JOURNAL OF
SHELTER MEDICINE &
COMMUNITY ANIMAL HEALTH

SHORT REPORT

# Prospective SARS-COV2 Surveillance in Shelter Cats Undergoing Ovariohysterectomy at a Veterinary Teaching Hospital

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*Abstract*

A total of 113 intact female shelter cats between approximately 5 and 18 months of age presented to a veterinary teaching hospital for ovariohysterectomy were surveilled for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) via polymerase chain reaction (PCR) and serology in an observational cross-sectional design to preliminarily assess risks of animal-to-human transmission. Swabs were obtained from the conjunctiva, oropharynx, rectum, and haircoat for PCR analysis. One cat (0.9%) had a low-positive rectal PCR result for SARS-CoV2, but was negative on subsequent testing and did not seroconvert. All other cats were negative on all PCR samples and serology. In the study population, the risk of COVID-19 transmission, both conspecific and zoonotic, appears low.

Keywords: *Coronavirus*; *COVID-19*; *feline*; *SARS-CoV-2*; *zoonosis*

Received: 14 March 2024
Revised: 1 August 2024
Accepted: 28 August 2024
Published: 21 November 2024

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**Reviewers:**
Uri Donnett
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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the coronavirus responsible for the COVID-19 pandemic,[1] with over 770 million human cases and approximately 7.0 million deaths globally as of December 1, 2023.[2] Domestic cats have been shown to be susceptible to experimental and natural infection, and are competent hosts for conspecific transmission under experimental conditions.[3–6] Seroprevalence can be high in cats from households with human infections (up to 43.9%) but is generally low in feral populations (0.8–3%).[7] Clinical signs in infected cats are often absent to rare and mild, with death being extremely rare.[8,9]

There has been one documented case of cat-to-human transmission of SARS-CoV-2.[10] Veterinary and shelter personnel may be at an increased risk of animal-to-human transmission given close interaction with large numbers of cats. SARS-CoV-2 transmission is primarily via respiratory/oropharyngeal secretions and aerosols,[11,12] potentially making contact with cats exhibiting signs of respiratory disease (sneezing, coughing, oculonasal discharge) high risk. Cats at shelters are highly likely to have upper respiratory disease, with one multi-shelter study finding 54.8% of cats to be affected.[13] The risk of exposure to respiratory secretions and aerosols also likely increases during the process of endotracheal intubation for surgery, which has been implicated in conspecific transmission of SARS-CoV-2 in human cases.[14] SARS-CoV-2 nucleic acid has also been reported in the feces of infected cats.[15] At the time of sampling, it was largely unknown whether routes other than respiratory (e.g. fecal shedding, haircoat carriage) played a significant role in feline SARC-CoV-2 transmission.

Each veterinary student at Cornell University College of Veterinary Medicine is required to perform an ovariohysterectomy on a shelter-sourced cat as part of the surgical curriculum. Given the unquantified risk of animal-to-human transmission posed during the close interaction between cats with limited historical information and veterinary personnel administering anesthesia and performing surgery, the objective of this study was to assess the prevalence of SARS-CoV-2 carriage in cats (both current [nucleic acid] and prior [serologic] exposure) as a preliminary means of assessing the level of risk to veterinary/shelter personnel. The hypothesis was that cats without respiratory signs would be unlikely to harbor SARC-CoV-2 nucleic acid or show serologic evidence of prior exposure.

## Methods

Cats for the surgical exercise were sourced from shelters within approximately 100 miles of the teaching hospital, were supposed to be free of signs of respiratory disease, and were transported to the hospital by shelter personnel; they were housed individually in cages for the duration of


Citation: Journal of Shelter Medicine and Community Animal Health 2024, **3**: 87 - http://dx.doi.org/10.56771/jsmcah.v3.87

their hospitalization. Within 4 h of arrival each cat was examined by the same veterinarian, immediately followed by polymerase chain reaction (PCR) sample collection using nylon flocked swabs and a toothbrush. Swabbed sites in every cat included both inferior conjunctival fornices, the caudal oropharynx, and 1–3 cm into the rectum. Swabs were immediately placed into viral transport media, with the conjunctival and oropharyngeal samples for each cat placed in the same container. The haircoat was brushed with an unused toothbrush, with one truncal-length stroke each on the dorsum, both sides, and the ventrum. The toothbrush was then agitated in a test tube of viral transport media for 15 s before being withdrawn. Blood samples were obtained the same day, typically during venipuncture for pre-surgical quick assessment tests; a small number were obtained the following day under general anesthesia. PCR and whole blood samples were submitted to the Cornell University College of Veterinary Medicine's Animal Health Diagnostic Center on the date of sampling. Nucleic acid extraction and reverse transcription polymerase chain reaction (Tetracore EZ-SARS-CoV-2 real-time RT-PCR) were then performed on swabs; serum neutralization was performed on blood samples. All samples were obtained between September and November of 2020.

## Results

A total of 113 cats were enrolled in the study; 34 (30.1%) had clinical signs potentially consistent with SARS-CoV2 (ocular/nasal discharge, sneezing, dyspnea, and/or elevated rectal temperature documented on the admitting physical examination medical record), of which 15 (44.1%) had increased temperature only. Sufficient blood for serum neutralization was not obtained from three (2.7%). One cat, an approximately 7-month-old female domestic shorthair with no clinical signs, had a positive SARS-CoV2 RT-PCR result on the rectal swab only (cycle threshold [Ct] count 39; negative cutoff >45 cycles); in serial monitoring over the ensuing week, the cat did not seroconvert and was negative on repeated RT-PCR testing from all swab sites. No other cats had positive RT-PCR results, and none were positive via serum neutralization.

## Discussion

The single positive RT-PCR likely represents a false positive given the high Ct, absence of nucleic acid on all other swabs, and failure to seroconvert; contamination from human handlers or laboratory personnel is also possible. SARS-CoV2 was found to be rare to absent in a population of young shelter cats sourced from areas with generally low prevalence of human infections. Despite the stated requirement of the surgical exercise that cats be free of signs of respiratory disease, roughly one third had signs potentially consistent with SARS-CoV2, although some or all of the 15 cats with only elevated rectal temperature might have been attributable to transport stress. The stipulation that cats be free of respiratory signs may bias the study toward negative results, although the majority of infected cats in other studies have mild or no clinical signs, consistent with the population in this study. Exposure to cats in shelter populations is unlikely to pose a significant risk of SARS-CoV2 transmission to humans in these areas. The findings of this study cannot be extrapolated to areas of high prevalence. Limitations include a relatively small number of subjects and cross-sectional (i.e. single time-point) convenience sampling.

## Conclusion

Consistent with contemporary studies, shelter cats in areas with low prevalence of human SARS-CoV2 infection are unlikely to harbor detectable SARS-CoV2, suggesting a low risk of transmission to conspecifics or humans working with similar cat populations.

## Authors' contributions

Carney PC: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, writing-original draft, writing-review and editing; Kirch PJ: data curation, investigation, project administration, resources, writing-review and editing; Thompson N: data curation, investigation, project administration, resources, writing-review and editing.

## Acknowledgments

The authors would like to thank Lorin Warnick for the project conception; François Elvinger, Erin Goodrich, Diego Diel, and the Cornell University College of Veterinary Medicine's Animal Health Diagnostic Center for materials and diagnostic testing; Carolyn McDaniel for patient care and management; and the many regional shelters and rescue organizations that provided the subjects and consented to their participation in this study.

## Conflict of interest and funding

This study was funded by the Cornell Feline Health Center's Rapid Response Fund. The authors declare no conflicts of interest.

## Statement of ethics

All procedures were approved by the Institutional Animal Care and Use Committee (protocol 2020-0089).

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