Canine Influenza Virus (CIV)

by Sheila J. Cook Msc

As early as the 1920s influenza was shown to be caused by a virus. There are however, three genetically very distinct types of influenza viruses: Influenza A Virus: This is by far the most pathogenic type and is responsible for pandemics such as the Spanish flu outbreak in 1918, Asian flu in 1957, Hong Kong flu in 1968 and the Swine flu in 2009 that was caused by the mysterious re-emergence of a 1918-like virus. Influenza A viruses infect several species including birds, pigs, horses, humans and now unfortunately dogs. There are many serotypes of the virus that are classified based on antibody reactivity to two proteins present on the surface of each virus particle – hemagglutinin (H) and neuraminidase (N). To date 16 different H and 9 N molecules have been identified. Interestingly, all H and N serotypes are found in wild aquatic birds which are therefore believed to be the natural host for influenza A and act as reservoirs for the transmission to other species. However, transmission from an intestinal virus of birds growing at 42°C to an upper respiratory tract infection of mammals where the temperature is approximately 33°C requires the virus to undergo many complex, incompletely genetic changes.

Influenza B virus mainly infects humans; although it has been documented in seals and ferrets. Influenza C Virus infects humans, dogs, and pigs, but is much less common.

The emergence of Canine Influenza Virus is one of those fortunately rare events where an entire viral genome in this case, that of the H3N8 equine virus, was transmitted to dogs where it adapted finally becoming canine-specific.

In Florida in 2004, 22 sick racing greyhounds were discovered; 14 had a mild respiratory disease, moderate fever and coughing, while 8 had more severe disease (bronchiopneumonia, pleuritis, high fever) that ultimately proved fatal. Upon necropsy, a H3N8 virus closely related to the current equine influenza viruses was isolated from the respiratory tracts of these dogs. Further, similar cases of respiratory disease were reported in racing dogs in 6 more states in 2004 increasing to 11 states in 2005. Serological epidemiology studies showed that in addition to circulating in racing greyhounds the H3N8 virus had been transmitted into the general pet population and by 2008, canine influenza was reported in 25 states.

Molecular analysis of the influenza isolated from dogs showed 96% homology with the 2002 and 2003 equine influenza isolates, suggesting interspecies transmission from horse to dog. Although similar horse/dog interspecies transmission has been documented in both the United Kingdom and Australia, canine influenza has so far become endemic only in the US. In addition to H3N8 other influenza serotypes have been discovered in dogs. An H3N2 avian influenza virus was isolated from dogs in South Korea with the potential

to spread from dog to dog, and in Thailand, the highly pathogenic avian influenza virus (H5N1) was reported in a dog that had ingested an infected duck carcass. Although about 25% of the local dogs tested had antibodies to H5N1, spread from dog to dog was not observed in this case.

How the equine H3N8 virus was transmitted to dogs is unclear although popular theories include close contact with infected horses, or the ingestion of infected horse meat. Similarly, feeding on contaminated poultry products or aerosol transmission from infected poultry has been suggested for transmission of the H3N2 virus in Korea. Both the strains of Influenza found is dogs are antigenically distinct from those found in humans and unlike human influenza, the canine form is not "seasonal"

As dogs and horses live in close association with humans and in the case of dogs, share our beds (especially in the case of Weimaraners) there is a concern that dogs (and horses) may provide a new source of a novel Influenza A virus transmission to humans. Could the dog act as a "mixing vessel" like the pig? One question you may ask is "Are dogs susceptible to human influenza infections – can I give my dog 'my' flu?" There is a recent report that the recent novel H1N1 virus (2009 swine flu) has been observed in pet dogs in China and the USA, following close contact with infected humans, but no reports of dogs transmitting the H1N1 virus to other dogs or humans. The transmission of flu viruses between different species is based on viral receptors, mainly found in the upper respiratory tract, that allow the virus to invade. If a species does not have the right receptors, the virus cannot infect. But of course, influenza viruses are constantly changing and have a tremendous ability to alter their genome and with it the ability to infect different species.

Clinical Signs of Canine Influenza:
Cough, runny nose and fever, with a small proportion of dogs developing severe disease, with pneumonia. The incubation period is usually two to four days from exposure to onset of clinical signs. The highest amounts of viral shedding occur during this time; therefore, dogs are most contagious during this 2-4 day incubation period when they are not exhibiting signs of illness. Virus shedding decreases dramatically during the first 4 days of illness but may continue up to 7 days in most dogs and up to 10 days in some dogs. The virus replicates in the mucosal lining of the respiratory tract and due to inflammatory responses, can result in rinhinitis, tracheitits, bronchitis and bronchiolitis. It is thought that approximately 80% of exposed dogs show clinical signs of disease, while 20% remain asymptomatic, though can still spread the virus.

Diagnosis:
There are two different tests to determine whether your dog has influenza which can be performed by your veterinarian. The first looks for the presence of virus in nasal secretions taken at the onset of disease and the second looks for an increase of antibody to the virus. An initial serum sample is taken, followed two to three weeks later by a second sample. If there is an increase in antibody level that indicates your dog has been exposed to influenza, either by infection or vaccination. The timing of nasal swabs is critical and if taken once clinical signs are evident may produce a false negative as viral shedding will have ceased.

Spread of Canine Influenza:
As with human influenza, canine influenza can be spread by direct contact with respiratory secretions, via aerosol, people moving between infected and uninfected dogs, or contaminated objects. As with any contagious disease, owners should use common sense and quarantine their animals.

Treatment of Canine Influenza:
Mainly supportive care, fluids. If a secondary bacterial infection occurs then broad spectrum antibiotics are administered.

Control &Vaccines:
Influenza viruses, including canine influenza viruses, are readily killed by commonly used disinfectants. In general, influenza viruses are susceptible to a variety of disinfectants including 1% sodium hypochlorite, quaternary ammonium. Veterinary Influenza vaccines are not the most effective drugs on the market. For example, in the equine H3N8 influenza, as a result of genetic variation, worldwide outbreaks have resulted despite regular vaccination. In 2009 an inactivated vaccine for H3N8 canine influenza was given a conditional license in the U.S. To date, no significant variation in the H3N8 subtype (antigenic drift) has been observed with canine influenza but this should be closely monitored if vaccine efficacy is to be insured. Canine Influenza vaccine can be termed a "lifestyle vaccine". If you think your dogs are at risk or in an area where there have been reports of canine influenza virus outbreak, then talk to your veterinarian about whether you should consider vaccinating you dog.

In 1992, Lederberg et al., 1992 published a report in the National Institutes of on Emerging Infections. In it he concluded that 'pathogenic microbes can be resilient, dangerous foes. Although it is not possible to predict their individual emergence in time and place, we can be confident that new microbial diseases will emerge'. The emergence of Canine Influenza certainly holds that to be true.

For more information:
http://www.cdc.gov/flu/canine/
http://www.avma.org/public_health/influenza/canine_bgnd.asp
http://www.cfsph.iastate.edu/Factsheets/pdfs/canine_influenza.pdf

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References:
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Influenza virus infections in dogs and cats. Timm C. Harder, Thomas W. Vahlenkamp (2010). Veterinary Immunology and Immunopathology. 134; 54-60