

Canine Distemper (CDV)

Canine distemper virus (CDV) is a highly contagious infection that can be fatal. As with all shelter disease, prevention is the key to addressing CDV. Learn about canine distemper vaccination, diagnosis, treatment, and disinfection.

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Distemper is a highly contagious viral infection caused by an enveloped, single stranded RNA virus of the genus *Morbillivirus*, family *Paramyxoviridae*.

Considerations in a shelter

Although greatly reduced by widespread vaccination, canine distemper continues to be a frustrating problem for many shelters. All too frequently, shelter dogs with green nasal and ocular discharge are misdiagnosed as distemper cases, when, much of the time, these signs are caused by various other agents of canine kennel cough/canine infectious respiratory disease (CIRD) complex. However, distemper does occur intermittently, especially in shelters located in communities with many unvaccinated dogs. Mild or early cases of distemper can appear identical to run-of-the-mill "kennel cough". For this reason, complacency about symptoms of respiratory illness can prove disastrous. Unfortunately, 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. An understanding of the natural history of the disease will help establish an effective preventive plan.

Susceptible host species

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 20 weeks of age. Domestic cats are not at risk of distemper, although some large felids such as lions appear to be. (Feline panleukopenia, though sometimes referred to as feline distemper, is not related to canine distemper). There is no demonstrated risk to humans from canine distemper. (At one time there was speculation that distemper might be associated with multiple sclerosis, however, studies over the last fifteen years have failed to support this connection [Appel, 1999].)

Special note on wildlife and raccoons

For disease control and public health purposes, live and deceased wildlife should always be segregated during transport and within the shelter. Distemper in raccoons is common in some communities and this can be an important means of transmission to shelter dogs. The following steps will limit the risk posed by raccoon transport and handling:

- Do not transport sick raccoons in vehicles with dogs. This has been linked to canine distemper outbreaks in shelters.
- Double bag dead wildlife for transport and disposal.
- Always handle wildlife with gloves. Wash hands after removing gloves and before handling domestic animals.
- Wear protective clothing when handling wild animals, or avoid contact of wild animals with clothing.
- Use separate equipment (carriers, traps, etc.) for wildlife handling and sanitize all areas following contact with any wild animal, especially a sick one.

Transmission and control

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. Although the virus is not extremely durable, it can survive in the environment for at least several hours, and during that time can be transmitted by fomites such as hands, feet, instruments, equipment or contaminated environmental surfaces. Virus can be shed by sub-clinically or mildly infected animals. Such animals probably play an

important role in maintaining the virus in a chronically infected shelter population. Therefore, careful isolation of all dogs with upper respiratory signs -always a good idea - is especially important in a shelter where distemper is a concern.

Incubation period

The incubation period is usually 1-2 weeks from the time of exposure to development of initial clinical signs, but it can be as long as 4-5 weeks or even more. Occasionally neurological signs develop months after exposure in dogs that never showed initial signs of infection. 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. ALL exposed dogs must be included in a quarantine plan in order to control an outbreak until an appropriate risk assessment has been determined for each animal. See [Risk Assessment section](#) below.

Disease course

Distemper virus can invade the respiratory, gastrointestinal, skin, immune and nervous systems. Consequently, signs are highly variable and disease course depends both on immune response and viral strain. Most commonly, early signs of clear to green nasal and ocular discharge, loss of appetite and depression are seen 1-2 weeks after infection, sometimes followed by lower respiratory and gastrointestinal involvement. Neurological signs, if they are going to appear, usually develop 1-3 weeks after recovery from GI and respiratory disease, but may occur at the same time or months later, even without a prior history of systemic signs. Asymptomatic infections are common, and dogs may shed for weeks without showing any clinical signs. Post-clinical shedding is also, unfortunately, a reality. Many dogs will shed infectious virus for weeks after recovery and some may shed for as long as 4 months.

Environmental decontamination

Distemper virus survives no more than a few hours in the environment at room temperature. Cold and moist conditions increase survival and it can last for several weeks at near freezing temperatures. The virus is readily inactivated by most commonly used disinfectants. Routine hygienic precautions are generally adequate to prevent spread. The most important factor in shelter decontamination is quarantine/removal of incubating and mildly/sub-clinically affected animals.

Vaccination

Vaccination is the cornerstone of distemper prevention in a shelter The canine distemper vaccine is one of the most rapidly protective vaccines available in veterinary medicine: within hours of administration vaccination can provide meaningful protection against severe disease and death, and complete protection can occur within days. All dogs 4-6 weeks of age and older should be vaccinated immediately upon intake with a modified live vaccine (earlier end of age range in the face of an outbreak or high risk environment). There is a recombinant vaccine available for distemper which is also rapidly effective and may provide superior protection in the face of maternal antibodies. This would make it a good choice for puppies when maternal antibody interference is a concern. However, a high percentage of puppies coming into shelters do not have maternal antibodies, having most likely been born to mothers who were neither vaccinated nor naturally exposed. Unless it is known that the mother was vaccinated or otherwise titer positive, the modified live vaccine is the preferred choice for shelter puppies as well as adults. (The recombinant vaccine would be a preferred choice in a known-vaccinated population, e.g. a breeding facility.) *Because vaccination is never absolutely reliable in puppies under 5 months, extra care should be taken to physically isolate puppies in a shelter facing a distemper problem.*

Although the vaccine is excellent, it does not provide immediate protection against infection and shedding. In shelters where dogs are exposed very soon after intake (e.g. group housed with clinically ill dogs), the vaccine may mask infection by preventing characteristic signs of neurological disease and death, while not preventing all infections. Distemper is highly immunosuppressive, and secondary bacterial pneumonia can develop in dogs with a primary viral infection. Therefore, even in shelters with good vaccination practices in place, distemper should be suspected if an increase in respiratory disease progressing to pneumonia is seen.

Clinical Signs of Canine Distemper

Clinical signs of upper or lower respiratory infection and gastrointestinal disease are non-specific; a diagnosis of distemper should not be made based on these signs alone. Clinical signs that are more suggestive of distemper but that are seen with less frequency include neurological signs, ocular signs and dermatological signs. All distemper suspects should receive a careful eye exam. As noted above, pneumonia can occur in dogs that receive only partial protection from vaccination prior to exposure. Clinical signs of distemper are often unapparent or mild,

especially in shelters that vaccinate most or all dogs at intake. If one dog in a shelter develops full blown disease, it is almost certain that there are other infected dogs with mild or no clinical signs (unless the affected dog was recently transferred from another facility and kept isolated from unvaccinated dogs and puppies). The only way to detect these positive cases is through PCR testing, and even that is not absolutely reliable.

Although severe signs are the most commonly recognized manifestation of distemper, mild infections from which dogs recover fully and uneventfully are common. *While we want to do all we can to prevent this devastating infection, a diagnosis of distemper should not in itself be cause for despair.*

Signs associated with dogs infected with canine distemper

Respiratory signs

- Nasal discharge
- Ocular discharge
- Coughing
- Dyspnea (difficulty breathing)
- Pneumonia (lower airway disease)

Diagnostic value of respiratory signs: Upper respiratory signs alone are much more likely due to [canine infectious respiratory disease complex \(a.k.a. "kennel cough"\)](#) than to distemper. Suspicion of distemper increases with progression to pneumonia, continued worsening of signs after > 2 weeks of treatment, or development of other signs listed below. However, pneumonia and GI signs accompanying upper respiratory infection in shelter dogs can have many other causes besides distemper.

Ocular signs

- 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 iris)
- Keratoconjunctivitis sicca (KCS = dry eye)
- Optic neuritis (inflammation of the optic nerve-may cause sudden blindness)
- Retinal degeneration or separation (may cause vision impairment)

Diagnostic value of ocular signs: These signs are relatively uncommon, but when seen in conjunction with other systemic signs, they greatly increase the suspicion of distemper.

Gastrointestinal (GI) signs

- Anorexia (loss of appetite)
- Vomiting
- Diarrhea (may be bloody)

Diagnostic value of gastrointestinal (GI) signs:

There is slightly increased suspicion for distemper when GI signs are seen in conjunction with URI signs in a dog with consistent age and exposure history. However, other causes of GI signs such as Parvovirus, internal parasites, stress, change in diet or antibiotic reaction should be considered. Suspicion greatly increases when severe GI signs occur in conjunction with respiratory signs and these signs persist for longer than 1 week.

Neurological signs

- May occur in dogs with no or only a mild history of other signs
- Usually occur within 1-3 weeks after systemic signs, but may occur at the same time or weeks to months later
- Are highly variable and may include:
 - seizures (focal or generalized)
 - weakness or paralysis
 - vestibular signs (head tilt, loss of balance or walking in circles)
 - myoclonus (muscle twitching/involuntary contraction)
 - hypersensitivity
 - neck pain/rigidity
 - behavioral changes

Diagnostic value of neurological signs:

In the absence of a history of trauma, appearance of neurological signs in a young dog with a high risk history (unvaccinated or incompletely vaccinated, possible exposure) should be considered highly suspicious for distemper regardless of other clinical signs. Appearance of neurological signs in conjunction with other signs (respiratory, GI, ocular, skin) listed above is virtually diagnostic of distemper.

Dermatological signs

- Pustular dermatitis (skin rash - associated with a favorable prognosis)
- Nasal and digital hyperkeratosis (thickening of the nose and footpads - associated with a poor prognosis and progression to neurological disease)

Diagnostic value of dermatological signs:

Same as for ocular signs. Nasal and digital hyperkeratosis should be interpreted with caution, as chronic nasal discharge can cause mild proliferation of nasal tissue and contact with harsh disinfectants on kennel floors can cause mild footpad changes.

Clinical pathology findings (finding on bloodwork)

- Lymphopenia (decreased white blood cell count) common in first week of infection
- Thrombocytopenia (decreased platelet count) possible but less common
- Other non-specific changes depending on organ involvement and presence of secondary bacterial infection

Diagnosis of Canine Distemper Virus

RT-PCR (reverse transcription polymerase chain reaction):

Can detect viral RNA in respiratory secretions, cerebrospinal fluid, feces, and/or urine (depending on localization of virus). This test is available through IDEXX as part of the **shelter respiratory panel**.

Diagnostic value:

A 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. False positives are possible within 1-3 weeks of vaccination. In our experience, this seems to be fairly uncommon - particularly if multiple samples are positive when a population is sampled, the index of suspicion for distemper should be high.

To help differentiate between vaccine interference and wild-type (true) infection, IDEXX Reference Laboratories has developed the **Canine Distemper Virus (CDV) Quant RealPCR™ Test**. This test provides a quantitative measure of the CDV viral load, which is typically much higher during active infection compared to the level detected due to recent vaccination. It has been incorporated into IDEXX's existing canine respiratory panel at no additional cost. A stand-alone test is also available for quantitative distemper virus information from swabs collected from respiratory mucosa, preferably deep pharyngeal. Results are available in 1-3 days.

Immunofluorescence assay (IFA):

To detect inclusion bodies on conjunctival scrape, buffy coat, urine sediment, traumatic bladder catheterization, trans-tracheal wash, or cerebrospinal fluid (with neurological signs).

Diagnostic value:

A positive result is very likely to indicate infection rather than vaccination. Negative result does not rule out disease, as false negatives are very common. This test is most useful early in the course of disease. The buffy coat is most likely to be positive very early in disease, sometimes before clinical signs appear. Conjunctival and genital (urine or bladder) samples may be positive in the first 2-3 weeks of infection. Trans-tracheal washes may be positive for more than 3 weeks. Virus persists in central nervous system (CNS) for at least 60 days.

Serology (as a diagnostic tool versus risk assessment tool; see below for risk assessment):

Vaccination generates antibody titers indistinguishable from natural infection; therefore serology has limited application in most shelter populations. However, it may be helpful in dogs known NOT to have been recently vaccinated.

IgM:

Serum antibodies measured by ELISA.

Diagnostic value:

Positive results possible within 3 weeks of vaccination. Otherwise, a positive result is a good indicator of distemper infection. IgM antibodies persist for approximately 5 - 12 weeks in natural disease. False negative results can occur in dogs that die acutely without developing an antibody response and can also occur in sub-acutely or chronically infected dogs.

IgG:

Serial titers on 2 serum samples taken two weeks apart to detect rising titers. Positive IgG titers are expected in vaccinated dogs, so a single positive IgG result cannot be used to diagnose distemper.

Diagnostic value:

In a dog known not to have been vaccinated within the past month, rising titers are indicative of infection. An increase of greater than four-fold is indicative of infection, even in a recently vaccinated dog. Less dramatic increases in IgG titer may be caused by infection or recent vaccination. False negatives are possible as with IgM.

Necropsy/histopathology:

Spleen, tonsil, lymph node, stomach, duodenum, bladder and brain should be submitted for examination by a pathologist in order to detect distemper, since it can localize in many different tissues.

Diagnostic value:

Distemper can be identified reliably on necropsy and histopathology by a qualified pathologist. 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.

Treatment of CDV

No specific treatment for distemper has been proven effective. Treatment consists of supportive care, and may include: fluid support, nutritional support and anti-emetic therapy for vomiting and prolonged anorexia, nebulization and coughage for pneumonia, and antibiotic treatment. Broad spectrum antibiotics are indicated to treat secondary bacterial infection. Antibiotics with good activity against *Bordetella bronchiseptica* and mycoplasma (e.g. doxycycline) may also be indicated if these pathogens are suspected or confirmed. Combination treatment may be required. Seizures may need to be controlled with anti-seizure medication and a single dose of dexamethasone (steroid) may be considered in an attempt to control CNS edema.

Because many dogs with mild signs are never actually confirmed as having distemper versus kennel cough/CIRD, assessing the true benefits of anecdotal treatment is often difficult. It is also difficult to determine the efficacy of treatments that are thought to be helpful early in the course of infection or illness, since the majority of distemper cases are not recognized until relatively late in the disease course.

The prognosis for dogs with worsening neurological signs is poor. If dogs survive, neurological damage is usually permanent but these dogs may stabilize and have a reasonable quality of life if damage is not too severe. The prognosis for long-term recovery in dogs with distemper infection limited to GI or respiratory disease is fair with good supportive care. As noted above, many dogs with mild signs are never even diagnosed and recover uneventfully. Although uncommon, adopters should be warned that neurological signs could develop up to 3 months after infection.

A 2013 case report from the University of Florida's Veterinary Medical Center describes the safe and effective use of botulinum toxin (botox) type A to treat debilitating myoclonus in a dog suspected of having had distemper. Botox was injected into the patient's affected muscles and initial improvement of myoclonus was noted within 5 hours. Repeated botox treatment was required 18 days later. No long-term, overt adverse side effects were reported. Although definitive botox treatment protocols for myoclonus do not exist for veterinary patients, the case report offers its treatment strategy (Schubert, Clemmons, Miles, & Draper, 2013).

Schubert, T., Clemmons, R., Miles, S., & Draper, W. (2013). [The use of](#)

[botulinum toxin for the treatment of generalized myoclonus in a dog.](#)
Journal of the American Animal Hospital Association, 49(2), 122-127.

Recovery

Shedding may persist for as long as 4 months in recovered dogs, although shedding is greatly reduced following complete resolution of clinical signs. Recently recovered dogs ideally should be adopted directly from the location of treatment or foster care rather than being mixed in with a general shelter population. At minimum these dogs need to be kept separated from puppies (including puppy training classes) and away from unvaccinated or immunosuppressed dogs for a full 4 months following recovery or until confirmed negative by RT-PCR. Since isolating dogs for such long periods is often impractical, RT-PCR testing can be used to assess whether dogs are still shedding detectable virus. Nasal swabs should be taken over a several-day period at least 2 weeks after recovery. If negative, the dog is most likely not shedding virus in significant quantities and is not a threat to other dogs (as with any test, false results are possible; careful sample handling is a must).

Risk assessment: how do you decide how much to worry about exposed animals?

When one animal from a population is diagnosed with distemper, many questions arise: what do we do about other animals in the environment? Are they all likely to get sick? Will widespread quarantine or even depopulation be necessary? Or is it okay to simply carry on business as usual? Or do we fall somewhere in between? The answers to these questions are dependent on several factors.

Not all exposed dogs will become infected. Due to varying levels of maternal antibody, it is not even uncommon for only some members of a litter to develop disease. The risk of infection depends on the animal's individual immune and vaccination status, the overall cleanliness of the environment and the level of proximity between the exposed and infected animal. The most important factor in disease risk is vaccination: a "fully" vaccinated animal over four months of age is at very low risk of CDV infection. However, even incompletely vaccinated animals may survive a possible exposure.

Risk due to environmental spread is reduced if:

- The facility is not crowded
- Dogs are housed singly or in stable pairs/groups and are not

handled or removed from their run during cleaning (e.g. [double sided runs used correctly](#))

- Animal housing areas are non-porous, non-scratched surface and can be (and are!) effectively cleaned and disinfected and thoroughly dried between uses by animals
- Separate tools and equipment are used for each area of the shelter
- Puppies and recently admitted dogs (at minimum) are handled with hand sanitizer, hand washing or change of gloves between individuals
- Access to common play areas is restricted to dogs over 5 months of age vaccinated at least 3-5 days previously
- There is no crossover of clothing, equipment or location between intake areas/activities and areas/activities involving sick animals or euthanasia
- Sick animals are promptly isolated
- Clinical signs appeared within a few days of shelter intake (and therefore the animal was more likely exposed in the community versus in the shelter)

Risk due to animal immune status is reduced if:

- ALL animals 4 weeks and older are vaccinated immediately upon intake
- Risk is very low in animals > 4-5 months old that are either:
 - Vaccinated with a MLV sub-cutaneous vaccine at least one week prior to exposure
 - Have a documented history of vaccination at or after 20 weeks of age and within three years prior to exposure
- Risk is greater in puppies under 5 months old even if vaccinated (due to maternal antibody interference)
- Risk is greater in animals vaccinated less than a week before exposure
- Risk is greatest in closely exposed, unvaccinated animals

If a single case occurs in an area where all animals have been vaccinated and environmental spread risk is deemed low based on the above listed factors, further steps to mitigate risk may not be necessary. If spread is observed or few of the above precautions are in place, the whole ward or even the whole shelter may need to be considered at risk/exposed.

Using serology to assess individual dog risk

Serology can be used in healthy dogs to detect protective distemper antibody titers and is a very useful tool to further clarify the need for quarantine of individual animals. Even in shelters that have the ability to quarantine, titer testing may be a more desirable approach given the estimated per-day cost of caring for a dog of \$10-\$40 per day, required

quarantine of 4 weeks, and the challenges inherent in housing and socializing dogs, especially puppies, for such a prolonged period.

Dogs with *no current or historical clinical signs* (no respiratory disease during their shelter stay or within the past four months, whichever is less) can be tested for antibody titers. In these dogs, a positive titer indicates probably protection even if they have been exposed to the virus. Titer testing cannot be used on dogs with current or recent clinical signs of respiratory disease or distemper, as in these cases a positive result may indicate a response to infection rather than prior protection. A careful physical exam of each animal to be tested is a must. Titer testing should be performed using a validated test or laboratory. Some laboratories can report quantitative results within 24 hours of sample submission, making this a reasonably efficient decision-making tool.

In-house serology tests can also be used and have the advantage of more rapid turn-around time, often within minutes. The Synbiotics Titerchek™ kit is designed to test for canine distemper virus (CDV) or canine parvovirus (CPV) antibodies in canine serum. The results are compared to positive and negative control wells and give non-quantitative positive or negative results. This kit is a well test; each time the test is run two additional wells must be used to run a positive and negative control. Because of this, the test is most economical when running several tests at once. Also since this is a well test rather than a “snap” kit, ensuring the staff running these tests is sufficiently skilled is essential.

More recently, another in-house option has become available in the US, the VacciCheck ImmunoComb™ test by Biogal. This kit provides semi-quantitative antibody titer levels for CPV and CDV (as well as Canine Adenovirus). The kit is a "self-contained" dot ELISA titer test kit, not needing any reagent preparation. The kit looks like a flat comb; each tooth of the comb is a test for an individual dog and includes the positive and negative controls. Results can be scored by their shade relative to the positive on a scale from 1 - 6. Results develop for all three viruses on the same comb simultaneously. The test provides results within approximately 20 minutes. Our [September 2011 Newsletter](#) contains an article with more information on this test, and you can find a video demonstrating its use on Youtube:

Asymptomatic adult dogs testing positive for protective titers are at low risk for developing distemper infection. It is reasonable to move these dogs through the shelter as usual rather than placing them in quarantine.

Interpretation of titers in dogs < 5 months of age is a little less clear-cut,

as positive titers may reflect either an active immune response or waning maternal antibody. Puppies testing positive are likely low risk but this is less certain than with adults and immunity may rapidly wane. These puppies are relatively safe to move to adoption or rescue, but should leave the shelter quickly if possible and it is prudent to advise adopters or rescuers of their recent exposure to distemper virus. Continue their vaccine schedule as usual.

All dogs, of any age, testing negative for protective titers at the time of exposure must be considered high risk; however, many of these dogs will not develop infection. Quarantine for 4-6 weeks is indicated for this group if possible.

While assigning risk groups never gives an absolute guarantee of whether a particular animal will become infected or not, defining which animals are at low risk of becoming sick and which are at a higher level of risk helps make decisions about who can be safely sent on their way and who needs more attention. Often, identifying the low risk animals and sending them happily along opens up resources for animals who are more at risk. Risk assessment can be used to minimize the amount of quarantine, euthanasia, and other drastic or costly measures taken while still effectively controlling an outbreak. Establishing risk categories for exposed animals also limits the number of dogs who need quarantine, isolation, or special rescue. When the number who would need something special falls to only those who are truly at risk, often the situation turns quickly from unimaginable to manageable. You can learn more about risk assessment by using our [Canine Parvovirus Outbreak Simulator and Guide](#).

Disinfection: how do you get rid of it?

Unlike parvovirus which can remain viable for months to years, distemper virus can be removed from the environment easily. The virus is readily inactivated by most commonly used disinfectants. Routine hygienic precautions are generally adequate to prevent spread. Thus, beefed up sanitation is not likely to be the most important element in controlling a distemper outbreak. That said, a shelter should always be cleaned as if there is an extremely hard to kill pathogen present (such as parvovirus).

As stated above, the most important factor in shelter decontamination is quarantine/removal of incubating and mildly/sub-clinically affected animals.

There is no benefit to a waiting period prior to re-use of a kennel after distemper decontamination; either mechanical cleaning and disinfecting

was effective, or it was not. Waiting a day or even a couple of weeks will not result in a significant further decrease in contamination. To be on the safe side, kennels should be completely cleaned, disinfected, and dried at least twice before re-use, however this can happen in a short period of time.

Infectious disease cheat sheet for CDV

Good – false positives possible 1-3 weeks after vaccine; quantitative RT-PCR can help distinguish

Disease name:

Canine distemper

Agent:

Morbillivirus (family Paramyxoviridae; enveloped RNA)

Susceptible domestic species

Dogs, ferrets

Zoonotic?

No (suspected links to multiple sclerosis have not been supported by research)

Diagnostic tests:

Qualitative +/-quantitative RT-PCR of respiratory mucosa, conjunctiva, nasal or ocular discharge

IFA for viral antigen or inclusion bodies in cells from conjunctival scrape, urine sediment, buffy coat

Serum IgM or rising serum IgG

CSF antibody detection

Test sensitivity

Fair to good during acute respiratory phase of disease

Fair to poor in acute disease, lousy in sub-acute or chronic disease

Good

Good in acute encephalitic disease, otherwise poor

Test specificity

Very good

Good except false positive may occur within 3 weeks of vaccination

Good – antibody ratio can rule out blood contamination from traumatic collection

Test comments

Lymphopenia and thrombocytopenia are common acutely.

Vaccine available?

Yes

Vaccine efficacy

Excellent. In the absence of maternal antibody interference, vaccine provides rapid protection (within hours to days) against severe disease and death. Modified live vaccine recommended for most shelter dogs and puppies. Recombinant vaccine may be preferred for at-risk puppies whose mother is known to have been vaccinated.

Excreted in:

All body excretions (feces, urine, etc), but most abundant in respiratory secretions

Mode of transmission:

Highly contagious. Aerosol, droplet, direct contact spread most common. Fomite transmission over short time/distance.

Disinfection

Routine disinfection is adequate. Susceptible to heat, drying and most common disinfectants

Incubation

Fever spike 3-6 days post-infection (may go unnoticed), clinical signs 1-4 weeks post-infection (longer incubation more common), CNS signs may

appear up to 3 months later with or without preceding signs

Post-recovery shedding

Up to 120 days, decreased with complete resolution of signs.

Carrier state?

No, but mild and inapparent infection common and important in propagation. Old dog encephalitis may represent recrudescence of latent disease, but dogs are not infectious in the interim.