# Canine Distemper

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Distemper occurs intermittently, especially in shelters located in communities with many unvaccinated dogs, and can appear identical to run-of-the-mill "kennel cough". It is not unusual to hear of shelters reporting having a particularly "bad" kennel-cough problem that eventually realize that the disease at fault is canine distemper. In fact, complacency about symptoms of respiratory illness can prove disastrous. Vaccination against distemper virus immediately on intake will help to significantly decrease a shelter's risk of disease outbreaks.

Canine distemper virus infects dogs and other mammals, including ferrets and raccoons. Dogs of all ages are susceptible if not previously immunized, although infection is most common in puppies less than 16 weeks of age. Domestic cats are not at risk of distemper, although some large felids such as lions appear to be.

**Transmission**

Canine distemper virus is shed in all body secretions of acutely infected animals. It can be spread by direct contact, by aerosol or respiratory droplet exposure. Dogs are capable of aerosolizing droplets up to 20 feet meaning this disease can be considered an "air-borne" contagion. In addition, virus can be transmitted by fomites such as hands, feet, or instruments over a time/distance even though it is short lived in the environment. Virus can be shed by subclinically or mildly infected animals; such animals probably play an important role in maintaining the virus in a chronically infected shelter population. This means that once distemper has been diagnosed in the shelter ANY sign of respiratory or gastrointestinal disease must be considered suspect. Therefore, careful isolation of all dogs with upper respiratory signs and/or diarrhea, poor appetite and weight loss - always a good idea - are especially important in a shelter where distemper is a concern.

**Incubation**

The incubation period (the time from exposure to the appearance of symptoms) is usually 1-2 weeks but can be as long as 4-5 weeks or even more. The initial symptoms of fever and lethargy in the early incubation period are often missed. Therefore, quarantine of dogs possibly exposed to distemper should be a minimum of one month, and even then it is impossible to be sure of catching all cases. This lengthy quarantine is often impossible to accomplish effectively resulting in either difficult euthanasia decisions and/or creative solutions. Be advised, ALL exposed dogs must be included in a quarantine plan in order to control an outbreak.

**Clinical signs**

Distemper virus can invade the respiratory, gastrointestinal, skin, immune and nervous systems. Consequently, signs are highly variable and disease course depends on immune response and dose. Most commonly, early signs of clear to green nasal and ocular discharge, fever, loss of appetite and depression are seen 1-2 weeks after infection, possibly followed by lower respiratory and gastrointestinal involvement. The "classical" neurological signs usually appear 1-3 weeks after recovery from GI and respiratory disease, but may develop at the same time or months later, even without a prior history of systemic signs.

Clinical signs more suggestive of distemper but seen with less frequency include neurological signs, ocular signs and dermatological signs. The ocular signs are often a valuable hint that distemper may be the underlying cause of dogs' symptoms. These include: anterior uveitis (inflammation of the front chamber of the eye; may cause the cornea to appear cloudy and/or cause changes in the appearance of the virus); keratoconjunctivitis sicca (dry eye); and optic neuritis (inflammation of the optic nerve-may cause sudden blindness.

**Distemper in shelters**

Most often distemper in shelters is rarely an isolated case. Mild cases tend to go undiagnosed so that the virus is effectively transmitted to more dogs resulting in a full blown outbreak. Once a case has been identified (usually a dog that develops full blown disease), then it is likely that there have been other, unrecognized cases in exposed dogs. An important effect of distemper virus is its immunosuppressive ability. Infected dogs are therefore not only more susceptible to other infectious diseases but also more likely to get sicker from them. For this reason, shelters that commonly have relatively mild true "kennel-cough" (URI caused by *Bordatella bronchiseptica*/parainfluenza/adenovirus infections) may suddenly find themselves dealing with particularly severe cases including pneumonias. "Routine" kennel cough is generally a mild to moderate self limiting disease that responds to well to antibiotics; distemper is not. However, upper or lower respiratory infection and gastrointestinal disease are non-specific; a diagnosis of distemper should not be made based on these signs alone especially if only dealing with one dog.

**Diagnosis**

Diagnosing distemper can be frustrating and difficult but careful observation and deductive reasoning based on clinical signs in both individual dogs and the shelter "herd" can raise the suspicion of distemper to justify pursuing further tests. Unfortunately, there is no simple and reliable method of diagnosing distemper in all infected dogs. The tests available include:

1. Immunofluorescence assay (IFA) which looks for inclusion bodies on conjunctival scrapes, in urine sediment, in transtracheal washes and cerebrospinal fluid (with neurological signs). The benefit of this test is that positive results are very likely to be correct. However, negative results do not rule out disease, as false negatives are very common. Conjunctival and urine samples may be positive in the first 2-3 weeks of infection whereas transtracheal washes may be positive for more than three weeks. Virus persists in central nervous system for at least 60 days.
2. Blood tests (serology) look for antibodies (titers) to distemper. It is usually necessary to take serial titers on 2 serum samples taken two weeks apart to detect rising titers as single titers do not have much diagnostic value. However, they can help to do risk assessment for exposed dogs in a shelter. A single positive titer in an older dog (over 6 months of age) that has never had nor currently has any clinical signs can be considered to be at low risk of having disease and thus adopted out.
3. PCR (polymerase chain reaction) detects virus in respiratory secretions, CSF, feces, urine (depending on localization of virus). False positives are possible within 1-3 weeks of vaccination. Otherwise, positive result is a good indicator of disease. However, negative result does not rule out distemper, especially when samples are obtained late in the course of disease when virus may no longer be shed. The canine respiratory panel PCR offered by IDEXX is helpful in distemper diagnosis. Conjunctival, pharyngeal and nasal swabs can be pooled for a single submission tube for testing. Recent vaccination may influence the testing to some degree, but there are some tricks to reducing that confusion. See the company's website for details: http://www.idexx.com/view/xhtml/en_us/smallanimal/reference-laboratories/testmenu/innovative-tests/real-pcr.jsf PCR can also help in determining adoption safety by testing dogs two weeks after full recovery from clinical signs. Dogs with negative PCR results at this time can be adopted out. Although vaccination may cause false positives, this is rare enough that PCR is a worthwhile investment and cheaper than holding the dogs a full 30 day quarantine.
4. Necropsy and histopathology are considered to be the gold standard tests but samples are often difficult for shelters to obtain antemortem. If distemper is a concern and a definitive diagnosis has not been reached by other testing methods, a necropsy is a worthwhile investment in a dog believed to have died of the disease to establish whether or not distemper is present in the shelter. Spleen, tonsil, lymph node, stomach, duodenum, bladder and brain should be submitted for examination by a pathologist in order to detect distemper, which can localize in many different tissues.

**Prognosis**

The prognosis for long-term recovery in dogs with distemper limited to GI or respiratory disease is fair with good supportive care, although recovered dogs may have permanent damage to the mucociliary apparatus and remain more susceptible to respiratory infections. Adopters should be warned that neurological signs could develop up to 3 months after infection. The prognosis for dogs with worsening neurological signs is poor; even if dogs survive, neurological damage is often permanent.

**Recovery and risk to other dogs**

Shedding may persist for as long as 3 months in recovered dogs, although a shorter shedding period is more common. Recently recovered dogs should be kept separate from the general adoptable population until at least four weeks after resolution of clinical signs, and separated from puppies, unvaccinated or immunosuppressed dogs for a full 3 months following recovery. If isolating recovered dogs for such prolonged periods is impractical, PCR testing can be used to assess whether dogs are continuing to shed detectable virus. Nasal and rectal swabs should be taken over a several day period at least 2 weeks after recovery (no clinical signs) and can be submitted as a pooled sample to reduce testing cost. If negative, the dog is most likely not shedding virus in significant quantities, and can be moved into the adoptable population or adopted into a home. CAUTION: this test has not been validated.

In summary, there is no simple and reliable method of diagnosing distemper in all infected dogs. Control of distemper requires a combination of effective vaccination, quarantine, isolation, disease recognition/diagnostic testing, and environmental decontamination.

**Managing canine distemper outbreaks**

It is often more difficult to stop distemper outbreaks than e.g. parvo. This is due to the lengthy incubation period, difficulty in diagnosis and confusing clinical signs. In addition to good vaccination protocols, effective cleaning and disinfection and stress reduction it is necessary to properly separate sick and healthy dogs.

- Make a clean break between exposed/vulnerable dogs and new incoming ones.
    - Isolate all sick dogs from general population. This is of utmost importance as failure to do so will likely perpetuate the disease in the shelter. Isolation must take into account the potential for both aerosolized and fomite spread of virus.
    - House puppies separately from adult.
    - House dogs singly. If multiple dogs are housed in one run then practice "all-in-all-out" (no mixing).
    - Do risk assessment of all healthy dogs. Single serum titers can help determine which dogs are at risk. In general, the lowest risk to highest are:
        - Healthy adult (over 4 months) dogs with high titers that were vaccinated well before the outbreak.
        - Healthy adult dogs with unknown vaccine history and high titers.
        - Healthy adult dogs with low titers
        - Puppies regardless of titer
        - Any dog with clinical signs regardless of titer.

**Vaccination**

Canine distemper is a preventable disease. The canine distemper vaccine is one of the most rapidly protective vaccines available in veterinary medicine: It can provide meaningful protection within hours of administration. All dogs 4-6 weeks of age and older should be vaccinated immediately upon intake with a modified live or recombinant vaccine. Revaccinate high risk puppies every two weeks up to at least 16 weeks of age. The recombinant vaccine may provide superior protection in the face of maternal antibodies, and therefore may be a good choice for puppies during an outbreak or in a community where distemper is a frequent threat. Because vaccination is never absolutely reliable in puppies under four months, extra care should be taken to mechanically isolate puppies in a shelter facing a distemper problem.