

Canine Influenza

Table of Contents:

- [Introduction](#)
- [What is canine influenza?](#)
- [Disease course \(incubation and recovery\)](#)
- [Clinical signs](#)
- [Is it flu or something else?](#)
- [Diagnosis](#)
- [Prevention and control](#)
- [Treatment](#)
- [Outbreak management](#)
- [Preparation: what you can do now to protect your shelter and community](#)
- [Koret Shelter Medicine Profiles of Common Shelter Diseases: Canine influenza](#)
- [Information for pet owners](#)
- [Notes on aerosol transmission](#)

Although not widely reported until late in 2005, canine influenza is not a brand new disease: the first recognized outbreak occurred in racing greyhounds in Florida in January of 2004, and the infection may have been present in certain dog populations for a couple of years prior to that. Since its first appearance, canine influenza has been spreading steadily, and has now been found in animal shelters, adoption groups, pet stores, boarding kennels, and veterinary clinics scattered throughout the United States. Current information about how many samples have been analyzed and how many confirmed cases have been found on a state by state basis is available at [Cornell's Animal Health Diagnostic Center website](#).

Although it is likely that canine influenza will continue to spread, at this point it remains relatively uncommon in most areas and should not cause excessive alarm. There is no indication at this time for pet owners to avoid dog parks or other areas frequented by dogs. Prudent precautions are the same as always for prevention of contagious respiratory disease in dogs.

What is canine influenza?

Canine influenza is an enveloped RNA virus. Dogs are the only known susceptible species; there is no evidence at this time that infected dogs pose a risk to humans or other species. Greyhounds are the only breed thus far reported to develop hemorrhagic pneumonia and acute death following infection. There are no other known age or breed risk factors for infection, severe disease or death. Healthy, well vaccinated dogs of all ages may be affected.

Disease course (incubation and recovery)

The incubation period is 2-5 days from exposure to onset of clinical signs. Peak viral shedding occurs 2-4 days post-infection, meaning that **dogs may be at their most infectious prior to showing signs of disease**. This represents a slightly shorter incubation period than is usually seen with other common causes of canine respiratory disease. In experimentally and naturally infected dogs, viral shedding ceases by 7 days post infection. This relatively short shedding period is typical of influenza infection in other species. Although a percentage of dogs may be subclinically infected as described below, there is no true carrier state for canine influenza. The short shedding period and absence of a carrier state is helpful for shelters trying to minimize disease spread within the shelter and community ? it is unlikely that dogs pose a significant infectious risk a week or more after infection.

Clinical signs

When canine influenza first strikes a given population, virtually 100% of dogs will become infected. However, up to ~ 20% will show no signs of disease. Therefore, all exposed dogs must be considered an infectious risk, whether or not they are showing signs of respiratory infection. In most dogs, signs of infection are similar to ?kennel cough? from other causes, and may include:

- Mild low-grade fever
- Soft, moist (productive) or dry cough lasting 10-30 days
- Unresponsive to antibiotics or antitussives

- +/- thick, purulent/mildly bloody nasal discharge

After the first week or so of coughing, 10-20% of dogs may progress to a more severe form of infection, including:

- High fever (104-106 F)
- Pneumonia

Death (overall fatality rate varies and is between 1-5%)

Is it flu or something else?

There is no way to distinguish canine influenza from respiratory disease caused by other infections based on clinical signs alone. Ultimately, diagnostics should be performed to rule canine influenza in or out. Some factors which raise the suspicion of influenza include:

- History
 - Recent introduction of a high risk dog into the shelter population, such as a dog transferred from a canine influenza endemic area, or recent admission of a dog from a boarding kennel or racing track
- Percentage of dogs affected
 - Since no dogs will have immunity when influenza first strikes, it is likely that over half the dogs will be infected. If only a few dogs are sick ? even if the clinical signs are consistent with flu - it is probably not canine influenza.
- All ages affected
 - Puppies are often more severely affected in outbreaks of respiratory disease from other causes, but canine influenza can strike all ages
- Vaccinated dogs affected
 - Vaccination provides good protection against canine distemper and moderate protection against other agents of canine respiratory disease. If a high percentage of well vaccinated dogs are severely affected, influenza is more likely
- Possibly more severe signs, more likely fever
- Possibly less responsive to antibiotics
- But secondary infections may respond to antibiotics
- Don't forget co-infections
 - Background disease will continue to occur in concert with canine influenza ? so a diagnosis of canine distemper, **Bordetella**, etc. does not rule out canine influenza infection.

Diagnosis

Serology is the most commonly used method to confirm infection. The first sample should be taken within 7 days after onset of clinical signs, and the 2nd 2-3 weeks later. A 4 fold rise in titers equals infection. One positive convalescent sample confirms a history of exposure, but does not indicate whether infection was recent.

A disadvantage of serology is that it can not be used acutely to determine active infection. Methods to detect current infection include an in-house Flu antigen ELISA kit (Becton-Dickinson Flu-A kit) and PCR (available at various reference laboratories). These tests can be run on nasal swabs and are most sensitive during the first 2-3 days post infection prior to onset of signs (PCR) or the first 2-3 days of illness (Flu-A ELISA). Lungs and distal trachea from dogs that died of pneumonia can also be tested by PCR. Although a positive test is indicative of infection, **canine influenza should not be ruled out based on negative PCR or viral isolation.**

Table 1: Summary of diagnostic testing options:

Diagnostic test	Comments
Serology	<p>Cornell Animal Health Diagnostic Center</p> <p>Obtain samples 1 week after onset of signs, second sample 2-3 weeks later. 4X rise in titer indicates recent infection. Single positive serum sample indicates past exposure at unknown time.</p>
Flu Antigen ELISA	<p>Becton-Diskinson or Quidel Quickvue</p> <p>Most sensitive in first 2-3 days of clinical signs. False negatives uncommon. Test kits come on batches of 20, cost comes out to ~ \$10- \$25/ test. Available through medical suppliers, e.g. Fisher</p>

PCRIdexx

Most sensitive before onset of signs in recently exposed dogs

False negatives common after onset of signs

Animal shelters may qualify for assistance with diagnostic testing; for more information contact Dr. Crawford in the Department of Small Animal Clinical Sciences at the University of Florida College of Veterinary Medicine phone (352) 392-4700, ext. 5731; or e-mail crawfordc@mail.vetmed.ufl.edu.

Prevention and control

Transmission

As noted, virus may be excreted for up to three days before clinical signs develop. So once disease is diagnosed, it will be necessary to count back several days to determine which dogs may be at risk from exposure. The virus is shed primarily in respiratory discharge and transmission can be via direct contact, fomites (contaminated objects such as hands, surfaces, clothing, etc.), droplet, and aerosol spread. In a few cases, dog handlers have carried virus home on clothing to infect their own dogs, so a change of clothes between work and home should be routine in any shelter in which canine flu is a concern (as it should be at all times, anyway). Although separate ventilation areas are ideal to control spread, some shelters and veterinary clinics have managed isolation in areas without separate air supply provided strict attention was paid to fomite control. See notes on aerosol transmission at the end of this document for further information.

Disinfection

Canine influenza persists < 1 week in the environment. It will be inactivated by most any commonly used disinfectant such as alcohol, bleach, quaternary ammonium compounds, and potassium peroxymonosulfate (e.g. Trifectant®).

Vaccination

Subcutaneous killed vaccines are available for canine influenza. These vaccines are labeled to reduce the severity of clinical signs and decrease the duration of viral shedding, though like many respiratory vaccines they may not completely prevent infection. The vaccines are labeled for use in puppies 6 weeks of age and older, and should be given as two injections, 2-4 weeks apart. The requirement for a booster limits the usefulness of this vaccine in some shelters, but it should be considered for pet dogs that stay in boarding kennels, attend doggy day care centers, frequent dog parks, or otherwise congregate with other dogs, especially in areas known to be endemic for canine influenza. The series of two vaccines should be completed at least two weeks before boarding to allow for optimal immune response. This vaccine may also be useful for shelters in endemic areas if dogs frequently stay for a prolonged period, or for shelters transferring dogs from non-endemic to endemic areas (to be administered **prior to transfer** into an endemic area).

Treatment

Although there is no specific treatment for canine influenza viral infection at this time, secondary bacterial infection may play a significant role and antibiotics are often indicated. Antibiotics commonly used for treatment of *Bordetella bronchiseptica* kennel cough, such as doxycycline, Clavamox, or Baytril, are generally not as effective for treatment of secondary infections associated with canine flu. Cephalosporins may be a good choice for treatment of the secondary infections associated with the milder form of disease. Remember that *Bordetella* is very frequently resistant to Cephalexin, so if a co-infection is suspected, treatment with multiple antibiotics may be indicated. The pneumonia associated with the severe form of disease can be caused by a variety of bacteria including *Pasteurella multocida*, *Staphylococcus intermedius*, *Streptococcus canis*, and *Mycoplasma spp*. Ideally, a transtracheal wash and culture and sensitivity testing should be performed to choose an antibiotic for treatment of severely ill dogs. If an empirical treatment choice must be made, good choices should include a combination of broad spectrum antibiotics such as a fluoroquinolone + penicillin, either orally if eating or parenterally if inappetent. Supportive care such as IV fluid therapy is of course helpful. Cough suppressants do not tend to be helpful and should be avoided in dogs with a productive cough. Anecdotally, a one-time injection of steroids was helpful in treating severely affected dogs in a shelter outbreak. The real efficacy of this treatment is unknown.

What about Tamiflu?

Oseltamivir (Tamiflu®) is a drug developed for treatment of influenza in humans. This drug should not be used for treatment of canine influenza at this time. There are several reasons for this. We do not currently know the appropriate dose and duration for treatment of dogs. For best effect in humans, the drug needs to be started within 48 hours of infection. We rarely recognize canine flu this early. Most importantly, Tamiflu® represents a primary line of defense against a human influenza pandemic. Use of this drug may soon be restricted in order to best reserve its use for protection of human health.

Outbreak management

As with any outbreak, management requires breaking the cycle of transmission between exposed, infected and new incoming dogs. Luckily the relatively short period of shedding makes this a more manageable proposition with canine influenza than is the case with diseases such

as canine distemper, which can have a prolonged incubation and shedding period. The bottom line is: ***all dogs in the shelter at the time a case is identified should be considered exposed/at risk***. These dogs may pose an infectious risk for up to 7-10 days after exposure ? to be on the safe side, they should be prevented from contacting naïve (unexposed) dogs for two full weeks after exposure. After this period, even if they are still clinically ill, they are very unlikely to pass their infection to other dogs. For shelters that can entirely shut down intake and adoption for two weeks, the outbreak can simply be allowed to run its course. Open-admission shelters may be able to work cooperatively with shelters in surrounding communities in order to accomplish this. Where shutting down intake is not an option, the following steps can help manage an outbreak:

- Create a clean, separate intake area for un-exposed dogs
 - At least a separate ward, ideally with separate ventilation
 - May consolidate all exposed dogs to a single ward in order to create clean ward for new intakes
 - For example, if shelter has two wards, one for stray and one for adoptable dogs, collect all exposed dogs into the stray ward and take in new strays into the adoptable ward
 - For shelters with a single ward for all dogs, options to avoid depopulation or ongoing disease spread include either diverting new intakes to another facility or sending exposed dogs off site for quarantine. The most practical way to accomplish this depends on resources of the community:
 - Veterinary or boarding clinic may be more practical to temporarily divert new intakes ? owners will need a limited number of places to look for lost pets
 - Foster care with no other dogs in household may be more appropriate to hold exposed dogs for a quarantine period, especially adoptable dogs that are through their stray holding period
 - ***For single ward shelters that are not yet affected by canine flu and rescue groups that would like to support them in the event of an outbreak, this is a great thing to think about beforehand.*** Muster resources ahead of time if possible.
- Shut down release/adoption of exposed dogs until two week quarantine is completed
 - Alternately, release only to homes with no other household dogs, with stipulation that dogs not be taken out in public for two weeks
 - Advise reclaiming owners of risk to other dogs
- If possible, isolate sick dogs separately from exposed/not sick dogs

What does adequate isolation look like?

- Limited, designated staff only to enter quarantine/isolation areas
- Separate jumpsuits (full clothing coverage), gloves, boots or shoe covers
 - Foot baths may be used in addition, but should not be exclusively relied upon
- Separate cleaning, feeding and treatment supplies
- Ventilation as separate as possible
 - At least separate by full wall and door ? designated area within a common air space may not be sufficient

What if it keeps coming back?

Some communities may become ?endemic? for canine influenza. In such cases, newly infected dogs may enter the shelter routinely, just as they now do with other infectious diseases. Where canine flu is a constant, shutting down for two weeks every time a case is identified may be unworkable. Under these circumstances, it may be necessary to continue business somewhat as usual in the face of ongoing outbreaks. It is nevertheless important to protect the community and adopter?s other pets. For some shelters, dogs are routinely kept nearly two weeks for quarantine, sterilization, etc. prior to being placed for adoption. In this case they will likely be through the most infectious period before being made available to the public, provided exposure occurs soon after intake. If dogs are placed for adoption less than two weeks after exposure, adopters should be clearly advised (verbally and in writing) of the risk to other dogs and warned to keep the dog strictly isolated - ***including fomite control*** - from other dogs until a two week quarantine period has been completed. If veterinary care is necessary, the veterinarian should be advised ahead of time of the risk that the dog is infected with canine influenza.

Pro-active communication

Rapid communication can help other shelters and animal facilities get prepared, protect the shelter?s reputation, and gather assistance to manage an outbreak. As in any outbreak, communicate early and often. Target groups to advise of the outbreak include:

- Recent adopters
- Local and state veterinary associations, shelters, and rescue groups
- State veterinarian
- Public health
- Media
- Shelter legal counsel

Possible resources to help manage an outbreak include:

- Local veterinarians
- Veterinary schools
- UC Davis Shelter Medicine program
- Dr. Cynda Crawford, University of Florida
 - crawfordc@mail.vetmed.ufl.edu
 - 352-392-4700 ext 5731

National shelter support agencies such as the ASPCA, HSUS, AH, NACA, Association of Shelter Veterinarians (ASV). For more information on these groups, please see our [Links](#) page

Preparation: what you can do now to protect your shelter and community

- Prepare an outbreak management plan
 - Role of community, veterinary clinics, rescue groups, other shelters
 - Chain of communication
- Educate staff and volunteers about the signs and risk factors for canine influenza
- Quarantine high risk dogs for 1 week
 - History of boarding
 - Recent transfer from high risk area
- Vaccinate for DHPP and ***Bordetella*** on intake. These vaccines will not prevent canine influenza, but will help decrease the incidence and severity of canine respiratory disease for other reasons, decreasing the occurrence of false alarms.
- Train staff to be alert to signs of respiratory infection, and provide written and oral instructions for all staff members and volunteers letting them know what to do if they notice a dog with signs of respiratory disease (e.g. don't take that dog for a walk, let a medical staff member know, post a sign on the dog's run)
- Isolate all dogs showing signs of respiratory infection. As with other respiratory pathogens, mildly affected dogs may transmit severe disease to others. Clean contaminated clothing, hands, equipment and surfaces after exposure to a dog with respiratory disease.
- For shelters which have contact with owned pet animals, such as obedience classes or vaccine clinics held at the shelter, make sure areas are cleaned and employees wash hands and change clothing between caring for shelter animals and handling pet animals. Remember, when influenza first arrives in a community, ***no dogs will be immune***, no matter how well vaccinated and cared for.

Information for pet owners

Preparation: what pet owners can do now to protect their dog's health

- Make sure your pet is following a vaccine schedule as recommended by a veterinarian. Although there is no vaccine for canine influenza, there are vaccinations that decrease the likelihood and severity of other canine respiratory infections. Vaccination against [kennel cough](#) is generally indicated for dogs at risk for exposure to lots of other dogs, for example dogs that are going to stay at a boarding kennel or doggie day care, participate in agility, dog shows, etc. Vaccines should be given at least a week before exposure, and may need to be boosted as often as every six months.
- If you board your pet, make sure that the kennel is clean and well maintained, and has a plan for immediately isolating and caring for any dogs that develop signs of [kennel cough](#) or other disease in a completely separate area (at least 50 feet from healthy dogs or with a separate air supply).
- Don't take your pet to dog parks or other places with lots of dogs if he or she has signs of kennel cough or other infectious disease, and for two weeks after recovery.
- Make sure your pet has current ID tags with your address as well as phone number clearly displayed. This will ensure that the animal can be returned promptly to you in the event of an escape, and will prevent exposure to kennel cough in an animal shelter.
- Keep your pet in overall good health. Until such time as a vaccine is developed, a strong immune system will be your dog's best defense against infection.

Notes on aerosol transmission

Aerosol transmission may play a significant role in the spread of canine influenza. Spread may be similar to that of other highly contagious canine respiratory infections such as canine distemper, transmission of which has been observed over distances of up to 20 feet, even from non-coughing dogs (personal communication, Max Appel, Cornell University, 2005). In a few cases of confirmed canine influenza, severely ill animals have been treated in intensive care units where separate air space was not possible, and no transmission was observed to other dogs in the ward (very strict attention was paid to fomite control). However, the safety of this practice can NOT be assured. Although entirely separate ventilation systems ***may*** not be necessary, every effort should be made to keep infected animals in a separate air space, or separated from other animals by at least 50 feet. If dogs must be treated in the same air space as other animals, strict attention to fomite control is still a worthwhile precaution, although it will not eliminate all risk of spread.

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[Cornell University Animal Health Diagnostic Center - Emerging Issues](#)
[Cornell University News Bulletin 10/1705 Test Summary for Canine Influenza Virus in Dogs not Affiliated with Greyhound Racetracks](#)
[Dr. Cynda Crawford on-line presentation about Canine Influenza](#)
[Canine Flu Information Site](#)
[UF Shelter Medicine CIV FAQ Site](#)

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