Canine Infectious Respiratory Disease Complex: Diagnosis & Treatment

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INTRODUCTION

Canine infectious respiratory disease complex (CIRDC) remains a persistent challenge for many shelters.

Goals:

• Identification & Recognition
• Treatment & Management
• PREVENTION
**PATHOGEN ROLES**

**Primary Pathogens:**
- *Bordetella bronchiseptica*
- Distemper
- Influenza (H3N8 & H3N2)
- *Strep equi subsp zoo*
- Parainfluenza
- Adenovirus type-2

**Unclear Role:**
- Respiratory Coronavirus
- *Mycoplasma spp.*
- Pneumovirus
- Herpesvirus-1
MULTIFACTORIAL ETIOLOGY

- Experimental infection with single pathogen typically causes mild clinical signs.
- Severe clinical disease seen in natural outbreaks cannot be reproduced.

*CDV is exception.

PATHOGENS:
- Viruses
- Bacteria

HUSBANDRY FACTORS:
- Crowding
- Stress
- Sanitation
- Ventilation/Air Quality
- Housing

HOST FACTORS:
- Age
- Immune State
- Depletion
- Stress

MULTIFACTORIAL ETIOLOGY
Sampled 61 CIRDC & 90 healthy dogs
- Paraflu, Distemper, Resp corona, Adeno-2, H3N8, Herpes, & Bordetella
- Both owned & shelter dogs

Paraflu, Resp corona, & Bordetella
- More frequently isolated in CIRDC dogs compared to healthy dogs
TAKE HOME POINTS:

- **Co-infections in**
  - 48% of *Brodetella* positive dogs
  - 83% of paraflu positive dogs
  - 100% of resp corona positive dogs

- **Healthy animals can be carriers**
  - 1% positive for adeno-2
  - 8% positive for paraflu
  - 46% positive for *Bordetella*

- **No pathogens found** in 9 CIRDC dogs
  - False negatives?
  - Pathogen not included in panel

- No pathogens found in 9 CIRDC dogs
  - 79% of CIRDC dogs had *Bordetella* - highest prevalence
*H3N2 - NOVEL VIRUS ➔ MOST EXPOSED DOGS BECOME CLINICAL

Clinical Signs 80%
Non-Clinical 20%
Exposed Dogs
Clinical Signs 80%
CIRDC CHARACTERISTICS
TRANSMISSION

Respiratory secretions

- Fomites — STAFF!
- Direct contact
- Aerosolization > 20 ft
- Environmental contamination
TYPICAL DISEASE COURSE

• Typical incubation period: 2-3 d, up to 14 d
  • Exception: distemper
  • Flu: short incubation period at 2-5 d

• Variable duration of illness
TYPICAL DISEASE COURSE

• Early shedding occurs for all pathogens → monitoring is critical

  • Shed for 7-10 days in respiratory secretions
    - H3N8 = sheds for 7 d post onset of clinical signs
  *H3N2 = some shelter dogs shedding up to 18 d post onset of clinical signs

• Pre-clinical & post-recovery shedding occurs but is greatly reduced once clinical signs resolve
DISEASE COURSE - DISTEMPER

Implications for:

• Controlling spread
• When to test
• What to advise adopters on
RECOGNITION & IDENTIFICATION
CLINICAL SIGNS

Typical: coughing, sneezing, nasal discharge, mild fever

**Distemper:**
Multi-systemic disease
Puppies & unvax adults
Not responding to tx

**Influenza:**
Any age
Any health status
Any vaccine status
Can affect lower resp tract

**Strep zoo:**
Can affect lower resp tract
Severe signs w/rapid onset

**GOALS:**
- Prompt disease recognition
- When to do additional diagnostics & what to do with the results
  - Identify the outliers as quickly as possible
  - Know when to get extra help
“Hello,
We've been hit hard here these last couple days. It broke on Wednesday, with only approximately 5 dogs needing to be isolated and treated. By Thursday morning at 8am, I had to quarantine an entire ward (approximately 30 dogs). All are exhibiting signs including the dry honking cough. All dogs are stable, but it has spread to the remainder of our canine population (totaling about 55 dogs).”
CLINICAL SIGNS

All CIRDC pathogens cause similar clinical signs
→ cannot diagnose based on signs
→ cannot always gage if an outlier is present

Clinical signs vary based on strain, host age/immune status, & co-infections
→ mildly clinical dog could be shedding a severe pathogen
WHY & WHEN TO DO DIAGNOSTIC TESTING

- Purpose: to target treatment & control measures
- Unusual clinical signs
- Increased morbidity/mortality
- During an outbreak
- Non-resolving signs in an individual animal
- More concerns/complaints from new owners/community vets
COMMON DIAGNOSTIC OPTIONS

PCR
Bacterial culture & sensitivity
Histopathology
Serology
- Indicates exposure not necessarily current infection
- Good for novel pathogen

Confirm that pathogen is on requested panel
WHO TO TEST

- Acutely affected (< 4 days of signs) & exposed dogs
- Prior to treatment
- Enough to reflect larger population
  - 10–30% of the population, at least 10
HOW TO PCR TEST

• Change PPE between dogs
• Individually wrapped swabs
• Swab 2 different sites & place into one red top tube
• Takes at least 3 people

http://sheltermedicine.vetmed.ufl.edu/shelter-services/tools-tips-fact-sheets/
REAL-TIME PCR PANEL

- Best for acute infections
- False negatives – transient/intermittent shedding
- False positives – recent MLV vx, contamination
- Must interpret in context of all info
  - Difficult to pinpoint single pathogen
  - Positive does not imply disease causation
  - Many pathogens found in healthy dogs
**H3N2 — Intermittent Shedding**

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DISTEMPER PCR

• High sensitivity
• False positives from recent MLV vax
• IDEXX will differentiate between vax & wild type strains
• Recombinant vx should NOT produce false positives

• Point-of-Care PCR available outside of U.S.
NECROPSY

- Can directly identify presence & role of pathogens
- Fresh, unfixed tissue submitted for PCR & culture/isolation
  - Obtain first before contamination
  - Refrigerate for bacteria, freeze for viruses
  - URT & lung samples
- Histopathology samples
  - Formalin (10:1, formalin:tissue)
  - Nasal sinus, trachea, lung, heart, hilar or thoracic inlet LNs
  - GI, liver, kidney, spleen if systemic disease

Chapter 7, Infectious Disease Management in Animal Shelters, Miller and Hurley
TREATMENT
PROMPT RECOGNITION & ISOLATION

• Move into isolation as soon as clinical signs seen
  ➔ Importance of staff training

• Intensity of shedding does NOT correlate with severity or duration of signs

• Who should be moved?
  • Any animal with clinical signs
  • Deadly pathogens can cause mild signs in some animals

• Isolation period = pathogen shedding period
H3N2 - PROLONGED SHEDDING →
REQUIRED PROLONGED ISOLATION

- Initial rec was 7 d isolation, then 14 d, but continued to see other dogs getting sick
- Shedding can continue for at least 18 d post onset of clinical signs (avg 12-13 d)
  - Viral load significantly decreases over time
  - Viability confirmed in long term shedder

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ISOLATION SPACE

- Separate building > same building, separate air flow > same building, restricted access (at least 25 ft distance)
- Easily disinfected with dedicated equipment
- Sufficient staffing for monitoring & care
- Ideally, separate staff w/ PPE
  - Full length gowns, booties, gloves
  - Change clothes after handling affected animals
TREATMENT RECOMMENDATIONS

Isolate

Antibiotic use is shelter, animal, & severity dependent
TREATMENT - PHARMACEUTICALS

Doxycycline 10mg/kg PO SID x 7-10 d

- Best first choice antibiotic for run-of-the-mill CIRDC
SUPPORTIVE CARE

Generally not recommended in shelter:

- Glucocorticoids
- Antitussives
- Anti-virals
- Convenia*

→ however in an adopted or foster home, consider specific supportive treatment
TREATMENT — PRIMARY VS. SECONDARY BACTERIAL INFECTIONS

• Consider risk of bacterial bronchopneumonia
  • Ie. young puppies more at risk of progressive disease
  • If others have progressed to pneumonia

• Best choice for *Bordetella* is often different than best choice for secondary invaders
  • Antibiotic resistance is a reality → culture & sensitivity
    • Non-responsive to treatment (signs persist > 7-10d)
    • Outbreak
    • Okay to combine -static w/ -cidal drug
    • Partially suppressed distemper?

• Severe pneumonia → parenteral combination of a fluoroquinolone and a penicillin or clindamycin
  • Nebulization (+/- aminoglycoside)
  • Supplemental oxygen
TREATMENT COURSE

- Use effective drugs at appropriate doses
- Choose realistic dosing schedules
- Start & stop treatment promptly
- Re-evaluate treatment consistently
- When switching, consider antibiotic spectrum
- Monitor daily
- Use shelter software to track
TREATMENT — MONITORING

- Record daily signs
- Better or worse
- Importance of initializing
TREATMENT — PREVENT COUGHING

• Maximize outdoor exposure
• Minimize irritants
• Minimize barking/excitement
• Minimize leash pulling
TREATMENT – FOSTERING FOR MILD DISEASE

Requires disease transmission training

Designated area
- Separated from other pets
- Pets with rock-solid vaccination hx
- Good ventilation
- Calm, low traffic
- Easily disinfected
- Dedicated supplies
OUTBREAK RESPONSE
OUTBREAK RESPONSE

• Prompt isolation of sick dogs
  → reduces infectious dose in environment

• Clean break for un-exposed animals

• Consider points of common contact

• Communication
CIRDC OUTBREAK RESPONSE - CASE STUDY

- Municipal shelter

- How many dogs to PCR test?
  - When to test?
  - Test nonclinical dogs?
- Implement Bordetella vaccine? If so, which one?
- How to make a clean break?
CASE STUDY — RISK FACTORS

- Increased length of stay
- Over capacity; not using housing appropriately
- Not isolating clinical dogs
- Not using mucosal *Bordetella* or paraflu vaccine
- Not DHPP vaccinating unhandleable dogs on intake
CASE STUDY — ISOLATION & BIOSECURITY

- Designated multiple iso wards to separate affected dogs
- Doggy tetris = started moving all clinical dogs into “iso” wards
Case Study — Diagnostics:

Positive results:

2 — CRCoV

All 10 — Mycoplasma

5 — Pneumovirus
CASE STUDY — TREATMENT

- Started intranasal Bordetella, CPIV, CAV-2 vaccine
- Started doxycycline as soon as first signs are seen
- Switched to enrofloxacin after PCR results returned
CASE STUDY - COMMUNICATION

- Staff compliance - challenge
- Staff, volunteers, local practitioners, adopters
CASE STUDY-CHANGES MADE

Cont. to use Accel; new focus on drying surfaces

Sent home CIRDC info sheets

Allowed mild CIRDC cases to be adopted with surgical waiver; must make sx appt before leaving with new pet

Started a CIRDC foster program

Realization that response must be multifactorial
RESOURCES:

www.sheltermedicine.com
www.sheltermedicine.vetmed.ufl.edu
www.animalsheltering.org
www.maddiesinstitute.org
www.sheltervet.org
www.aspcapro.org
REFERENCES


Crawford C. “Canine Respiratory Infections in Animal Shelters”


REFERENCES

- Sykes JE. “Canine and Feline Infectious Diseases” 2013
THANK YOU!!

QUESTIONS?

mcaziz@ucdavis.edu
CANINE INFLUENZA (H3N2)
H3N2 - EPIDEMIOLOGY

2006-2007 emergence in Korea, China, Thailand
  - Direct transfer from avian influenza likely

Korean reports of clinical signs and mortality in cats

No zoonosis reported
H3N2 - CHICAGO OUTBREAK

First cases identified in homes

Risk factors
• Doggie daycare
• Boarding

Initial respiratory panels = false negatives

UW & Cornell used broader primers to discover H3N2

IDEXX retrospective study on 884 submissions from March 2015
• 63 (7.1%) positive for H3N2
• 59 cases from Chicago area & 1 from each: IN, MI, WI, CA

Origin?
• Although rumors have circulated that the virus was introduced to the U.S. through dogs rescued and imported from Asia, there is no evidence to confirm these rumors. - AVMA
Emerging Disease Monitoring: Canine Influenza Virus (H3N2)
AHDC Testing Data Summary
March 13 – May 22, 2015

[Map showing state-by-state testing data for Canine Influenza Virus (H3N2)]

1. Labels indicate number of CIV-positive results / total number of tests performed by the AHDC.
H3N2 – SHELTER OUTBREAK CHARACTERISTICS

Novel virus → most exposed dogs become clinical

Clinical signs

- Honking cough
- Mostly mild to moderate respiratory signs
  - Some progression to pneumonia
  - Handful of deaths

No cats clinically affected so far

80% Clinical Signs
20% Non-Clinical

Exposed Dogs
H3N2 — SHELTER OUTBREAK CHARACTERISTICS

Risk Factors:
- Early on: sharing adoption/training center with public animals
- Later on: bringing in community dogs

Identification
- Higher rate of CIRDC
- Slightly more severe signs
- Spread of CIRDC very quickly (2-4 days) $\rightarrow$ tidal wave

Incubation period: typically 2-4

Shedding period: up to 18 days?
- Weak positives early and late in disease course (diff from H3N8)
“Hello,
We've been hit hard here these last couple days. It broke on Wednesday, with only approximately 5 dogs needing to be isolated and treated. By Thursday morning at 8am, I had to quarantine an entire ward (approximately 30 dogs). All are exhibiting signs including the dry honking cough. All dogs are stable, but it has spread to the remainder of our canine population (totaling about 55 dogs).”
H3N2 - SHEDDING

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  - Shedding can continue for at least 18 days post clinical signs’ onset
  - Viral load significantly decreases over time
    - Intermittent shedding
  - Currently testing for viability
H3N2 - TESTING

Acutely affected (<5 days)
Cornell, UW, or IDEXX
  - WVDL = same day turn around, $33/test for shelters
  - Cornell + UW = place swabs into red top tube w/ 1mL saline

H3N2 positives average of 12-13 days

Not yet recommended to test in non-endemic areas even if dogs have CIRDC signs

In endemic area, yet unaffected still ➔ periodic surveillance
H3N2 - PREVENTION

Sanitation
• Most disinfectants kill flu virus on surfaces
• Shorted lived, reportedly:
  • 48 hours on surfaces
  • 24 hours on fabric
  • 12 hours on hands

Prompt recognition
Isolation
Divert intake when possible
  → Reduce exposure
Responsible movement of animals
H3N2 — VACCINATION?

Commercially available: H3N8 killed vaccine

Anecdotal: handful of dogs that had been vaccinated against H3N8 have become ill with H3N2

Disadvantages:
- Unclear of cross immunity
- Killed vaccine ➔ longer time to onset of immunity
- Cost
H3N2 — IMPACT ON SHELTERS

Very difficult to prevent - readily transmitted in shelter despite good biosecurity

Huge scale (200 dogs affected at one time in CACC)

Stopped live releases

Canceled fundraisers

Canceled community outreach

PetSmart Charities rerouted transfer ins

Exposure to staff pets
H3N2 - ADOPTION/RESCUE RECS

Clinically healthy/exposed from affected facility
- Okay to release from shelter
- Quarantine/separate for 7 days at least

Clinically ill from affected area/shelter
- Okay to release from shelter
- Isolate away from other dogs for 21 days from onset of clinical signs
  - Or two negative PCR tests since
- Do not travel to unaffected areas for 21 days (do not cross state line without a vet cert)
H3N2 — ALTERNATIVES FOR BREAKING THE CYCLE

1. Divert intake completely
   - No new intakes that can be exposed or can expose existent population

2. Establish a clean break
   - PAWS: Newly intaken dogs are on a completely separate pathway
     - Sick dogs upstairs
     - New dogs on 1st floor

3. House new intakes with fully dogs that have fully recovered (21 days since onset of signs)