed by Persa 23/1718 (1.33%) and Siamese 22/1718 (1.28%) respectively Table 2, but it should be mentioned that the mestizo race represents in the present study 82.30% of the population, being the race more frequent in the study region. Although it was pointed out that there was significant statistical difference between feline mestizos and the other races ($P \leq 0.05$), it cannot be said that there is a predisposition of the virus by the mestizo races (Creole), which will be discussed later; while pure breeds such as Persian, Siamese and Angora, show a high frequency of infection Persian cats within their breed showed frequency of 20.35%, Siamese 26.19% and Angora 33.33% respectively (Table 2).

Table 3 Serological results for FeLV in positive individuals by area of origin

Study area	Serology SNAP (+)	±F %
East Medellin	150	39.89
Western Medellin	44	11.7
Envigado	114	30.31
Sabaneta	33	8.77
Caldas	35	9.3
Total	376	100

Discussion

The number of records analyzed theoretically represents 2.14% of the feline population in the Aburrá valley, with Medellín being the second city in Colombia, with an estimated 80,000 cats, according to estimates by the Mayor's Office of Medellín for 2013, although the census is unknown Actual and actual number of cats in Envigado, Sabaneta and Caldas, for 2013, it is presumed that the number could reach 2000 more, due to this boom in cat ownership in the south of the Aburrá Valley, many inhabitants who own felines, make the decision to do the blood tests with the SNAP, to rule out the presence of FeLV.¹⁴ Regarding the analysis of the proportions of FeLV between males and females, it can be seen that the disease behaves in this study

very similar to many viral infections in the feline species, affecting equally both males and females.^{3,11,15} These findings are similar to the descriptions made by other authors such as Ramírez et al.,¹³ in the animal welfare center "La Perla" of the city of Medellín, regarding the frequency of the disease the value found of 21.88% is very Similar to those described by these two authors in the wellness center that is 26.1%, other authors describe frequencies ranging from 20-25%,^{6,13} but the frequency described in the present study far surpasses descriptions given in other European countries and in North America where they are described as between 7-15%.¹⁶ Because the population of this study is much greater than those described in other studies in Colombia, where the frequencies have been lower, it would explain why the frequency of FeLV in the South of the Aburrá Valley surpasses the prevalence of FeLV in other Colombian studies.^{6,7,10,14} But it is important to clarify that being a study of the frequency of FeLV positivity records, the data may be over or underestimated and at no time can be interpreted as a prevalence, it is only a frequency of felines positive to the FeLV test, where the current health status of the patient is unknown. When analyzing the frequency according to sex, which differs from some authors who argue that males present the disease more frequently than females,^{5,8,12,17} a possible hypothesis that supports the explanation of why it was similar, is that there is a government policy on birth control (Agreement 53 of 2013 and 22 of 2014, Mayor's Office of Medellin), leads to the sterilization of males and the management of free-living felines, which decreases the proportions between sexes.^{4,5,6,11} The age indicates a growing presence of felines in the area, being in age young cats;^{6,19} Other authors mention that leukemia occurs more in the adult stage, since it is where they mate and the cats before the copulation are spit and bite so they are more exposed to get sick,¹³ but it is important to note that FeLV, also affects young animals, before copulation, very similar to what other authors described,^{6,17,18} this because of the transmission that seropositive females make, to their offspring,^{1,18,19} especially when the presence of the virus is evaluated in cats of breeds such as Siamese, Persian and Balinese, which have more conservative habits and their possible infection would come from the hatchery.^{6,15} As for the breed, it could be indicated that the mestizo breed is the most seropositive for FeLV, but it should be indicated that it is only the most frequent breed in the study area, which explains why it is the most prevalent, this is similar to the descriptions made by other authors in the subject, in which the proportions of infection by FeLV, are more frequent in mestizo cats, because they are the most common animals in developing countries.^{4,6,11,17,20} As for the other races, it was found that pure breeds with positivity for high FeLV such as Persian, Siamese and Angora, is not that they are more susceptible,¹⁵ but that prevention programs are being ineffective and that the mechanisms of Transmission is maintained,^{7,18,19} since, as described in the literature, contagion is carried out through direct contact between infected mothers and neonates,¹ because not only is the process of lactogenic transmission involved, but for the licking of seropositive mothers and their offspring,⁹ this may be the possible explanation of why pure races of recent incursion in Antioquia, Colombia already appear as positive to FeLV, this coupled with failures in prevention by vaccination,^{3,10,12,19} in Colombia there is an approved vaccine for the control of FeLV (Leukocell 2®, Zoetis ©, New Jersey, USA), which is a dead virus vaccine that must be applied to animals after the 8 weeks of vi gives and with revaccination to the tenth week,¹² subcutaneously, which guarantees a protection of 90%,^{10,18,19} but in the middle its use has been ruled out, for which many cats do not receive the vaccination, because there are some concepts about the possibility of contracting the disease through vaccination, which may explain why in the area of influence,

the disease is very frequent, due to urban myths by the owners. In felines, the condition of behaving as a walking animal facilitates the transmission of viruses by saliva in cats, especially during fights.^{1,12} This could be the explanation of why the area of eastern Medellín is where FeLV is most frequent (Table 1), since it is an area where cats live in uni or bifamiliares homes and not in apartments, as well as being the Medellín area of lower socioeconomic stratum where the mestizo felines predominate, for this reason their free behavior allows the infection between the individuals.^{3,15} An opposite case happens with the municipalities of Envigado and Sabaneta, which are more urban and where the populations of infected cats are lower but the population evaluated is lower, the problem is that the possible presence of FeLV in this area is due to problems in the vaccination of the copies. The frequency of FeLV in the Aburrá Valley and especially in the Municipalities where this frequency study was conducted are high, the plans and programs to prevent the disease seem to be insufficient, in addition to showing that the disease is possibly very prevalent in that medium. This is the first FeLV frequency study in four southern municipalities of the Aburrá Valley and will serve as a starting point for future FeLV prevalence studies.

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None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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