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Frequency of CPV Infection in Vaccinated Puppies that Attended Puppy Socialization Classes

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ABSTRACT

Socialization is one method of preventing behavior problems in dogs; however, some oppose socialization before 16 wk of age due to the risk of contracting infectious diseases. The objectives of this study were to determine if puppies that attended puppy socialization classes and were vaccinated by a veterinarian at least once were at an increased risk of confirmed canine parvovirus (CPV) infection compared with puppies that did not attend classes and to determine the frequency of suspected CPV infection in puppies vaccinated at least once that attended classes with trainers. Twenty-one clinics in four cities in the United States provided information regarding demographics, vaccination, CPV diagnosis, and class attendance for puppies \leq 16 wk of age. In addition, 24 trainers in those same cities collected similar information on puppies that attended their classes. In total, 279 puppies attended socialization classes and none were suspected of or diagnosed with CPV infection. Results indicated that vaccinated puppies attending socialization classes were at no greater risk of CPV infection than vaccinated puppies that did not attend those classes. (*J Am Anim Hosp Assoc* 2013; 49:95–100. DOI 10.5326/JAAHA-MS-5825)

Introduction

Behavior problems are an important, if not the primary, reason for relinquishment and euthanasia of pet dogs.^{1–5} Fear and aggression are more commonly reported in relinquished dogs compared with owned dogs, and dogs that had bitten a person are at increased risk of relinquishment.^{6,7} Separately, it is estimated that approximately one-quarter of a million dogs and cats are euthanized annually in small animal veterinary practices in the United States as a direct result of behavior problems.⁸ This does not take into account the number of pets with medical problems that owners elect not to treat, and perhaps euthanize, due to concurrent behavior problems.

Socialization is one method of preventing behavioral problems.⁹ The socialization period in dogs has been described as a sensitive period of development when puppies readily acquire behaviors that define their future abilities to form social partnerships with dogs, other animals, and humans. The socialization period is generally accepted by experts to fall between 4 wk and

16 wk of age.⁹ One study showed that puppies socialized before 12 wk of age were more likely to succeed as guide dogs for visually impaired people.¹⁰

Although socialization occurs throughout the life of the dog for maintenance of social relationships and behaviors, puppies that are not socialized during the first 3 mo of life are more likely to be fearful, defensive, and possibly aggressive later in life.¹¹ Studies have shown that dogs raised either under restricted conditions or deprived of social contact as puppies had impaired social communication.^{11–14}

One way of socializing puppies is through puppy socialization classes. One study showed higher retention in homes for dogs that participated in puppy socialization classes.¹⁵ In another study, puppies that attended a puppy socialization program were more responsive to commands.¹⁶ The Koret Shelter Medicine Program at the University of California, Davis and the American Veterinary Society of Animal Behavior both recommend that healthy puppies can generally start puppy classes as early as 7–8 wk of age, that

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CPV canine parvovirus

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puppies should receive a minimum of one set of vaccinations and be dewormed at least 7 days prior to the first class, and that puppies should be kept current on vaccinations throughout the classes. Experts also recommend that classes should be held on surfaces that are easily cleaned and disinfected, and that visits to dog parks, pet stores, or other areas that are highly trafficked by ill dogs and/or dogs of unknown vaccination status and/or not sanitized regularly should be avoided.^{15–18}

Some veterinarians do not agree that puppies should be socialized at a young age due to the risk of contracting infectious diseases such as canine distemper and canine parvovirus (CPV).¹⁹ Additionally, veterinary students are still being taught to confine puppies until 1 wk after their last parvovirus vaccination (personal communication with J. Sykes, July 25, 2011). Although the annual incidence of CPV infection in the United States is unknown, one source indicates that CPV infection is one of the most common causes of infectious disease in dogs, and all studies indicate an increased susceptibility in puppies < 6 mo of age.^{20,21} No study to date has shown that puppies attending puppy socialization classes with other healthy, vaccinated puppies were at an increased risk of being diagnosed with CPV infection.

Two distinct groups of puppies were evaluated in the current study: those examined by veterinarians and those enrolled in puppy socialization classes. There was no attempt to relate those two groups because the number of puppies that attended puppy socialization classes was very small relative to the number of puppies that visited veterinarians. The first objective of this study was to determine if puppies that attended puppy socialization classes were at an increased risk of confirmed CPV infection compared with puppies that did not attend socialization classes. The hypothesis was that vaccinated puppies that visited veterinary clinics and attended puppy socialization classes were at no more risk of being diagnosed with CPV infection than vaccinated puppies that did not attend those classes. The second objective was to determine the frequency of suspected CPV infection in puppies that attended puppy socialization classes regardless of whether they were examined by veterinarians. The hypothesis was that the proportion of vaccinated puppies suspected by trainers of having CPV infection that attended puppy socialization classes would be relatively low.

Materials and Methods

This study was approved by the University Institutional Review Board for Human Subject Use (Protocol No. 201017864–1) and the Institutional Animal Care and Use Committee (Protocol No. 12628). In the first part of this study, small animal veterinary clinics in four cities in the United States were selected from the

American Veterinary Medical Association directory and an Internet search based on willingness to participate. Veterinary clinics were selected from both low- and high-income levels of the zip code in which they were located using Census Bureau data to account for differences in the frequency of CPV infection in these locations.²² Large cities were chosen in an effort to increase sample size.

CPV infection is likely widespread in the United States, and a distinct seasonality in disease incidence has been reported.^{23–25} Therefore, four cities from across the country with different seasonal patterns were included: a hot and humid city in the southeast (Atlanta, GA); a city in the midwest with distinct seasons (Chicago, IL); a hot and dry city in the southwest (Phoenix, AZ); and a cool and humid city in the northwest (Seattle, WA). Inclusion criteria for veterinarians were that they examined at least three puppies per mo and routinely vaccinated puppies \leq 16 wk of age against parvovirus. All veterinarians in the selected clinics participated.

A total of 128 veterinary clinics were contacted to determine study eligibility and request participation in the study. The clinics were instructed to maintain records of all puppies that received their initial examination at that clinic between birth and 16 wk of age using a standardized form. The form had undergone pilot testing at two small animal veterinary practices, and necessary revisions were made before the documents were distributed to participating veterinarians. At the time of the initial visit, the signalment and source (shelter, breeder, pet store, friend/giveaway, stray, owner bred, miscellaneous) of each puppy was collected. Additional information collected at each visit included status of parvovirus vaccination, deworming, and fecal testing; whether the puppy was either suspected or confirmed as having CPV infection; and whether the puppy attended puppy socialization classes. Space was provided on each form for additional comments. Each clinic was provided with parvovirus antigen tests^a to test puppies suspected of having CPV infection, thereby eliminating the financial burden of obtaining a definitive diagnosis.²⁶ Veterinarians were asked to explain why CPV infection was suspected, and a diagnosis of CPV infection was made if the parvovirus test was positive. Puppies were excluded from statistical analysis if they were not vaccinated against parvovirus at least once by a veterinarian (either at the participating clinic or at a different clinic prior to visiting the participating clinic [according to the owner]), if they were only initially vaccinated after recovering from CPV infection, if their first visit to the clinic was when the puppy was > 16 wk of age, if the puppy was either suspected or confirmed to have CPV infection prior to the study, and if the veterinarians did not provide complete information.

In the second part of the study, dog trainers in each of the same four cities noted above were selected from the Association

of Pet Dog Trainers directory and an Internet search based on willingness to participate. Trainers were also selected from low- and high-income levels of the zip code in which they taught puppy socialization classes using Census Bureau data.²² Inclusion criteria for trainers were that they taught puppy socialization classes with enrollees predominantly < 20 wk of age at the first class, required puppies to be healthy to attend classes, and required that each puppy had at least one parvovirus vaccination administered prior to starting the first class.

A total of 126 dog trainers were contacted to determine eligibility. Trainers were instructed to keep records of all puppies that attended puppy socialization classes starting before 20 wk of age using a standardized form, and to obtain owner consent to collect this data, including the owners' telephone numbers for follow-up information (if necessary). Information collected included signalment and source (shelter, breeder, pet store, friend/giveaway, stray, owner bred, miscellaneous), administration of parvovirus vaccination, and whether the puppy was suspected by the trainer of having CPV infection either prior to or while attending classes. Trainers were not given a list of specific clinical signs to look for because the signs of CPV infection can be variable. If CPV infection was suspected, the trainers were asked to explain why. If all information was not collected by trainers on the puppies that attended socialization classes (e.g., reason for absence from the last class, if the puppy was enrolled in a drop-in class in which owners could either choose to bring their puppy or not on any given week) then owners were contacted by the investigators directly and the missing information was collected. The investigators specifically asked owners if their puppies had any vomiting, diarrhea, or were diagnosed by a veterinarian with CPV infection since the last socialization class they attended. Puppies were excluded from statistical analysis if they started socialization classes > 16 wk of age, if the age of the puppy was unknown, if they were not vaccinated against parvovirus before starting the class, or if they did not complete the class or attended a drop-in class and the owners could not be reached by follow-up telephone call to confirm the reason for absence.

Statistical Analysis

Results were reported as proportions, exact odds ratios, and exact 95% confidence intervals. A *P* value < 0.05 was considered statistically significant. Analyses were performed using a computer statistical software program^b.

Results

Of the 128 veterinary clinics contacted, veterinarians at 26 clinics agreed to participate and 21 completed the study (4 in Atlanta, 4 in

Chicago, 9 in Phoenix, and 4 in Seattle). Of the participating clinics, 11 were in low-income zip codes and 10 were in high-income zip codes. Veterinary clinics collected information on 1,394 puppies. Of those, 1,012 were included and 382 puppies were excluded as described in **Figure 1**. Of the 70 breeds included in the study, the 10 most common breed groups were mixed-breed dogs (*n* = 333), Chihuahuas (*n* = 100), Pit bull terriers (*n* = 70), Labrador retrievers (*n* = 43), Yorkshire terriers (*n* = 39), shih tzu (*n* = 38), bulldogs (*n* = 31), German shepherd dogs (*n* = 31), poodles (*n* = 24), and rottweilers (*n* = 23).

In total, 48 of 1,012 (4.7%) puppies attended puppy socialization classes and 876 of 1,012 (86.6%) did not. The remaining 88 puppies had unknown class histories. Of the 617 puppies who were examined at clinics in low-income zip codes with known class attendance status, 26 (4.2%) attended classes. Of the 307 puppies who were examined at clinics in high-income zip codes with known class attendance status, 22 (7.2%) attended classes. Fourteen puppies that did not attend classes were diagnosed with CPV infection, and no puppies that attended puppy socialization classes were diagnosed with CPV infection (odds ratio, 0; 95% confidence interval, 0–5.60; *P* = 0.94). Data on class attendance was not obtained for 1 puppy diagnosed with CPV infection and 87 puppies without CPV infection (**Figure 2**).

Of the 1,012 puppies included in this study, 15 (1.48%; 95% confidence interval, 0.83–2.43%) were diagnosed with CPV infections (7 females) at the participating clinic. All clinics diagnosing CPV infections were located in low-income zip codes. Breeds represented among cases included Chihuahuas (*n* = 2),

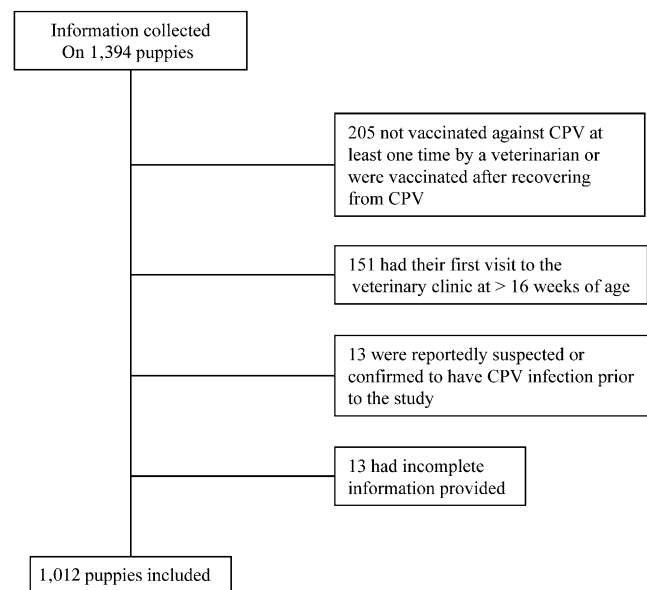


FIGURE 1 Inclusion and exclusion criteria for enrolling puppies examined at participating veterinary clinics. CPV, canine parvovirus.

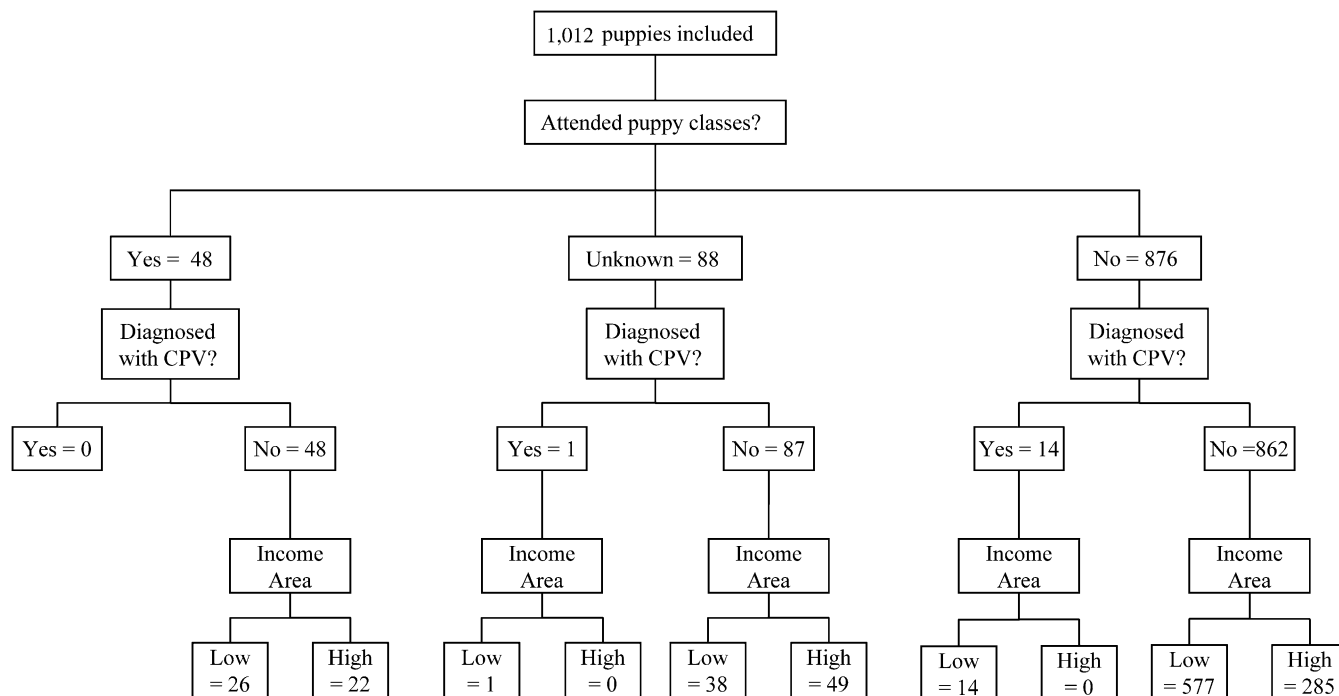


FIGURE 2 Characteristics of included puppies, cross-classified by puppy class status, CPV infection status, and income level. CPV, canine parvovirus.

mixed-breed dogs (n = 2), Pit bull terriers (n = 2), poodles (n = 2), shih tzu (n = 2), and one each of the following breeds: Great Dane, Lhasa apso, mastiff, rottweiler, and Saint Bernard.

Five puppies were acquired from a friend or as a giveaway, four were bred by the owner, three were acquired from a pet store, two were acquired from a breeder, and one was acquired from an unknown source. Twelve puppies were vaccinated at the participating clinic that went on to later diagnose CPV infection, and three were reportedly vaccinated by a veterinarian before presenting to the veterinarian enrolled in the study that diagnosed CPV infection.

Of the 126 dog trainers and training facilities contacted, 29 agreed to participate. In total, 24 dog trainers at 18 facilities completed the study (4 trainers in Atlanta, 13 trainers at 7 training facilities in Chicago, 2 trainers in Arizona, and 5 trainers in Seattle). Of the participating trainers, 5 taught classes in low-income zip codes, 18 in middle- or high-income zip codes, and 1 taught classes in both low- and middle-income zip codes. Puppy classes were primarily taught indoors on cement, tile, or rubber matting. Most classes were taught weekly for 6–8 wk. Many classes had 6–8 puppies enrolled, but the number of puppies enrolled in any class varied from 2 to 13.

Information was collected for 365 puppies, and 231 were included in the study. The other 134 puppies were ineligible because they did not attend the last puppy socialization class and the owners could not be reached to either confirm or deny that their

puppy missed the class due to CPV infection or they attended a drop-in puppy socialization class and the owners could not be reached to confirm or deny that their puppy was diagnosed with CPV infection after the class (n = 56), they started the puppy socialization class when the puppy was > 16 wk of age (n = 72), they were not vaccinated before starting class (n = 4), or their age was unknown (n = 2). No puppies included in the study were suspected by trainers of having CPV infection either before starting socialization classes or during the classes. The owner of one puppy reported that the puppy was diagnosed with CPV infection by a veterinarian after attending socialization classes. That puppy was reportedly vaccinated before classes started. Fifty-three puppies attended classes in low-income zip codes and 178 puppies attended classes in middle- or high-income zip codes.

Discussion

In this study, no puppies that were diagnosed with CPV infection attended socialization classes. This confirmed the authors' hypothesis that vaccinated puppies that attended socialization classes were at no more risk of being diagnosed with CPV infection than puppies that did not attend classes. One puppy was diagnosed with CPV infection, and it was not known if that puppy attended socialization classes. It is possible, but unlikely, that puppy attended socialization classes because only 2 of the 89 puppies examined at that specific clinic attended socialization classes.

Although it would seem that a random sample of puppies in the United States would be the most ideal sample for this study, not all puppies in the United States are provided with veterinary care and are, therefore, not comparable to the experimental group of vaccinated puppies that attended socialization classes. Further, the authors of this study tried to balance the number of veterinary clinics and dog trainers from low- and high-income zip codes, but specific information on the income levels of the owners was not collected. It is likely that there were owners visiting clinics or attending puppy classes with income levels that were different than the overall income level of the zip code.

Limitations of the first part of this study included having no control over how many vaccinations were given to each puppy prior to presentation to the veterinarian participating in this study, no confirmation from other veterinarians that a dog was previously vaccinated by them, being unable to measure the incidence of CPV infection following a standard vaccination protocol at the clinic, and not being able to randomize dogs to classes. Because the study population was not a random sample of the puppy population in the United States, the results may not be generalized to cities and states not included in the study.

In the second part of this study, no puppies that had attended puppy socialization classes were suspected by trainers of having CPV infection during classes, confirming the authors' hypothesis that the proportion of vaccinated puppies that attended puppy socialization classes that were suspected of having CPV infection was very low. There was only one puppy that, according to the owner, was diagnosed by a veterinarian with CPV infection after completing puppy socialization classes. This puppy was not suspected by the trainer of having CPV infection either before or during classes, and the puppy was vaccinated against parvovirus before starting classes. Additionally, when one of the authors of this study spoke with the owner of that puppy, the owner reported that the puppy had chronic diarrhea, had been diagnosed with giardiasis, and that the diarrhea resolved on a raw food diet. Confirmation of CPV infection diagnosis by the veterinarian could not be obtained. It is not uncommon to diagnose multiple gastrointestinal-related agents in a puppy at a veterinary clinic; therefore, the presence of one pathogen does not negate the potential presence of another.

Limitations of the second part of this study were that trainers did not identify the individual that administered the CPV vaccinations (many trainers accepted vaccinations given by nonveterinarians, such as owners and breeders), trainers were not requested to collect data on whether the puppies continued to receive vaccinations during the puppy class series, and trainers were not veterinarians and did not have the laboratory ability to

confirm CPV infection, which could lead to underreporting. Because the study population was not a random sample of the puppy population in the United States, the results may not be generalized to cities and states not included in the study.

Conclusion

Vaccinated puppies that attended puppy socialization classes were at no more risk of being diagnosed by veterinarians with CPV infection than vaccinated puppies that did not attend those classes. No puppies were suspected by trainers of having CPV infection. The results of this study are anticipated to help alleviate some veterinarians' concerns regarding infectious disease transmission at puppy socialization classes and increase attendance at those classes. ■

FOOTNOTES

- ^a Canine Parvovirus Antigen Test Kit; IDEXX Laboratories, Inc., Westbrook, ME
- ^b STATA/IC 10.1 for Windows; StataCorp LP, College Station, TX

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