

## Canine and Feline Parvovirus in Animal Shelters

### Overview

Feline parvovirus (panleukopenia virus) and canine parvovirus are highly contagious viral diseases that commonly cause serious illness in cats and dogs in animal shelters. Every shelter is at high risk for exposure to feline and canine parvoviruses and most have been affected by outbreaks of feline panleukopenia or canine parvovirus. These outbreaks are very costly with regard to animal suffering and death, resource allocation to management and eradication, staff morale, and negative public image.

This document provides a basic overview of: 1) populations at risk; 2) incubation times, clinical disease, duration of virus shedding, and modes of transmission; 3) diagnosis; and 4) strategies for management and prevention in shelters.

### Populations at risk

Kittens and puppies are the most susceptible to parvoviral infection due to lack of protective immunity from maternally derived antibodies or from ineffective responses to vaccination. They typically enter shelters at an age when maternal immunity has waned to a level that does not protect against infection, but still interferes with responses to vaccination. Unvaccinated young adult cats and dogs are also at risk for infection, but the clinical disease may be inapparent or mild. Older cats and dogs that have spent time outdoors eventually develop immunity by natural exposure to virus in the environment. Panleukopenia outbreaks commonly occur in the summer and fall ("kitten season") when large numbers of kittens are admitted to shelters. Since dogs are not seasonal breeders like cats, there is no apparent seasonal pattern to parvovirus outbreaks in dogs.

### Clinical features

The primary route of exposure to parvoviruses is nasal or oral contamination with virus-containing feces or contaminated surfaces. The incubation period from time of exposure to onset of clinical disease ranges from 2 to 14 days, but typically is 5 to 7 days. Because the disease may be difficult for the shelter to detect during the incubation period, apparently healthy but infected animals may be adopted out only to become ill a few days later in their new home.

Both FPV and CPV infect rapidly dividing cells in the intestinal tract, lymphoid tissues, and bone marrow. Resulting clinical signs include a sudden onset of fever, vomiting, diarrhea, dehydration, hypovolemic shock, panleukopenia, and death from shock or sepsis. The clinical signs can be worsened by concurrent

infections with internal parasites and protozoa (coccidia), other viruses, bacteria, and STRESS induced by the shelter environment. The mortality rate can be 90% in kittens and puppies that are not treated aggressively with supportive therapies. Parvovirus can have a higher mortality rate in shelter puppies and kittens despite early or aggressive therapy because of concurrent debilitation, parasitism and stress. Adult cats and dogs may have subclinical infection or mild transient diarrhea.

***The most common cause of sudden death in kittens and cats in shelters is FPV!*** Both age groups can progress in hours to a moribund state without having any gastrointestinal signs.

Parvovirus shedding in feces starts within 4 days of exposure, so that infected dogs and cats in the incubation period are already contagious prior to onset of clinical signs. Virus shedding continues through the disease phase and typically stops in conjunction with clinical recovery. Animals with subclinical infection or transient symptoms also shed infectious virus in feces, but usually in much lower amounts and for a short period of time.

## Diagnosis

Not all cases of vomiting or diarrhea in juveniles and young adults are due to CPV or FPV, especially in animals that are debilitated, parasitized, co-infected with other pathogens, and stressed from entering the shelter environment. Therefore, ***parvovirus infection cannot be reliably diagnosed based on the age of the dog or cat and the clinical signs***. Since other diseases mimic parvo and panleuk, ***diagnostic testing should be performed on all dogs and cats with compatible clinical signs*** instead of making a decision on a guess, especially if animals suspected of having parvo or panleuk are euthanized.

The point of care test kits (IDEXX SNAP, Zoetis Witness) for detection of parvovirus antigens in feces are a rapid and cost-effective diagnostic tool for dogs and cats in shelters. All animals with compatible clinical signs should be immediately tested in order to start proper containment strategies. False negative results can occur in 25% or more of infected animals due to intermittent virus shedding very early or late in the course of disease, binding of antibodies to the virus, and virus quantities in feces below the level of detection. Test results are most accurate if the test is performed within 3 days of onset of clinical signs. Negative tests should be repeated on the following day for cats and dogs suspected to have parvo based on clinical presentation. A PCR test on feces may be helpful for cases suggestive of CPV in the face of negative fecal antigen tests. A WBC count to detect leukopenia can also be performed to build evidence for a diagnosis of parvoviral infection.

Recent vaccination with modified-live parvovirus vaccines results in transient fecal shedding of vaccine virus that purportedly causes false-positive reactions on the parvo antigen tests for the two weeks postvaccination. Studies have shown that the IDEXX SNAP Parvo test does not detect vaccine strains in the feces from kittens or puppies, but it is unknown if the Witness test detects vaccine strains. A strong positive test result in combination with compatible clinical signs or known contact with virus is most likely due to true infection instead of a false positive from detection of a vaccine strain. Testing of feces by PCR will result in a higher rate of vaccine-induced false positive test results due to the high sensitivity of PCR.

Although it is a common practice, there is no compelling medical evidence to use the parvovirus test kits for routine screening of all dogs and cats in the shelter that don't have compatible clinical signs or known exposure – resources would be better allocated for control and preventive strategies. Necropsies should be performed on animals with unexplained deaths, particularly when there are unusual

numbers of deaths of puppies and kittens in the shelter, foster homes, or adoptive homes. This is especially important for sudden death of adult cats and kittens during “kitten season”. Feces and intestinal mucosal scrapings obtained during necropsy can be tested with the parvovirus antigen diagnostic tests. Histopathological evidence for parvovirus infection is the gold standard for confirming diagnosis.

## **Disease Management**

Tools for effective and life-saving management of parvovirus include:

1. Isolation of infected sick animals for the duration of the shedding period
2. Quarantine of exposed asymptomatic animals for the duration of the incubation period
3. Create a clean break to prevent exposure of new animals
4. Strict biosecurity policies
5. Environmental decontamination using a disinfectant that kills parvovirus

### **Isolation**

***The most effective strategy for limiting transmission of CPV or FPV in the shelter is the prompt isolation of sick dogs and cats with positive test results.*** This reduces the infectious dose in the general population. The sick animals should be housed in a physically contained isolation room if treatment is being considered. The decision to treat CPV or FPV should be carefully considered based on shelter resources, including whether there is an appropriate isolation room to contain infection, enough staff to dedicate to treatment, costs for aggressive supportive treatment 1 to 2 weeks, and costs of personal protection equipment (PPE) which must be worn by staff in contact with the sick animals to maintain strict isolation conditions. ***The most important consideration is whether the shelter can manage treatment without contaminating the entire facility and putting healthy animals at risk, resulting in spread of shelter-acquired disease*** forcing temporary closure and potential depopulation. If this is not possible, then sick animals should be removed from the facility for treatment or euthanized to relieve suffering and curtail disease transmission. Recovered animals with a negative parvovirus antigen test may be moved to adoption or rescue with relatively low risk for spreading virus as long as they are housed separately from puppies/kittens and adults vaccinated for <7 days. They should be bathed first to remove virus from the fur.

### **Quarantine**

***Since sick animals shed infectious virus for 3-4 days before onset of clinical disease, all others exposed to the sick animals either by direct contact or fomite contact should be quarantined for 14 days*** (maximum incubation period). The infection status of exposed animals is unknown – they may be infected and in the pre-clinical incubation period, have subclinical infection with shedding, or not infected due to immunity. Quarantined animals should be monitored twice daily for clinical signs. If clinical signs occur, the animal should be moved to isolation to help reduce the infectious dose of virus in the environment. The 14-day quarantine clock must be re-started for the remaining animals.

### **Clean break**

Unexposed resident animals and newly admitted animals must be protected from exposure to infected and quarantined animals. This group should be housed in a separate ward or ideally, a separate building. Staff should care for these “clean” animals first to avoid contamination of the environment and should not backtrack into this housing area after working with animals in isolation and quarantine unless they wear full PPE.

## **Biosecurity**

Staff caring for the infected animals in isolation and exposed animals in quarantine must wear full PPE (hair cover for long hair, gown, gloves, boots). Handling of dogs and cats should be minimized. Ideally, separate staff would be assigned to isolation, quarantine, and unexposed housing areas. If there is not enough staff for dedicated assignments, staff should always care for healthy unexposed animals first, followed by quarantined animals and sick animals in isolation last. In addition to PPE, the isolation and quarantine areas should have dedicated cleaning and feeding supplies that are not transferred between populations.

## **Environmental decontamination**

Parvoviruses are very durable, can persist in the environment for years, and are resistant to inactivation by quaternary ammonium disinfectants, including Roccal, Parvosol, Triple Two, Broadcide, and A33. Only 4 disinfectants reliably kill parvoviruses – sodium hypochlorite (bleach), calcium hypochlorite (WysiWash), potassium peroxydisulfate (Trifectant), and accelerated hydrogen peroxide (Accel/Rescue). For optimum killing activity, environmental surfaces contaminated with feces, urine, vomit, blood, and other organic material must first be cleaned with a detergent before applying the disinfectant solution and allowing contact with the surfaces for at least 10 minutes before rinsing.

Disinfection with bleach, WysiWash, Trifectant, or Accel/Rescue should be performed not just during CPV or FPV outbreaks, but on a daily basis for all animal housing areas, food and water bowls, litterpans, animal transport vehicles, transport cages, and hallways to reduce the risk for environmental transmission of any infectious disease. Food/water bowls and litterpans should not be cleaned in the same sinks. In addition, they should be made of stainless steel instead of plastic because scratched plastic is difficult to fully disinfect. Consider using disposable litterpans in cages housing cats quarantined due to exposure to FPV.

Mop buckets should not be used for cleaning and disinfection of kennel runs. High pressure hoses and power washers should also not be used in kennels unless all dogs are removed, because the force sprays feces on all surfaces and can even aerosolize fecal matter. Cleaning and disinfection supplies should be dedicated to each room and not removed for use in other areas in order to minimize cross contamination.

While foster homes are generally a safer and less stressful environment for puppies and kittens, they have porous surfaces that are difficult to disinfect after contamination with parvovirus. It is very risky to send susceptible puppies and kittens to foster homes with a previous history of parvovirus.

It is also very risky to let puppies or kittens co-mingle in exercise areas and playpens containing wood, plastic, or dirt that can't be effectively disinfected.

## **Prevention**

***Vaccination of all dogs and cats on intake is the cornerstone for prevention of parvoviral transmission in shelters.*** All dogs and cats 4 weeks of age and older must receive a vaccine containing modified-live parvovirus on intake, regardless of intake status (stray, owner surrender, rabies quarantine, cruelty case, pregnant, lactating, injured, ill). A delay of even a day can significantly increase the risk for infection. All puppies and kittens should be re-vaccinated every 2 weeks while in the shelter until they are 5 months old. The potential for maternally derived antibodies to interfere with vaccination in puppies and kittens <5 months old is the reason they should be re-vaccinated every 2 weeks to successfully induce

protective antibody titers. Restricting vaccinations to adoptable animals only creates a large pool of susceptible animals that can make parvovirus infections an endemic problem which eventually affects all animals.

In addition to vaccination, another strategy to prevent parvovirus infection is to move puppies and kittens from the shelter into foster as soon as possible after intake, as long as the foster homes do not have a history of housing parvovirus-infected animals in the past. Vaccination should be repeated every 2 weeks for puppies and kittens in foster care.

Finally, all efforts to reduce stress should be pursued. The most effective way to reduce stress on animals and staff in the shelter is to prevent crowding by practicing population management principles. Limiting run and cage occupancy to 1-2 compatible adult animals or one litter of puppies/kittens results in less stress and substantially reduces risk for infectious disease.

### Resources

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