

Canine Influenza Virus: Management, treatment and prevention of disease

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Introduction



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Conflict of Interest Disclosure



Introduction



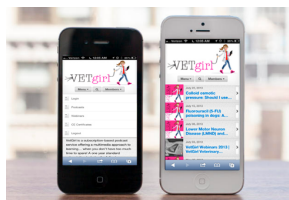
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CANINE INFLUENZA VIRUS

Canine Influenza Virus: H3N8 vs. H3N2



- **H3N8**
 - First detected in US 2004
 - Equine origin
 - Only in the US
 - Relatively stable antigenically
- **H3N2**
 - Earliest reported cases in China in 2006
 - Avian origin
 - Multiple “mixtures” of virus detected

Gene	% Similarity	Strain
PB2	99	A/canine/Korea/KR18801/2011(H3N2)
PB1	99	A/canine/Korea/S1/2012(H3N2)
PA	99	A/feline/Korea/O1/2010(H3N2)
HA	99	A/canine/Korea/CY005/2010(H3N2)
NP	99	A/feline/Korea/FY028/2010(H3N2)
NA	99	A/canine/Korea/S1/2012(H3N2)
MP	99	A/canine/Korea/CY005/2010(H3N2)
NS	99	A/canine/Korea/KR18801/2011(H3N2)



Canine Influenza Virus: Clinical Issues

- Incubation period may be as short as 2 days but typically 3-4
- Contact or aerosol spread with contagious period of about 1 week
- Secondary bacterial pneumonia most common problem





Canine Influenza Virus: Clinical Issues

- On an individual animal basis, difficult to determine causative agent of CIRP
- All dogs currently are susceptible
 - No evidence of breed differences
 - No evidence of age factor
- Most easily identified in group settings where >50% of animals showing signs



Canine Influenza Virus: The typical case

- 6 month old mixed breed adopted from animal shelter
 - Lethargic, vomiting, nasal discharge
- After several days, presented to clinic with cough, temp 104.1 and bilateral mucopurulent nasal discharge
- Recovered normally with antibiotic treatment



RECENT OUTBREAK IN CHICAGO



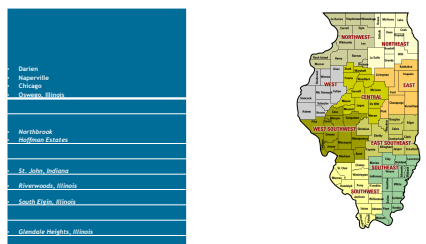


Why do we care?

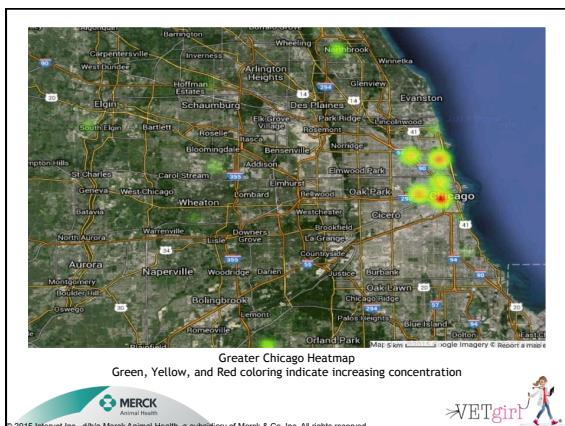
- Highly infectious
- Recent Chicago, IL outbreak
- Morbidity and mortality
- Pet owners seeking medical advice
 - What should we do or recommend

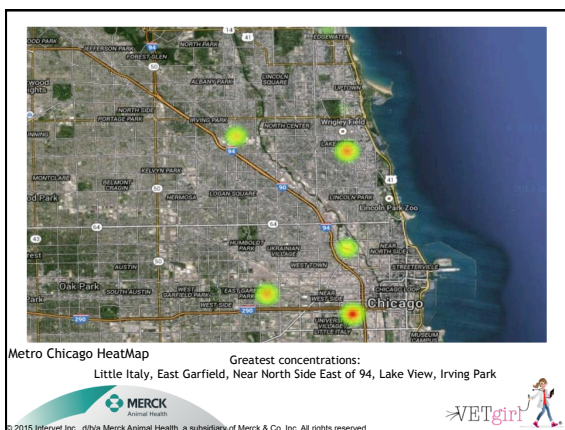


Cities with positive CIV



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CIV is associated with a relatively high morbidity and mortality^{2,4}

- Dogs have no natural immunity to CIV²
 - Virtually 100% of naive dogs exposed become infected

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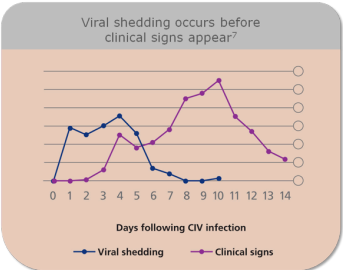
This text block contains a bolded statement about the severity of CIV (Canine Infectious Virus) and a bulleted list of facts. The first fact states that dogs have no natural immunity to CIV, and the second fact states that virtually 100% of naive dogs exposed become infected. The text is accompanied by the Merck Animal Health logo and the VETgirl logo.

HOW DO WE DIAGNOSE IT?





Canine influenza is hard to diagnose^{2,4,7}

Viral shedding occurs before clinical signs appear?





Days following CIV infection	Viral shedding	Clinical signs
0	0	0
1	1	0
2	2	0
3	3	0
4	4	0
5	3	1
6	2	2
7	1	3
8	0	4
9	0	5
10	0	6
11	0	7
12	0	6
13	0	4
14	0	2



2015 Chicago outbreak



- Merck Animal Health began testing in late March 2015
- 140 positive CIV cases (approx. 250 tests)
- 9 cases of CPI
 - 8 of those had DAPPv and monovalent *Bordetella*
 - 1 dog had an intranasal vaccine
 - 1 dog had a CIV vaccine and was CIV negative despite exposure



CIV: DIAGNOSTIC ISSUES

TESTS OF CHOICE



- Polymerase Chain Reaction Tests
 - Does not depend on viable virus
 - Relatively rapid
 - Matrix gene is best target for any type A influenza virus
 - Second test needed to define virus strain
 - Good screening test for decision to do virus isolations

CIV: DIAGNOSTIC ISSUES



TESTS OF CHOICE

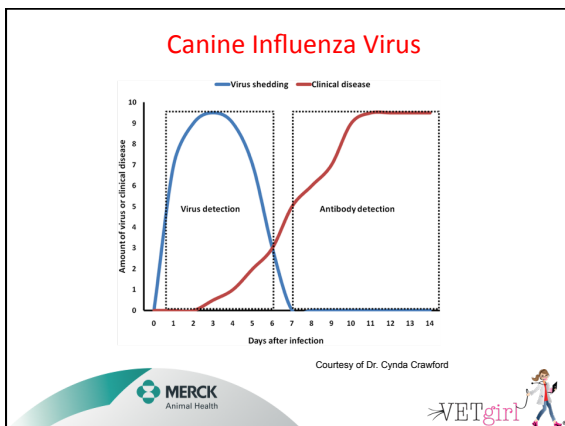
- Polymerase Chain Reaction Tests
 - Nasal or pharyngeal swabs sample of choice
 - Swabs can be placed in sterile tube with few drops of saline to keep moist
 - Ship overnight on ice pack
 - Lung tissue or lung swabs

Experimental Infection H3N8

Days Post Infection	Per Cent Positive
0	0
1	80
2	100
3	100
4	65
5	80
6	75
7	10



CIV: DIAGNOSTIC ISSUES

Hemagglutination Inhibition Assay

- Measures antibody that binds to the HA protein of the virion
 - Can be detected within 8 days of an infection
 - Low seroprevalence in general population permits good “guess” of recent infection with single sample.
 - Vaccine titers generally low (<32)

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DIAGNOSTIC ISSUES

- Hemagglutination Inhibition Assay
 - Relatively strain specific test
 - AHDC is offering HI testing for both CIV H3N8 and CIV H3N2

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CANINE INFLUENZA VIRUS??

- All Influenza Viruses in dogs are not CIV
 - H5N1(avian) – not in US
 - H3N2(human) –serological data
 - H3N8(equine)- natural infections
 - H1N1(09) – US
 - H5N2 (avian) - China



WHAT DO WE DO WHEN POTENTIAL CASES PRESENT TO YOUR CLINIC?



Management: Biosecurity and Hygiene

- Protective clothing
 - Dedicated for use in the facility
- Equipment disinfection
- Hand washing
 - Hand sanitizers



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Management: Biosecurity and Hygiene

- Virus is not environmentally resistant
 - 48 hours on dry hard surfaces
 - 24 hours on clothing, bedding
 - Virus is killed by cleaning with soap and water
- Clean, then disinfect



Precautions with suspected CIV-infected patients

- Avoid exposure of coughing dogs to other patients
- Treat patients on outpatient basis, if possible
- Do not bring patient through waiting room—use separate entrance
- Examine in designated area and disinfect afterwards
- Segregate staff after exposure, if possible
- Remember: clinical signs peak after viral shedding stops





Controlling CIV in the clinic

- Every dog present at the time should be considered at risk
- All exposed dogs should be considered infected and potentially shedding virus
- Exposed dogs will need to be isolated on site
- Aerosol transmission may play a significant role in the spread of CIV⁸



Controlling CIV in the clinic

- Measures need to be taken to reduce spread via clinic staff
- Affected facilities should be quarantined for 14 days following clinical signs
- Clinic closure may be required



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Which dogs are most at risk?



- Dogs of animal healthcare personnel that may be exposed at home through contaminated fomites
- Dogs that are taken to venues where multiple dogs interact/socialize
 - Boarding facilities
 - Doggie daycares
 - Shelters/rescues
 - Pet stores
 - Adoption groups
 - Breeding facilities
 - Groomers



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Which dogs are most at risk?



- Dogs that compete in shows or other events where many dogs are present
- Dogs that are vaccinated for *Bordetella* have same risk factors
- Dogs that travel
- Service dogs



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Nobivac Essential protection for essential bonds **Canine Flu H3N8 vaccine**



- Nobivac® Canine Flu H3N8
 - Killed virus, adjuvanted vaccine
 - Subcutaneous administration
 - Safe for use in dogs 6 weeks of age or older
 - Two 1-mL doses given 2 to 4 weeks apart for naive dogs
 - Annual revaccination with one dose is recommended

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Nobivac Essential protection for essential bonds **Canine Flu H3N8 vaccine**

- Of the positive cases found in the 2015 Chicago outbreak, none had been vaccinated for CIV.
- HOWEVER, there is currently no data regarding cross protection of current H3N8 vaccines and protection against H3N2.
 - In areas where CIV H3N8 is enzootic, protecting against this variant is recommended
 - Especially in dogs that have a social lifestyle

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SO, HOW DO WE TREAT CIV?

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Immediate triage

- Get it out of your waiting room!
- Examine it end of the day if possible
- Dedicate one room
- Disinfect appropriately
- Move to isolation
- Reduce fomites
- Triage the patient: ABCD



Primary survey

- Immediate assessment
- Stabilization of the ABCDs!
 - Airway
 - Breathing
 - Circulation
 - Dysfunction





Primary survey: Airway



Primary survey: Breathing



- Evaluate RR/RE
- Nasal discharge
- Tachypnea or dyspnea
- Orthopnea
- Auscult!
 - Increased BVS → parenchymal
 - Dullness → pleural
 - Crackles → cardiac
 - Wheezes → bronchial



Primary survey: Breathing



- Cyanotic = $paO_2 < 40$ mmHg
 - About to arrest – treat immediately!
- O₂ therapy!

pulse ox < 70%
pulse ox < 70%



Primary survey: Circulation

- Stabilize!
 - Assess HR, mm, CRT
 - Goal: HR < 160-170



Clinical signs of CIV

- Lethargy/weak
- Anorexia
- Fever
- Coughing
- Tachypnea (at rest)
- Tachycardiac
- Dyspnea
- Exercise intolerance
- Coughage → cough
- Constant panting
- Cyanosis
- Nasal discharge
- Collapse



Physical examination

- Coughing
- Dehydration
- Fever (T>103°F/39.4°C)
- Auscultation
 - Harsh lungs
 - Dull lungs
 - Crackles



Just because it's "pink..."

- Cyanotic: $paO_2 < 40$ mmHg
– About to arrest – treat immediately!

pulse ox < 70%
pulse ox < 70%

- O₂ therapy!



Further diagnostics

- Physical examination (PE)
- Chest radiographs
- Pulse oximeter
- Arterial blood gas



Goals of Treatment

- Hydration
- Oxygenation
- Antibiotic therapy
- Nebulization and coughage
- Supportive care
- Anti-emetic therapy





Treatment protocols: IV fluid therapy

- Ensure hydration
 - Prevent dehydration of airway secretions which worsen ability to be expectorate
- Replace hydration over several hours while indoors via IV catheter
 - Crystalloid





Oxygen Therapy

- Oxygen
 - Pulse ox < 92%? NEEDS O₂!
- Establish Airway
- IV access





Oxygen Therapy

- Face mask
- Flow by
- Hood/E-collar
- Intranasal
- Intra-tracheal
- Oxygen cage
- Tracheostomy tube
- Endotracheal tube (ETT)
- Positive pressure ventilation (PPV)



Antibiotic therapy

- Viral infection but concern about secondary septic hemorrhagic syndrome in severe cases
- Mixed bacterial flora
 - Gram +/-
- Combination broad-spectrum antibiotic therapy
- Route of delivery
 - IV or IM
 - If stable, switch to oral after initial IV/IM dose



Antibiotic therapy

- Broad spectrum antibiotics if secondary bacterial infection suspected
 - Doxycycline
 - Amoxicillin/clavulonic acid
 - Enrofloxacin + amoxicillin/clavulonic acid
 - Enrofloxacin + cefazolin or ampicillin
 - Amikacin in hydrated patients only



Nebulization and coupage

- Goals:
 - Hydrate
 - Loosen/expectorate secretions
- Promote expectoration
- Coupage q. 4-6 hours



Miscellaneous treatment

- Cooling measures?
 - If very elevated T → DIC
 - Stop cooling at T>103°F/39.4°C
- Analgesics
 - If painful, treat.
 - Be aware of respiratory depression and cough suppression w/ opioids
- No NSAIDS!
 - History of gastric ulcers, vomiting, etc
- One-time, anti-inflammatory dose of DexSP?
 - No. Viral!



Consider inhaled therapy?

- Metered-dose inhaler (MDI) with spacer and small face mask
- Quick therapeutic response
 - Increase time to patient comfort
 - Decrease hospitalization time
- Trudell Medical International, Canada
 - <http://www.trudellmed.com/animal-health/aerodawg>



Benefits: Inhaled Medications

- Albuterol (β -agonist)
 - Bronchodilation
- Fewer systemic side effects
 - Glucocorticoids
- Fluticasone propionate (Flovent*)
 - 220 mcg inhaler, chamber inhaler system





Summary of treatment recommendations

- Cough suppressants only if bacterial pneumonia is ruled out.
- Immediate isolation
- Low stress environment





Further diagnostics

- Frequent serial PE
- CBC
 - Left shift?
- Chemistry
- Chest radiographs
 - Bronchopneumonia
 - ARDS?
- Measures of oxygenation
- Arterial blood gas or pulse oximetry
- Transtracheal wash
 - Culture and sensitivity
- Testing to Cornell?





Further diagnostics

- Oral antibiotic therapy for 2-6 weeks
- Recheck serial radiographs
- Continue antibiotics 1-2 weeks past resolution of radiographic disease



Conclusion

- Educate owners appropriately
- Discuss preventative care
 - No doggy daycares
 - Minimize dog exposure
 - Vaccination?
- Recognize and treat appropriately

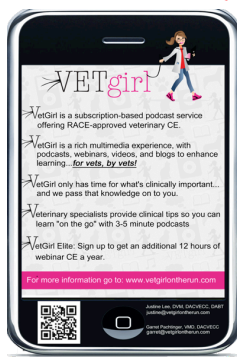


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