Seroprevalence of feline leukemia virus and feline immunodeficiency virus infection among cats in North America and risk factors for seropositivity

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Objective—To determine seroprevalence of FeLV and FIV infection among cats in North America and risk factors for seropositivity.

Design—Prospective cross-sectional survey.

Animals—18,038 cats tested at 345 veterinary clinics (n = 9,970) and 145 animal shelters (8,068) between August and November 2004.

Procedure—Cats were tested with a point-of-care ELISA for FeLV antigen and FIV antibody. A multivariable random effects logistic regression model was used to identify risk factors significantly associated with seropositivity while accounting for clinic-to-clinic (or shelter) variability.

Results—409 (2.3%) cats were seropositive for FeLV antigen, and 446 (2.5%) cats were seropositive for FIV antibody; 58 (0.3%) cats were seropositive for infection with both viruses. Multivariable analysis indicated that age, sex, health status, and cat lifestyle and source were significantly associated with risk of seropositivity, with adults more likely to be seropositive than juveniles (adjusted odds ratios [ORs], 2.5 and 2.05 for FeLV and FIV seropositivity, respectively), sexually intact adult males more likely to be seropositive than sexually intact adult females (adjusted ORs, 2.4 and 4.66), and outdoor cats that were sick at the time of testing more likely to be seropositive than healthy indoor cats (adjusted ORs, 8.89 and 11.3).

Conclusions and Clinical Relevance—Results suggest that certain characteristics, such as age, sex, health status, and lifestyle, are associated with risk of FeLV and FIV seropositivity among cats in North America. However, cats in all categories were found to be at risk for infection, and current guidelines to test all cats at the time of acquisition and again during illness should be followed. (*J Am Vet Med Assoc* 2006;228:371–376)

Feline leukemia virus infection and FIV infection are among the most common infectious diseases of cats in North America. The prevalence of FeLV infection has reportedly[1,2] decreased during the past 20 years, presumably as a result of implementation of widespread testing programs and development of effective vaccines. In contrast, testing for FIV infection is less common, and a vaccine against FIV has only recently been introduced. Thus, whether the prevalence of FIV infection is also changing is unknown.

Determining the true prevalence of FeLV or FIV infection is difficult because testing is voluntary and results are not collected into a central database. In addition, the lack of any national registry of veterinary clinics, animal shelters, or pet owners precludes selection of a 2-stage random sample of cats for testing that is representative of the population as a whole. For this reason, previous studies[3,4,a] of the prevalence of FeLV or FIV infection have relied on convenience samples representing specific categories of cats examined at veterinary clinics or enrolled in spay-neuter programs. Authors of a large national study[3] involving 27,976 sick cats and cats considered at high risk for infection reported prevalences of 13% for FeLV infection and 7% for FIV infection; however, that study was completed more than a decade ago. Prevalences were much lower in a recent study,[a] in which 1.3% of 1,763 cats were positive for FeLV infection and 0.9% of 1,757 cats were positive for FIV infection, but that study was restricted to healthy pet cats. Authors of a study[4] of 1,876 unowned feral cats reported that prevalence of infection was 4% for each virus.

More information is needed, therefore, regarding the current prevalences of FeLV and FIV infection in cats and factors associated with seropositivity. The purposes of the study reported here were to determine seroprevalence of FeLV and FIV infection among cats in North America and to identify risk factors for seropositivity.

Materials and Methods

Study participants—Veterinary clinics and animal shelters in the United States (including Puerto Rico) and Canada were invited to participate in the study. Potential study centers were identified through the membership roster of the American Association of Feline Practitioners; a list of all individuals who had purchased FeLV and FIV test kits in the recent past; and lists of animal shelters, cat rescue organizations, and groups participating in trap-neuter-return programs for feral cats derived from various Internet directories. Potential study centers were sent a letter explaining the study and inviting them to participate. Only those centers that routinely tested at least 25 cats a month for FeLV and FIV infection were eligible to participate.

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OR Odds ratio
CI Confidence interval

Study centers that agreed to participate were asked to submit results of tests for FeLV and FIV infection performed on kittens and cats during August, September, October, and November 2004. Study centers were provided with testing guidelines developed by the American Association of Feline Practitioners, which recommend testing all newly acquired cats, all cats exposed to infected cats, all cats of unknown infection status, and all sick cats. Ultimately, however, the decision of whether any individual cat was tested was made by the cat owner.

Data collection—Test results and information regarding signalment, environment, and health status of tested cats were submitted to the investigators by fax transmission. In general, veterinary clinics that participated in the study submitted information on owned pet cats, and animal shelters that participated, including traditional animal shelters, rescue groups, and groups involved with feral cat spay-neuter programs, submitted information on unowned cats. For purposes of data analysis, information submitted by veterinary clinics regarding results of testing of unowned cats was grouped with information submitted by the animal shelters and information submitted by animal shelters regarding results of testing of owned pet cats was grouped with information submitted by the veterinary clinics.

Testing protocol—Cats were tested for FeLV antigen and FIV antibody with a commercially available ELISA.[b] Blood, serum, or plasma was used for testing. Reported sensitivities of the assay for detection of FeLV antigen and FIV antibody were 98.6% and 98.2%, respectively; reported specificities were 98.2% and 100%, respectively.[c] Confirmatory tests were not performed as part of the present study.

Risk factors—To evaluate regional variations in seroprevalence of infection, the United States was divided into 4 geographic regions defined by the US Census Bureau and used by the CDC for human health surveillance.[d] Canadian provinces were grouped into a single fifth region.

Other risk factors that were evaluated included age (juvenile [ie, < 6 months old] vs adult) and sex (sexually intact female, spayed female, sexually intact male, and castrated male). Owned pet cats were grouped according to whether cats were kept exclusively indoors or had access to the outdoors. Unowned cats were grouped as stray cats, owner-relinquished pet cats, and feral cats. Finally, general health status of the cat at the time of testing was recorded as healthy or sick.

Statistical analysis—Seroprevalence was defined as the percentage of cats with positive ELISA results. Unadjusted seroprevalence estimates of FeLV infection, FIV infection, and FeLV-FIV coinfection were calculated for the study population as a whole and for subpopulations of cats grouped according to facility type (veterinary clinic vs animal shelter).

Asymptotic χ^2 tests were used to test for bivariate associations between each of the putative risk factors and seropositivity. Because of collinearity between cat source and facility type, a 5-level categorical variable incorporating cat source and facility type (outdoor pet cat tested at a clinic, indoor pet cat tested at a clinic, stray cat tested at a shelter, relinquished pet cat tested at a shelter, and feral cat tested at a shelter) was used. Crude (unadjusted) ORs and their 95% CIs were calculated.

Risk factors found in bivariate analyses to be significantly associated with risk of seropositivity were included in multivariable logistic regression analyses.[5] For these analyses, all categorical variables were recoded as indicator variables. To build the regression models, the main effects of covariates were analyzed by use of a backward elimination procedure, with a P value for the likelihood ratio test > 0.05 used for removal. Remaining main effects were forced into a subsequent model in which the same backward elimination procedure was applied to first-order interaction terms of biological importance. In instances when sparse data resulted in unstable parameter estimates, interaction terms were excluded. The final model (main effects and first-order interactions) was then rebuilt to further partition overall variance into fixed (ie, model terms) and random (ie, effects of variable testing protocols at clinics and shelters and variable compliance with testing recommendations) effects.[6,7] Main effect and interaction terms for which the P value was > 0.05 were excluded. All statistical analyses were performed with standard software.[e,f] Values of $P < 0.05$ were considered significant.

Results

A total of 345 veterinary clinics and 145 animal shelters in the United States (representing 40 states and Puerto Rico) and Canada (representing 7 provinces) participated in the study. During the period of the study (August through November 2004), 18,038 cats were tested at participating veterinary clinics (n = 9,970) or animal shelters (8,068).

Of the 18,038 cats tested during the study period, 409 (2.3%) were seropositive for FeLV antigen and 446 (2.5%) were seropositive for FIV antibody. Fifty-eight (0.3%) cats were seropositive for infection with both viruses. The proportion of cats that were sick at the time of testing was significantly ($P < 0.001$) higher among cats tested at veterinary clinics (2,050/9,970 [20.6%]) than among cats tested at animal shelters (676/8,068 [8.4%]). For both viruses, the seroprevalence of infection was significantly ($P < 0.001$) higher among cats tested at veterinary clinics (FeLV, 285/9,970 [2.9%]; FIV, 305/9,970 [3.1%]) than among cats tested at animal shelters (FeLV, 124/8,068 [1.5%]; FIV, 141/8,068 [1.7%]; **Tables 1 and 2**).

There were significant regional differences in FeLV seroprevalence, with cats from the western region having significantly lower seroprevalence of infection than cats from all other regions. Seroprevalence of FIV infection among cats from the western region was significantly lower than seroprevalence among cats from the midwestern and southern regions. No significant regional differences in seroprevalence of coinfection were identified.

Several factors were found in bivariate analyses to be significantly associated with risk of FeLV and FIV seropositivity (Tables 1 and 2). In particular, for both viruses, the risk of seropositivity was significantly higher in adult than in juvenile cats and in male than in female cats. Risk of seropositivity was significantly higher in pet cats that were allowed outdoors (FeLV, 232/6,357 [3.6%]; FIV, 273/6,357 [4.3%]) than in pet cats that were kept strictly indoors (FeLV, 53/3,613 [1.5%]; FIV, 32/3,613 [0.9%]). For cats tested at animal shelters, source (stray, relinquished, or feral) was not significantly associated with FeLV seropositivity, but feral cats had a significantly higher risk of FIV seropositivity (28/709 [3.9%]) than did stray cats (75/4,550 [1.6%]) and relinquished pet cats (38/2,809 [1.4%]). Adult male cats represented 49% of all cats tested and 71.7% of all cats seropositive for FIV antibody. General patterns of risk factors for coinfection with FeLV and FIV were similar to patterns for seropositivity with either virus alone.

For both viruses, risk of seropositivity was higher among sick cats than among healthy cats. Seropositivity risks were highest among sick feral cats (FeLV, 5/33 [15.2%]; FIV, 6/33 [18.2%]), followed by sick pet cats allowed access to the outdoors (FeLV, 104/1,417 [7.3%]; FIV, 114/1,417 [8.0%]). In contrast, seropositivity risks among healthy feral cats (FeLV, 7/676 [1.0%]; FIV, 22/676 [3.3%]) and healthy pet cats allowed access to the outdoors (FeLV, 128/4,940 [2.6%]; FIV, 159/4,940 [3.2%]) were significantly ($P < 0.001$) lower. The lowest risks for seropositivity for FeLV and FIV infection were found among healthy cats in the western region (FeLV, 25/3,339 [0.7%]; FIV, 46/3,339 [1.4%]), healthy juvenile cats (FeLV, 90/8,482 [1.1%]; FIV, 75/8,482 [0.9%]), healthy female cats (FeLV, 113/8,001 [1.4%]; FIV, 82/8,001 [1.0%]), healthy pet cats kept strictly indoors (FeLV, 33/2,980 [1.1%]; FIV, 21/2,980 [0.7%]), and healthy

Table 1—Results of bivariate analyses of potential risk factors for FeLV seropositivity in 18,038 cats tested at veterinary clinics and animal shelters in North America.

Factor	Categories	No. of cats tested	No. with positive results (%)	OR	95% CI	*P* value
Study site	Animal shelter	8,068	124 (1.5)	Referent	NA	NA
	Veterinary clinic	9,970	285 (2.9)	1.9	1.5, 2.3	< 0.001
Region	West	3,737	39 (1.0)	Referent	NA	NA
	Canada	325	8 (2.5)	2.4	1.1, 5.2	0.03
	South	6,359	144 (2.3)	2.2	1.5, 3.1	< 0.001
	Northeast	3,747	107 (2.9)	2.8	1.9, 4.0	< 0.001
	Midwest	3,870	111 (2.9)	2.8	1.9, 4.0	< 0.001
Source	Clinic—indoors only	3,613	53 (1.5)	Referent	NA	NA
	Shelter—relinquished pet	2,809	41 (1.5)	1.0	0.7, 1.5	0.981
	Shelter—stray	4,550	71 (1.6)	1.1	0.7, 1.5	0.732
	Shelter—feral	709	12 (1.7)	1.2	0.6, 2.2	0.652
	Clinic—outdoors access	6,357	232 (3.6)	2.5	1.9, 3.4	< 0.001
Age	Juvenile	9,556	131 (1.4)	Referent	NA	NA
	Adult	8,482	278 (3.3)	2.4	2.0, 3.0	< 0.001
Sex	Spayed female	2,611	45 (1.7)	Referent	NA	NA
	Sexually intact female	6,588	128 (1.9)	1.1	0.8, 1.6	0.485
	Sexually intact male	5,855	148 (2.5)	1.5	1.1, 2.1	0.023
	Castrated male	2,984	88 (2.9)	1.7	1.2, 2.5	0.03
Health status	Healthy	15,312	238 (1.6)	Referent	NA	NA
	Sick	2,726	171 (6.3)	4.2	3.5, 5.2	< 0.001

NA = Not applicable.

Table 2—Results of bivariate analyses of potential risk factors for FIV seropositivity in 18,038 cats tested at veterinary clinics and animal shelters in North America.

Factor	Categories	No. of cats tested	No. with positive results (%)	OR	95% CI	*P* value
Study site	Animal shelter	8,068	141 (1.7)	Referent	NA	NA
	Veterinary clinic	9,970	305 (3.1)	1.8	1.5, 2.2	< 0.001
Region	West	3,737	72 (1.9)	Referent	NA	NA
	Northeast	3,747	79 (2.1)	1.1	0.8, 1.5	0.576
	Midwest	3,870	102 (2.6)	1.4	1.0, 1.9	0.039
	South	6,359	183 (2.9)	1.5	1.1, 2.0	0.003
	Canada	325	10 (3.1)	1.6	0.8, 3.2	0.161
Source	Clinic—indoors only	3,613	32 (0.9)	Referent	NA	NA
	Shelter—relinquished pet	2,809	38 (1.4)	1.5	1.0, 2.5	0.076
	Shelter—stray	4,550	75 (1.6)	1.9	1.2, 2.8	0.003
	Shelter—feral	709	28 (3.9)	4.6	2.8, 7.7	< 0.001
	Clinic—outdoors access	6,357	273 (4.3)	5.0	3.5, 7.3	< 0.001
Age	Juvenile	9,556	100 (1.0)	Referent	NA	NA
	Adult	8,482	346 (4.1)	4.0	3.2, 5.0	< 0.001
Sex	Spayed female	6,588	82 (1.2)	Referent	NA	NA
	Sexually intact female	2,611	44 (1.7)	1.4	0.9, 2.0	0.103
	Sexually intact male	5,855	193 (3.3)	2.7	2.1, 3.5	< 0.001
	Castrated male	2,984	127 (4.3)	3.5	2.7, 4.7	< 0.001
Health status	Healthy	15,312	280 (1.8)	Referent	NA	NA
	Sick	2,726	166 (6.1)	3.5	2.9, 4.2	< 0.001

See Table 1 for key.

cats tested at animal shelters (FeLV, 77/7,392 [1.0%]; FIV, 110/7,392 [1.5%]).

The final multivariable logistic regression model for risk of FeLV seropositivity included factors for age, source, region, sex, and health status (**Table 3**). Juvenile cats had a lower odds of seropositivity than did adult cats; cats in the western region had a lower odds of seropositivity than did cats in the southern, northeastern, or midwestern region. Spayed female cats had a lower odds of seropositivity than did sexually intact female cats or sexually intact male cats, and healthy cats had a lower odds of seropositivity than did sick cats. There was a significant interaction between health status of the cat at the time of testing and source, suggesting effect modification of 1 risk factor on the other. Individual clinic or shelter, considered as a random

Table 3—Results of multivariable random effects logistic regression of potential risk factors for FeLV seropositivity in 18,038 cats tested at veterinary clinics and animal shelters in North America.

Factor	Categories	Estimate	SE	OR	95% CI	*P* value
Intercept	NA	–6.781	0.365	NA	NA	< 0.001
Age	Juvenile	Referent	NA	NA	NA	NA
	Adult	0.924	0.130	2.52	1.95, 3.25	< 0.001
Source	Shelter—relinquished pet	Referent	NA	NA	NA	NA
	Shelter—feral	0.056	0.468	1.06	0.42, 2.65	0.905
	Clinic—indoors only	0.295	0.262	1.34	0.80, 2.25	0.260
	Shelter—stray	0.340	0.301	1.40	0.78, 2.53	0.259
	Clinic—outdoors access	1.146	0.252	3.15	1.92, 5.16	< 0.001
Region	West	Referent	NA	NA	NA	NA
	Canada	0.262	0.515	1.30	0.47, 3.57	0.610
	South	0.604	0.259	1.83	1.10, 3.04	0.020
	Northeast	0.790	0.387	2.20	1.03, 4.71	0.041
	Midwest	0.853	0.276	2.35	1.37, 4.03	0.002
Sex	Spayed female	Referent	NA	NA	NA	NA
	Castrated male	0.336	0.192	1.40	0.96, 2.04	0.080
	Sexually intact female	0.606	0.199	1.83	1.24, 2.70	0.002
	Sexually intact male	0.883	0.194	2.42	1.65, 3.54	< 0.001
Health status	Healthy	Referent	NA	NA	NA	NA
	Sick	1.966	0.363	7.14	3.51, 14.55	< 0.001
Health status × source	Sick × shelter—relinquished pet	Referent	NA	NA	NA	NA
	Sick × shelter—feral	1.276	0.753	3.58	0.82, 15.67	0.090
	Sick × clinic—indoors only	0.109	0.445	1.12	0.47, 2.67	0.806
	Sick × shelter—stray	–0.814	0.468	0.44	0.18, 1.11	0.082
	Sick × clinic—outdoors access	–0.927	0.387	0.40	0.19, 0.85	0.017

See Table 1 for key.

Table 4—Results of multivariable random effects logistic regression of potential risk factors for FIV seropositivity in 18,038 cats tested at veterinary clinics and animal shelters in North America.

Factor	Categories	Estimate	SE	OR	95% CI	*P* value
Intercept	NA	–6.087	0.257	NA	NA	< 0.001
Age	Juvenile	Referent	NA	NA	NA	NA
	Adult	0.720	0.229	2.05	1.31, 3.22	0.002
Source	Clinic—indoors only	Referent	NA	NA	NA	NA
	Shelter—relinquished pet	0.616	0.269	1.85	1.09, 3.14	0.022
	Shelter—stray	0.894	0.242	2.45	1.52, 3.93	< 0.001
	Clinic—outdoors access	1.419	0.197	4.13	2.81, 6.08	< 0.001
	Shelter—feral	1.423	0.320	4.15	2.21, 7.77	< 0.001
Sex	Sexually intact female	Referent	NA	NA	NA	NA
	Castrated male	0.191	0.424	1.21	0.53, 2.78	0.653
	Sexually intact male	0.196	0.222	1.22	0.79, 1.88	0.379
	Spayed female	0.455	0.409	1.58	0.71, 3.52	0.266
Health status	Healthy	Referent	NA	NA	NA	NA
	Sick	1.007	0.116	2.74	2.18, 3.43	< 0.001
Age × sex	Adult sexually intact female	Referent	NA	NA	NA	NA
	Adult castrated male	0.565	0.464	1.76	0.71, 4.37	0.223
	Adult sexually intact male	1.342	0.287	3.83	2.18, 6.72	< 0.001
	Adult spayed female	–0.684	0.471	0.50	0.20, 1.27	0.146

See Table 1 for key.

effect in the model, explained 17.1% of the total variance in risk of FeLV seropositivity ($P < 0.001$).

The final multivariable logistic regression model for risk of FIV seropositivity included factors for age, source, sex, health status, and the interaction between age and sex (**Table 4**). Healthy cats had a lower odds of FIV seropositivity than did sick cats; pet cats kept strictly indoors had a lower odds of seropositivity than did pet cats with access to the outdoors, feral cats, relinquished pet cats, and stray cats. Juvenile cats had a lower odds of seropositivity than did adult cats, and sexually intact female cats had a lower odds of seropositivity than did sexually intact adult male cats. Individual clinic or shelter, considered as a random effect in the model, explained 17.6% of the total variance in risk of FIV seropositivity ($P < 0.001$).

The final multivariable logistic regression models for risk of serologic evidence of coinfection with FeLV and FIV included factors for age, sex, and health status. The magnitude of the ORs was more similar to the magnitude of the ORs for FeLV seropositivity than FIV seropositivity, although their direction was the same. In particular, adult cats had higher odds of coinfection seropositivity (adjusted OR, 5.31; 95% CI, 2.64 to 10.69) than did juvenile cats, sick cats had higher odds of coinfection seropositivity (adjusted OR, 8.24; 95% CI, 4.47 to 15.24) than did healthy cats, and sexually intact male cats had higher odds of coinfection seropositivity (adjusted OR, 2.96; 95% CI, 1.46 to 6.00) than did sexually intact female cats. Individual clinic or shelter, considered as a random effect in the model, explained 47.3% of the total variance in coinfection seropositivity ($P < 0.001$).

Discussion

Identification and segregation of infected cats are considered to be the most effective methods for preventing new infections with FeLV and FIV, and the American Association of Feline Practitioners recommends that all cats be tested for both viruses when they are first acquired as pets, when they are exposed to cats known to be infected, when they are exposed to cats for which infection status is unknown, and when they become ill, regardless of previous test results.[8] However, many factors affect which cats are actually tested. In particular, although veterinarians can recommend testing, individual cat owners are ultimately responsible for the decision as to whether to test.

Although seroprevalences of FeLV and FIV infection in the present study differ from values given in previous reports,[3,4,a] it is not possible to compare results of these different studies to assess changes in seroprevalences over time because of differences in the study populations. Previous studies each tested a single population of cats, such as high-risk cats,[3] healthy pet cats,[a] and feral cats,[4] whereas the present study included a large number of cats of all ages, lifestyles, and health conditions tested contemporaneously under similar conditions during a single season. Trends in population seropositivity rates over time could be monitored by repeating this same study in the future.

It has been recommended that positive results for the FeLV ELISA be confirmed with an immunofluorescent antibody test and that positive results for the FIV ELISA be confirmed with a western blot assay.[1,8] Because positive assay results were not confirmed by means of an alternative assay in the present study, it is possible that some positive assay results were falsely positive for infection. Feline immunodeficiency virus antibodies can be detected in uninfected cats when cats are vaccinated against FIV and when kittens nurse from queens vaccinated against or infected with FIV.[9,10] The FIV vaccination status was unknown for many cats in the present study, particularly those tested by animal shelters. Presumably, however, veterinarians would not choose to test pet cats for FIV if they were known to be vaccinated, and the population of cats cared for by animal shelters was unlikely to have a high rate of FIV vaccination. Thus, bias of estimates caused by false-positive FIV assay results was likely minimal. False-negative assay results are also possible and occur when cats have not yet seroconverted following recent exposure and when the concentration of FeLV p27 antigen or FIV-specific antibodies in serum is less than the detection limit of the test.

Crude (unadjusted) seroprevalences should be interpreted cautiously because various study centers and pet owners may have had different philosophies about the importance of testing, and patterns of selecting cats for testing may have influenced reported prevalences. In the present study, the proportion of cats that were sick was significantly higher among cats tested at veterinary clinics than among cats tested at animal shelters. It is possible that veterinarians at veterinary clinics may perceive an increased need to test sick pet cats for diagnostic purposes, compared with staff managing homeless cats at animal shelters. Because prevalence was higher in sick cats than in healthy cats, this would have artificially increased the reported prevalences of infections among pet cats tested at veterinary clinics. A similar situation exists for feral cats. Many large feral cat spay-neuter programs do not routinely test all feral cats at the time they are neutered. Testing is more likely to be performed when a feral cat is debilitated and a decision is being made as to whether to return the cat to the colony.[11,12] Alternatively, shelters may selectively test healthy cats perceived as good candidates for adoption. If sick cats are less frequently tested because they are deemed unadoptable, this would artificially decrease the reported prevalences among cats tested at animal shelters.

Bivariate risk factor associations with seropositivity in the present and previous studies also should be interpreted cautiously because clinics and cats were not sampled in a random manner, limiting the extent to which findings can be generalized to the entire North American cat population. However, multivariate analysis identified age, sex, health status, and cat lifestyle and source as significant determinants of the risk of FeLV and FIV seropositivity. Feline leukemia virus and FIV seropositivity risks were both higher in adults, males, cats that were sick at the time of testing, and cats with access to the outdoors. This information can be used to support lifestyle recommendations to keep cats healthy, such as preventing cats from roaming outdoors. Furthermore, it can be used to focus testing resources on cats with the highest risk of infection, when it is not possible to test all cats as recommended.

Despite the availability of point-of-care testing for FeLV and FIV infection and of FeLV and FIV vaccines, infections with these debilitating viruses are still common in North America. Characteristics such as sex, age, lifestyle, and health status can be used to assess the likely risk of FeLV and FIV infections. However, cats in all categories were at risk in the present study, suggesting that current guidelines to test all cats at the time of acquisition and again during illness should be followed whenever possible.

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c. Dietz M, IDEXX Laboratories Inc, Westbrook, Me: Personal communication, 2005.
d. Midwestern region was defined as Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, and Ohio. Northeastern region was defined as New Hampshire, New York, Massachusetts, Connecticut, New Jersey, and Pennsylvania. Southern region was defined as Delaware, Maryland, West Virginia, Virginia, Kentucky, North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, Arkansas, Louisiana, Oklahoma, Texas, and Puerto Rico. Western region was defined as Washington, Oregon, Idaho, Montana, Colorado, Utah, Arizona, California, and Alaska.
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Correction: In "What Is Your Diagnosis?" published December 1, 2005 (*J Am Vet Med Assoc* 2005;227:1743–1744), the mediolateral radiographic view of the right elbow joint (Figures 1A and 2A) of the horse should have been printed in the opposite direction as if the horse's head was on the left versus the right.