

## **Canine Influenza (CIV) Overview**

*Compiled January 2018 by Dr. Emilio DeBess*

### **Basics**

Canine influenza (CIV) is a highly contagious respiratory tract infection largely caused by 2 subtypes of the influenza A virus, H3N8 and H3N2. Influenza A viruses are segmented, single-strand RNA orthomyxoviruses that are host-specific and circulate worldwide. While CIV is considered a primary pathogen, it has also been associated with kennel cough disease complex.

### **Transmission**

Canine influenza virus is spread most easily in overcrowded or high-population environments, such as shelters, boarding centers, dog parks, pet stores, dog shows, veterinary hospitals, and grooming facilities. Spread occurs via aerosol transmission, fomites, and direct oronasal contact. Because of the potential for incidental exposure or fomite transmission, single-pet homes are also considered susceptible to influenza virus infection.

Currently, CIV is perpetuated mostly through shelters, with other outbreaks occurring sporadically. A seasonal pattern seems to occur with CIV outbreaks, especially with H3N8. Peak infections have occurred in mid-winter months, as well as summer through mid-fall months.

### **Clinical Signs**

The most common clinical signs are coughing, anorexia, lethargy, pyrexia, sneezing, ocular discharge, and clear to mucopurulent nasal discharge. Dyspnea may also be seen in severe cases, especially with H3N2 infection. Fever usually only occurs in the beginning stages of infection and is often low grade. Cough is usually dry and nonproductive. If pneumonia is present, clinical signs can also include more significant pyrexia, a productive cough, tachypnea, and/or dyspnea.

### **Treatment/Management/Prevention:**

#### **SPECIFIC THERAPY**

No specific treatment exists for CIV. While many infections are self-limiting, supportive care may be needed for more seriously affected dogs.

#### **SUPPORTIVE THERAPY**

Supportive care (e.g. IV fluids, supplemental oxygen) may be needed for patients with moderate to severe clinical signs. Nutritional support may also be necessary because anorexia is a common clinical finding. Nebulization with saline and/or coupage up to 4 times daily may be helpful for pneumonia.<sup>1,2,8</sup> N-acetylcysteine as a mucolytic may be useful in combination with saline nebulization.<sup>1</sup>

While antibiotics are not warranted for viral infections, secondary bacterial infections are common with CIV. Therefore, antibiotics may be helpful as preventative and therapeutic measures.<sup>2</sup> Antibiotics are likely indicated for patients with fever, purulent nasal discharge, productive coughing, or pneumonia.<sup>1</sup> In the absence of culture, commonly used antibiotics include amoxicillin-clavulanate, azithromycin, doxycycline, and enrofloxacin. In severe cases, hospitalization and IV antimicrobials can be considered.<sup>1,2,8</sup>

While antiviral drugs (e.g. oseltamivir) have been utilized in clinical practice for some viral infections, their use for CIV is not recommended. Their safety and efficacy are not fully established in dogs; they are less effective if not used early in the disease course and most dogs are not brought in for treatment until later; drug-resistant viral strains may result; and viral mutations that can result from antiviral use could transfer across species strains.<sup>1,2,6,8,9</sup>

Corticosteroids are generally contraindicated unless chronic respiratory inflammation or severe ARDS-type symptoms occur. Anti-inflammatory doses are recommended over immunosuppressive doses. Prolonged and increased shedding of H3N2 virus has been reported in dogs receiving immunosuppressive doses of prednisolone.<sup>2</sup>

Cough suppressants are not recommended for patients with confirmed or suspected bacterial pneumonia as they can decrease bacterial and mucus clearance from the respiratory tract.<sup>1,2</sup> Their use may be warranted for terminating a perpetual cough

cycle. Bronchodilators are generally of limited use but may be helpful in breaking the cough cycle. Bronchodilators may also help alleviate severe bronchiolitis.

## Preventive Measures:

### *Prevention, Isolation, Disinfection*

Recommend that owners avoid high-risk environments (e.g. dog parks, kennels, dog shows) during outbreaks. Avoid hospitalization of ill dogs, if possible, to prevent spread of the virus. Enforce a minimum of 20 feet of separation between infected dogs and healthy populations. Dogs may require isolation for at least 21 days from onset of illness for H3N2 subtypes, or if the subtype is unknown. Biosecurity measures include wearing gowns, booties, disposable gloves, as well as other fomite prevention measures (e.g. sanitizing stethoscopes).<sup>1</sup> Because cats and ferrets may be susceptible, isolation can be extended to prevent spread beyond just canine companion animals.

Influenza viruses are sensitive to routine disinfectants and are considered relatively easy to kill outside the host.<sup>1</sup> Canine influenza virus has been shown to persist in the environment for only 48 hours. Due to the highly infectious nature of CIV, however, kennels and facilities may require evacuation for up to 1-2 weeks. Equipment and facilities can be cleaned with a 1:30 dilution of bleach or quaternary ammonium compounds. Adequate contact time (generally 10 minutes) should be ensured.

## Vaccination

Licensed vaccines are available for dogs for both H3N8 and H3N2 subtypes. Currently marketed vaccines are inactivated, adjuvanted vaccines for either H3N8 or H3N2, or an inactivated bivalent (for both strains) vaccine. Give an initial vaccination followed by a booster 2-4 weeks later. Yearly vaccination is recommended for dogs in high-risk or endemic environments. Current vaccines do not prevent CIV infection but they significantly decrease the severity and degree of infection, illness, and viral shedding. Onset of significant immunity may take up to 1 week after the second booster, thus single vaccines are unlikely to be protective for dogs initially entering shelters or other high-risk facilities.

At this time, several live-attenuated influenza vaccines are being tested. Live-attenuated vaccines typically produce better immunity and protection than inactivated influenza vaccines.

## References:

- 1) King L G: Canine Influenza: Epidemiology, Clinical Disease, Diagnosis, Treatment, and Prevention. Western Vet Conference 2010.
- 2) Hanson J M, Dunn D, Yeuroukis C K: Canine Influenza. Clinician's Brief, 34 Refs ed. 2016 Vol 14 (9) pp. 97-103.
- 3) Nogales A, Rodríguez L, Chauché C, et al : Temperature-Sensitive Live-Attenuated Canine Influenza Virus H3N8 Vaccine. J Virol 2017 Vol 91 (4).
- 4) Rodríguez L, Nogales A, Reilly E C, et al : A live-attenuated influenza vaccine for H3N2 canine influenza virus. Virology 2017 Vol 504 (0) pp. 96-106.
- 5) Nogales A, Huang K, Chauché C, et al: Canine influenza viruses with modified NS1 proteins for the development of live-attenuated vaccines. Virology 2017 Vol 500 (0) pp. 1-10.
- 6) Sykes J E: Canine Influenza . World Small Animal Veterinary Association World Congress Proceedings 2014.
- 7) Crawford P C : Canine Influenza Virus - Old and New. Fourth International Society for Companion Animal Infectious Diseases Symposium 2016.
- 8) Wolfson W, Taboada J, Côté E: Influenza. Clinical Veterinary Advisor Dogs and Cats, 3rd ed. 2015 pp. 554-555.
- 9) Barr S C: Kennel Cough and Canine Influenza. Central Veterinary Conference 2013.
- 10) Watson C E, Bell C, Toohey-Kurth K: H3N2 Canine Influenza Virus Infection in a Dog. Vet Pathol 2017 Vol 24 (3) pp. 527-30.
- 11) Hanson J M, Tripp R A, Harvey S B: Nasal Swabs to Detect Canine Influenza Virus. Clinician's Brief, 19 Refs ed. 2016 Vol 14 (7) pp. 32-40.
- 12) Hilling K, Hanel R: Canine influenza. Compend Contin Educ V 2010 Vol 32 (6) pp. e1-9,e9.
- 13) Zhu H, Hughes J, Murcia P R: Origins and Evolutionary Dynamics of H3N2 Canine Influenza Virus. J Virol 2015 Vol 89 (10) pp. 5406-18.
- 13) Zhu H, Hughes J, Murcia P R: Origins and Evolutionary Dynamics of H3N2 Canine Influenza Virus. J Virol 2015 Vol 89 (10) pp. 5406-18.
- 14) Reine-Salz N: Canine Influenza H3N2 Infection in Four Dogs. Am College Vet Internal Med Forum ACVIM 2016.
- 15) Cima G: H3N2 canine flu may require longer isolation. J Am Vet Med Assoc 2016 Vol 248 (2) pp. 139.
- 16) Dalziel B D, Huang K, Geoghegan J L, et al : Contact heterogeneity, rather than transmission efficiency, limits the emergence and spread of canine influenza virus. PLoS Pathog 2014 Vol 10 (10) pp. e1004455.
- 17) Leutenegger C, M, Estrada M, Armstrong R D: Canine Influenza Virus H3N8: A 4 Year Review of Seasonal Patterns, Geographical Frequency Differences and Age Distribution. ACVIM 2012.
- 18) Newbury S, Godhardt-Cooper J, Poulsen K P, et al : Prolonged intermittent virus shedding during an outbreak of canine influenza A H3N2 virus infection in dogs in three Chicago area shelters: 16 cases (March to May 2015). J Am Vet Med Assoc 2016 Vol 248 (9) pp. 1022-6.
- 19) Secret S A , Sharma A: THORACIC RADIOGRAPHIC CHARACTERISTICS OF CANINE INFLUENZA VIRUS IN SIX DOGS. Vet Radiol Ultrasound 2016 Vol 57 (5) pp. 462-6.