Seroepidemiological Survey of Infection by Feline Leukemia Virus and Immunodeficiency Virus in Madrid and Correlation with Some Clinical Aspects

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A study of 180 healthy cats found that 15.6% were feline leukemia virus (FeLV) positive, 8.3% were feline immunodeficiency virus (FIV) positive, and 1.1% were FeLV and FIV positive, which corresponded to 30.4, 13.8, and 2.6, of 115 cats with FIV- and FeLV-related symptoms, respectively. Differences were seen in the sexes and age of the populations studied. Anemia, leukopenia, and lymphopenia were the most frequent hematological abnormalities in infected cats.

Two of the three members of the family Retroviridae described in cats are pathogenic: feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV). Both retroviruses have a worldwide distribution. FeLV is transmitted primarily by saliva and respiratory secretions, but it is also secreted by urine, feces, tears, and milk (3, 8). Contagion occurs through the sharing of food and drink containers and by behavior such as grooming of one another. FIV is similar to human immunodeficiency virus type 1 (HIV-1), to the extent that it has been proposed as the best animal model with which to study the pathogenesis of HIV-1 and therapy for humans infected with the virus (3). FIV is shed mainly in the saliva (8) and is transmitted mostly through bite wounds (4, 8, 19), but it is also transmitted in utero or through colostrum and milk (8). FIV induces a progressive immune dysfunction, which develops for months or even years.

The aim of the present work was to estimate the percentage of healthy and symptomatic cats in Madrid infected with the feline retroviruses (FeLV and FIV) as representative of the situation in urban areas in Spain. Some epidemiological parameters of the infected cats such as age, sex, and origin were also studied. Hematological values and renal function were compared between healthy and sick cats.

Cats from the Madrid metropolitan area were sampled between January and November 1999. Group H included 180 healthy animals brought to a veterinary practice for vaccination or a routine checkup. Group S included 115 animals that showed signs such as anorexia, depression, fever, lymphomegaly, stomatitis, rhinotracheitis, generalized skin infections, or tumors which could be related to infection with feline retroviruses. Data collected from the animals included age, sex, origin, lifestyle, and vaccination and clinical histories. Blood was collected from the animals to determine whether they were infected with FIV and/or FeLV by using a commercial kit (Snap Combo Plus R; Idexx, Inc., Westbrook, Maine). According to the literature, the sensitivity and specificity of this type of enzyme-linked immunosorbent assay range between 93 and 100% (2, 5, 9, 13, 17).

Among the 180 cats in group H, 15.6% were found to be FeLV positive, 8.3% were FIV positive, and 1.1% were positive for both viruses. With respect to the 115 animals in group S, 30.4% were FeLV positive, 13.9% were FIV positive, and 2.6% were positive for both viruses. Among the cats in group H, the prevalence of FeLV agrees with data from other studies: 18% in Italy (1) and 13.4% in Germany (6). In the case of the percentage of cats infected with FIV, results were also similar to those of previous studies in Western Europe: 11% in France (4) and 6% in the United Kingdom (11). Other studies obtained different prevalences of infected cats: 2% FeLV-positive cats in Sydney, Australia (15), 1.2% FeLV-positive cats in Norway (18), 0.7% FIV-positive cats in Switzerland (14), and 44% FIV-positive cats in Japan (12). These differences are probably related to sociocultural circumstances, which determine the lifestyles and origins of the domestic cats and possibilities for interactions between infected and noninfected cats. As might be expected, the percentage of cats infected with FeLV, FIV, and both viruses was almost double in cats in group S compared with that in cats in group H. It is worth mentioning that the clinical signs are very nonspecific, and a high percentage of animals with clinical signs suggestive of infection with FIV or by FeLV were negative for both retroviruses.

To study the influence of age, cats were classified in three categories: young (<3 years old), mature (3 to 8 years old), and senior (>8 years old). Among the cats in group H, 70% of the FeLV-positive animals were young, 20% were mature, and 10% were senior. Among the FIV-positive cats in group H, the proportions were 20, 60, and 20%, respectively. Among the FeLV-positive cats in group S, 50.1% were young, 42.8% were mature, and 7.1% were senior cats. Among the FIV-positive cats in group S, the age distributions were 33.4, 55.5, and 11.1%, respectively. The average older age of FIV-positive cats in group H probably reflects the fact that FIV is more easily transmissible by bites. Besides transmission from queens, the fact that FeLV-positive animals were younger than FIV-positive animals may also indicate that animals infected with FeLV die at a younger age and fewer infected animals reach an older age.

When classified by sex, the percentages of FeLV-positive or FIV-positive males in group H (63.2 and 83.3%, of the 103 animals whose sexes were known, respectively) were signifi-
cantly higher than those for females \((P < 0.05)\). On the other hand, the proportions of FeLV-positive and FIV-positive males among the 94 cats in group S were only 41.4 and 50\%, respectively. These differences were significant \((P < 0.05)\). These data seem to indicate that sex may somehow influence the development of signs related to FeLV or FIV infection. Other investigators (10) have also detected sex-related differences in the rate of FIV positivity among cats, especially in the sense that estradiol may protect peripheral lymphocytes from apoptosis after stimulation.

The number of red blood cells (RBCs), the number of leucocytes (WBCs), and the leucocyte formula were determined for 27 FeLV-positive, 9 FIV-positive and 43 FIV- and FeLV-negative cats, including cats in both groups H and S. The intervals considered normal were 5.5 million to 10 million RBCs/\(\mu\)L, 5,500 to 19,500 WBCs/\(\mu\)L, 35 to 75\% neutrophils, and 20 to 55\% lymphocytes. Fifty percent of the FeLV-positive cats, 44\% of the FIV-positive cats, but only 14\% of the FIV- and FeLV-negative cats had anemia. Thus, FeLV and FIV infections seem to be related to anemia, even though there was no predominant alteration, which may indicate that the animals studied were in different clinical stages of the disease, each one characterized by a specific alteration. The most frequent variations were neutropenia (33.3\% of FeLV-positive cats) and lymphopenia (37.5\% of FIV-positive cats).

Some investigators have suggested that infection with feline retroviruses may induce renal lesions due to the deposit of immune complexes in renal tissues (12, 16). Urea and creatinine levels were determined in 213 plasma samples of cats in each one characterized by a specific alteration. The most frequent variations were neutropenia (33.3\% of FeLV-positive cats) and lymphopenia (37.5\% of FIV-positive cats).

From the results of this study, we may conclude that an important percentage of cats are infected with FIV and FeLV and have no clinical signs. Accordingly, the everyday veterinary practice should aim to detect these retroviruses in all cats that come to the practice for the first time in order to control the infection. In addition, FIV and FeLV detection is also necessary for sick cats, as the clinical signs are varied and nonspecific, so that appropriate measures can be taken, especially avoidance of free roaming.

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