

SHORT REPORT ARTICLE

Response to Rabies Vaccine in Kittens Under 12 Weeks of Age

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Abstract

We used a prospective observational study to determine whether the administration of rabies vaccine to kittens under 12 weeks of age would induce protective antibody titers. All 10 enrolled kittens had Rapid Fluorescent Focus Inhibition Tests (RFFIT) titers of less than 0.1 IU/mL prior to vaccination, indicating their susceptibility to the rabies virus at approximately 9 weeks of age. All kittens demonstrated a robust immune response to vaccination (i.e. titers > 0.5 IU/mL) on samples collected 28 days after vaccination. These results suggest that, in the absence of maternally derived antibodies (MDAs), kittens approximately 9 weeks of age would be susceptible to the rabies virus but can also have an excellent immune response following vaccination against rabies virus at the time of surgical sterilization.

Keywords: *animal shelter; immune response; titers; trap-neuter-return; TNR; trap-neuter-vaccinate-return; TNVR; vaccination*

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Targeted trap-neuter-return (TNR) efforts are often the only practical method for managing community cats in many contexts and enjoy strong public support.^{1–3} Although only 32 U.S. states and the District of Columbia require cats to be vaccinated against the rabies virus,^a many TNR programs include this as standard practice, leading an increasing number of individuals to adopt the more explicit designation, TNVR (trap-neuter-vaccinate-return). A 2018 survey found that 89.5% of TNR organizations vaccinated cats against rabies at least once.⁴

Previous research has demonstrated the effectiveness of vaccination, particularly with the rabies vaccine, in community cats sterilized as part of a TNVR program.⁵ Vaccination at the time of sterilization allows for more efficient delivery of veterinary care – especially important for organizations that are often operating at capacity. Although there is no ‘standard’ minimum age to sterilize kittens, a threshold of ‘2 lbs. or 2 months’ (i.e., roughly 1 kg and 8 weeks of age) is a common practice.⁴ The Association of Shelter Veterinarians’ Guidelines notes that surgical sterilization can be performed safely as early as 6 weeks of age (~0.7 kg).^{6,7} One challenge faced by TNVR programs involves vaccinating kittens old enough

to be sterilized but younger than the label age (12 weeks) for the rabies vaccine.⁸ The purpose of the study reported here was to determine whether administration of rabies vaccine to kittens under 12 weeks of age would induce protective antibody titers.

Methods

We used a prospective observational study design to compare titer levels before and after kittens were vaccinated against the rabies virus. The research protocol was reviewed and approved by the Institutional Animal Care and Use Committee at Arkansas State University under protocol number FY24-25-155.

In November 2024, 10 kittens (3 male and 7 female) from five different litters (Table 1), all estimated to be under 12 weeks of age, were provided by a rescue organization and transported to Paws Plus Veterinary in Lakeland, Florida. Age was determined by two factors: kittens (1) had no eruption of permanent incisor teeth and (2) weighed less than 1.2 kg of body weight (mean: 1.0, standard deviation [SD] 0.09).^{9,10} This was a convenience sample of kittens requiring sterilization prior to adoption. All kittens appeared to be healthy as determined by their pre-surgical physical examination, performed by a veterinarian. The kittens were anesthetized via intramuscular injection of a combination

a Wisch RF, Andrews A. Table of State Rabies Laws Concerning Cats. Animal Legal & Historical Center, Michigan State University College of Law; 2024. Accessed February 26, 2025.

of ketamine, dexmedetomidine, and butorphanol and maintained with isoflurane via face mask. Once anesthesia was induced, 2.0 mL of blood was collected via jugular or medial saphenous venipuncture and allowed to clot. The samples were then centrifuged, and the serum withdrawn and placed into plastic transport tubes. The samples were refrigerated (<6 days) until they could be shipped to the Kansas State Veterinary Diagnostic Laboratory (KSVDL) for pre-vaccination antibody titer testing using the Rapid Fluorescent Focus Inhibition Test (RFFIT). RFFIT endpoint testing was chosen as its results are comparable to Fluorescent Antibody Virus Neutralization (FAVN) testing¹¹ but can be done at slightly lower cost.^b

Once anesthetized, each kitten was prepared for surgery. This included applying lubricant to each eye and clipping hair from the site of the incisional area. The skin was cleaned with chlorhexidine scrub and rinsed with chlorhexidine solution. Ovariohysterectomy or castration was performed by standard techniques. A tattoo was applied to the ventral abdomen to show sterilization status. After surgery, a transdermal dose of buprenorphine (Zorbium®, Elanco) was applied to the dorsal cervical area for post-operative pain control. Once surgery was completed, a combination panleukopenia/calicivirus/rhinotracheitis vaccine and a rabies (Imrab® 3, Boehringer Ingelheim) vaccine was administered distally on the right forelimb and right hindlimb, respectively, as recommended by the Feline Veterinary Medical Association.⁷ After surgery and when all procedures were completed, anesthesia was partially reversed with atipamezole (Antisedan®, Zoetis). The kittens were placed on the recovery ‘beach’ with warming devices to help maintain their body temperature and discharged to the rescue once fully recovered from anesthesia. The kittens were then housed in foster homes until post-vaccination samples could be obtained.

Post-vaccination samples were collected in a manner identical to pre-vaccination collection, but without sedation, 28 days after the administration of the vaccines. At this time, ‘a peak rabies virus antibody titer is expected, and the animal can be considered immunized’.¹² The samples were refrigerated (<6 days) and shipped overnight to KSVDL for RFFIT testing. Titer levels of at least 0.5 IU/mL ‘provide evidence of a robust immune response after rabies vaccination’.^c

^b KSVDL. Rabies Titer Comparison. Kansas State Veterinary Diagnostic Laboratory. November 23, 2021. Accessed May 9, 2025. <https://ksvdl.org/resources/rabies-titer-comparison.html>.

^c KSVDL. RFFIT Test. Kansas State Veterinary Diagnostic Laboratory. January 9, 2023. Accessed February 26, 2025. <https://ksvdl.org/laboratories/rabies-laboratory/rffit-test/>

Table 1. Rapid Fluorescent Focus Inhibition Test (RFFIT) titers in kittens before and 28 days after vaccination against the rabies virus

Patient no.	Sex	Weight (kg)	Rabies titers (IU/mL)	
			Pre-vaccination	Post-vaccination
111324-1 [§]	M	1.00	<0.1	≥13.0
111324-2 [‡]	F	0.95	<0.1	1.9
111324-3 [†]	M	1.13	<0.1	11.9
111324-4	F	1.00	<0.1	≥13.0
111324-5 [‡]	M	0.95	<0.1	4.0
111324-6 [*]	F	1.00	<0.1	12.5
111324-7 [§]	F	1.00	<0.1	10.0
111324-8 [*]	F	1.00	<0.1	≥13.0
111324-9 [*]	F	1.22	<0.1	5.8
111324-10 [†]	F	1.04	<0.1	2.9

Titers > 0.5 IU/mL indicate a robust immune response to vaccination.

^{*}, [†], [‡], and [§] denote littermates.

Results

RFFIT tests revealed titers less than 0.1 IU/mL for all 10 kittens enrolled in the study prior to vaccination. Samples collected 28 days after vaccination revealed titer levels indicative of a robust immune response (>0.5 IU/mL) for all 10 kittens (Table 1).

Discussion

To our knowledge, this is the first study to look at rabies antibody response in kittens less than the minimum label age of 12 weeks of age, identifying two distinct aspects of rabies vaccination in TNVR programs. First, it showed that none of the kittens enrolled in the study had measurable antiviral rabies antibodies and were therefore susceptible to the disease. Second, and more importantly, it showed that kittens estimated to be under the label age of 12 weeks of age, and with low initial levels of antibodies, had a robust response when vaccinated against rabies. This is important because many TNVR programs do not have the resources to divert young kittens to foster care for socialization and adoption; as a result, some of these kittens are returned to their colony after receiving what might be the only rabies vaccine they will ever receive. Knowing that kittens can develop protective immunity to rabies from one vaccine, even if they are younger than the label age, is important to continuing the practice of vaccinating these kittens.

Although the results presented here are promising, it should be noted that this was a pilot study with a small sample size. In addition, our study design did not include a control group, thereby precluding any comparisons between vaccinated and unvaccinated kittens.

Moreover, the potential role of maternally derived antibodies (MDAs) in this study remains unknown. Previous studies have found that only 20% of kittens and 3% of puppies born to vaccinated mothers exhibited sufficient protection against the rabies virus (titers > 0.5 IU/mL) approximately 8 days (via quantitative enzyme-linked immunosorbent assay)¹³ and 6 weeks (via FAVN) after birth,¹⁴ respectively. We measured titers only at approximately 9 and 13 weeks of age and had no information about the vaccination status of the queens. Finally, several of the kittens were littermates (Table 1), which could lead to similar antibody responses.

Conclusion

Our results provide evidence that vaccinating kittens under the minimum label age of 12 weeks against the rabies virus can be effective and should therefore be considered for TNVR programs if the resources to divert these kittens to foster care for socialization and, ultimately, adoption are unavailable.

Authors' contributions

GRW: conceptualization and writing; SMN: conceptualization; PJW: writing.

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Conflict of interest and funding

In recognition of JSMCAH policy and our ethical obligations as researchers, the authors acknowledge that one of us (GRW) has worked extensively in high-quality, high-volume spay/neuter (HQHVSN) clinics and trains other surgeons in HQHVSN techniques, mostly in support of TNVR and return-to-field (RTF) programs. Another author (PJW) is employed by a national animal welfare organization that promotes TNVR and RTF programs. This research was funded by a grant from Maddie's Fund®. Maddie's Fund is part of The Duffield Foundation Family, which also includes Liberty Dogs and Dave & Cheryl Duffield Foundation.

Author notes

N/A.

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