H3N2 Canine Influenza

For Veterinarians

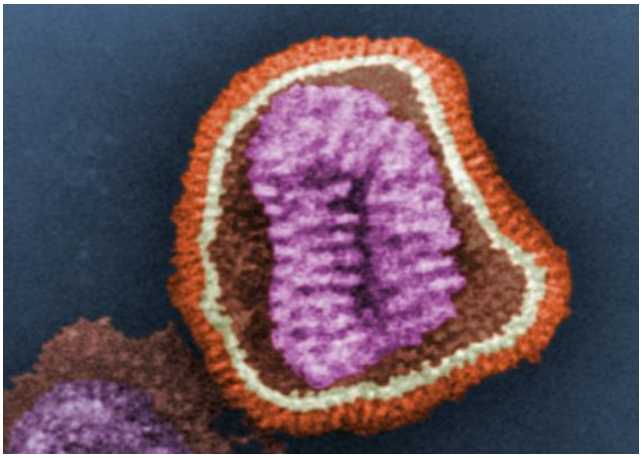
Canine influenza virus

Canine influenza virus (CIV) is a type of influenza A that is adapted to dogs. Influenza virus strains are named based on their hemagglutinin (H) and neuraminidase (N) types. There are two different CIVs in North America.

H3N8 CIV was first identified in Florida in the early 2000s and was the result of adaptation of an equine influenza strain to dogs.[1] This virus is still present in the US but the incidence of disease appears to be relatively low.

H3N2 CIV is a more recently encountered strain in North America.[2-5] It is believed to have originated in Asia as a result of direct transmission of an avian H3N2 virus to dogs. Canine H3N2 was likely introduced to the US in 2015 through importation of dogs from South Korea. It has spread widely in the US, causing outbreaks in many regions.

H3N2 CIV was first identified in Canada in southwestern Ontario in late December 2017.



Colourized transmission electron micrograph depicting the ultrastucture of an influenza virus particle (PHIL 10073)

Transmission

Transmission of CIV, as for other influenza viruses, involves direct contact between animals, short-distance aerosol transmission and indirect transmission from contaminated fomites. Direct contact poses the highest risk. Humans can potentially act as fomites through short-term carriage of CIV on their bodies or clothing, with subsequent exposure of a dog.

Infected dogs can start shedding CIV before the onset of disease (usually ~24h before), so clinically normal dogs can be a source of infection. Shedding of H3N2 CIV has not been well investigated, but H3N2 CIV appears to have a relatively long period of infectivity. A study of a shelter outbreak showed that shedding most often stopped with 14d, yet intermittent positive PCR results were obtained in some dogs for up to 24 days.[5] Whether that reflects intermittent shedding, prolonged low level shedding or re-exposure is difficult to discern.

Direct nose-to-nose contact poses the highest risk of transmission of canine influenza virus.

Clinical disease

H3N2 influenza causes disease that is indistinguishable from other causes of canine infectious respiratory disease complex (CIRDC, also referred to as “kennel cough”). Dogs of any age can be affected, although disease is more likely to be severe in very young and old dogs, as well as brachycephalic breeds.

Coughing, sneezing, nasal discharge, ocular discharge, decreased appetite and fever are the main signs. Fever is often transient and may not be present by the time of veterinary examination. Cough can persist after elimination of active infection, and cough is not a good indicator of risk of viral shedding. Most dogs fully recover within 2-3 weeks.

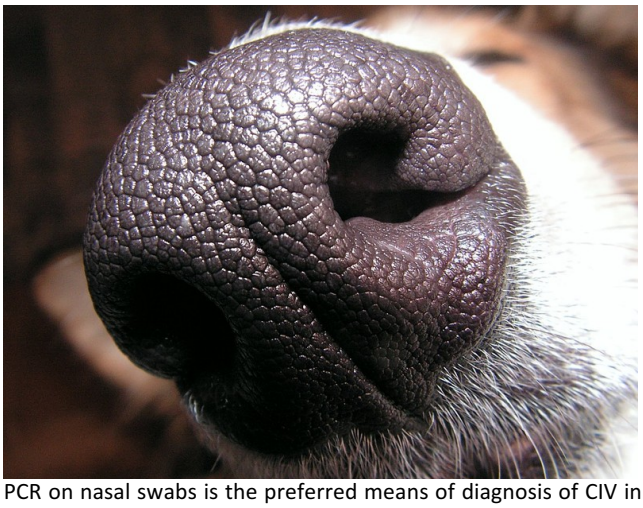
Complications are uncommon but the true incidence of severe disease associated with H3N2 CIV is not well understood. Secondary bacterial pneumonia is the main concern. Fatal infections are rare but can occur. High or persistent fever, increased

respiratory rate and effort, anorexia and purulent nasal discharge are indicators of more severe disease and/or secondary bacterial infection.

Brachycephalic dog breeds are at higher risk of developing more severe clinical disease if infected with canine influenza virus.

Diagnosis

Diagnosis usually involves detection of CIV by PCR from nasal swabs. Nasopharyngeal or oropharyngeal swabs can also be collected but nasal swabs are preferred. Ocular swabs can also be tested but are lower yield. PCR testing can broadly detect influenza A or target specific influenza types (e.g H3N2). PCR testing detects viral shedding, and is highest yield early in disease.



PCR on nasal swabs is the preferred means of diagnosis of CIV in dogs, but must be used early in the course of infection during period of active viral shedding.

Serological testing can be performed but is of limited use clinically. In areas where CIV has not been present, a single positive antibody titre is suggestive of infection in dogs that have not been previously vaccinated or traveled to a region where CIV is present. However, definitive diagnosis requires detection of a 4-fold increase in antibody titre in samples collected 2-4 weeks apart. It is preferable to test the acute and convalescent samples at the same time, so serological diagnosis of CIV is retrospective. Virus isolation can also be performed but is less common.

Treatment

There are no specific treatments. Supportive care (e.g. cough suppressants) should be provided, as needed. Antibiotics are not indicated for CIV infection, but occasionally may be needed if a secondary bacterial component develops, as is described in recent respiratory infection guidelines.[6]

Vaccination

Commercial vaccines are available. These may be against H3N8 or both H3N8 and H3N2. Vaccination is not 100% effective but can reduce the risk and potentially severity of infection. A minimum of 2 doses is required, 2-4 weeks apart. CIV vaccination is a non-core vaccine7 that should be considered based on the risk of exposure and the risk of complications of infection.

Infection control in veterinary facilities

CIV is highly transmissible in veterinary clinics, particularly in areas where CIV is new, because of the high transmissibility of the virus and the naïve canine population. Various exposure risks and sources may be present, including mixing of dogs in waiting rooms, contamination of waiting room, examination and treatment room environments, aerosol transmission in ward and treatment areas and indirect transmission through veterinary personnel or equipment.

Control of CIV in veterinary clinics is dependent on prompt recognition of the potential for CIV and use of enhanced infection control practices, along with good adherence to general principles of infection control.

- ➔ Front office staff should flag any acute respiratory disease cases at the time of appointment booking. Owners can be directed to call from their vehicle upon arrival or come into the clinic initially without their dog. The dog can then be admitted directly to an examination room or isolation area and personnel can start the appointment wearing additional personal protective equipment (gown or lab coat that will be used just for that appointment, gloves). Routine use of mask and eye protection is not required, but should be considered in situations where someone's face will be in close proximity to a potentially infected

dog, especially if the dog is coughing. In that event, goggles and mask, or a face shield, should be used.

- ➔ Infected (or suspected) cases should be housed in an isolation area and handled with enhanced precautions (as described above).
- ➔ Potentially contaminated items (e.g. stethoscopes) should be cleaned and disinfected after use on a CIV suspect. Potentially contaminated consumable materials should be disinfected or discarded.
- ➔ Routine disinfectants, used properly, will inactivate CIV. Prompt and careful disinfection of potentially contaminated environments is required.
- ➔ Veterinary personnel should pay close attention to hand hygiene. Hands should be washed or an alcohol-based hand sanitizer should be used after patient contact (including after removing gloves). Alcohol-based hand sanitizers will effectively inactivate CIV.

Zoonotic potential

H3N2 CIV is different than the common H3N2 human (seasonal) influenza virus. There is currently no evidence that H3N2 CIV can infect people. However, the potential for human infection cannot be discounted. Of greater concern is the potential for re-assortment of human influenza and CIV, if a dog (or person) is infected with both strains at the same time, as occasional infections of dogs with human H3N2 or H1N1 influenza viruses have been identified. Re-assortment of influenza viruses is of concern because it can potentially result in a virus that is readily able to infect people but is different enough from other human influenza viruses that people have no immunity from previous influenza infection or vaccination.

Other species

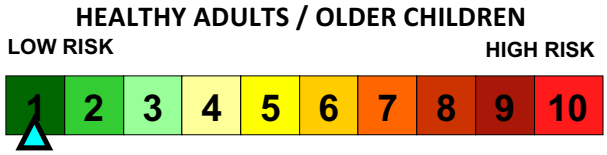
H3N2 CIV can infect cats, but the incidence appears to be low. Ferrets are susceptible to a range of flu viruses and are also susceptible to H3N2 CIV.

Reporting

As of January 1, 2018, Ontario veterinarians and veterinary laboratories are required to immediately report known or suspected infections with "novel influenza viruses" to their local Medical Officer of Health. This includes influenza viruses not known to be circulating in Ontario, which would include H3N2 CIV at this time.

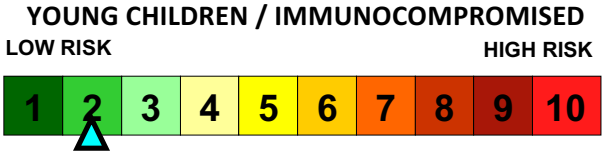
What is the risk?

The risk of disease to the general population posed by H3N2 canine influenza virus is:



Individuals with compromised immune systems (e.g. HIV/AIDS, transplant and cancer patients) are more susceptible to many kinds of infections, including those that may be transmitted by pets. Infants and young children (less than 5 years old) are more likely than adults to extensively handle animals if given the opportunity, which may increase the potential for disease transmission. Young children should be supervised when playing with animals, and an adult should ensure that they wash their hands afterwards. Pets should not be allowed to lick broken skin or any person's face.

For these groups, the risk of disease posed by H3N2 canine influenza virus is likely:



Additional information:

Hanson JM et al. Nasal swabs to detect canine influenza virus. Clinician's Brief 2016.

Center for Food Security and Public Health. Disease information – Influenza.

The Ohio State University. Disease prevention at canine group settings.

- Canine influenza (flu) information for dog owners (handout)

References and image sources:

1. Crawford PC, et al. Transmission of equine influenza virus to dogs. *Science* 2005;310:482-485.
2. Voorhees IEH, et al. Spread of Canine Influenza A(H3N2) Virus, United States. *Emerging Infectious Diseases* 2017;23.
3. Sun H, et al. Zoonotic Risk, Pathogenesis, and Transmission of Avian-Origin H3N2 Canine Influenza Virus. *J Virology* 2017;91.
4. Jang H, et al. Seroprevalence of three influenza A viruses (H1N1, H3N2, and H3N8) in pet dogs presented to a veterinary hospital in Ohio. *J Vet Sci (Suwŏn-si, Korea)* 2017;18:291-298.
5. Newbury S, 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;248:1022-1026.
6. Lappin MR, et al. Antimicrobial use Guidelines for Treatment of Respiratory Tract Disease in Dogs and Cats: Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases. *J Vet Internal Medicine / American College of Veterinary Internal Medicine* 2017.
7. Ford RB, Larson LJ, McClure KD, et al. 2017 AAHA Canine Vaccination Guidelines. *J Am Anim Hosp Assoc* 2017;53:243-251.
8. Jeoung H-Y, Lim S-I, Shin B-H, et al. A Novel Canine Influenza H3N2 Virus Isolated from Cats in an Animal Shelter. *Vet Microbio* 2013:1-22.

CDC Public Health Image Library
http://phil.cdc.gov/phil/home.asp