Canine Infectious Respiratory Disease Complex

Using What We Know

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A Preview:
Where are we going?

What we know.
– Pathogenesis
– Infectious Agents
– Transmission

How to use it.
– *Prevention!*
  – Vaccination
  – Population Management
  – Sanitation
  – and Treatment
Case Definition: What do we mean when we say “kennel cough”?

- Shelter cough
- Infectious tracheobronchitis
- Pneumonia
- Systemic Disease?
Clinical Signs

- Cough
- **Nasal discharge**
- Vomiting*
- Sneezing
- Fever
- Anorexia (not eating)
- Dehydration
- Depression / lethargy
- Difficulty breathing (dyspnea)
- Others…..
How often do you see it?

Always

Commonly

Rarely
Pathogenesis and Infectious Agents
Canine Infectious Respiratory Disease Complex

- Infectious Canine Tracheobronchitis
  - (aka Kennel Cough)
- Canine Distemper
- Canine Influenza
How does it happen?
Canine Infectious Respiratory Disease Complex (CIRDC)

**Bacteria:**
- *Bordetella*
- *Mycoplasma*
- *Streptococcus?*
- Secondary invaders

**Viruses:**
- *Distemper*
- *Influenza*
- *Parainfluenza*
- *Adenovirus*
- *Coronavirus*
- *Herpesvirus*

**Husbandry**
- Crowding
- Stress
- Incomplete disinfection
- Failure to isolate
- Poor air quality, airway irritation

**Synergy**
Clinical Signs

• *Bordetella* (ITB)
  – “Kennel cough” and nasal discharge
  – Partially responsive to antibiotics?

• Distemper
  – “Kennel cough” and nasal discharge
  ± Progression to neurological signs
  ± Gastrointestinal, lower respiratory, systemic signs

• Canine Influenza
  – “Kennel cough” and nasal discharge
  – Unusually high number affected
  ± More severe disease
  ± Hemorrhagic pneumonia
Less common causes of canine respiratory disease

• Heartworm
• Heart failure
• Neoplasia
• Fungal pneumonia
• Pulmonary Parasite Migration
Clinical presentation can have as much to do with host response as pathogen virulence
Who is likely to be affected?

- *Bordetella*
  - Any age
  - Kennel history?
  - Vaccinates less than non-vaccinates?
- Distemper
  - Puppies
  - Unvaccinated adults
- Canine Influenza
  - Any age
  - Any vaccine status
  - *Any health status*
**Incubation**

- **Bordetella**
  - 3-10 days from exposure to clinical signs

- **Canine Influenza**
  - 2-5 days from exposure to clinical signs

- **Distemper**
  - Fever spike 3-6 days post-infection
  - Clinical signs 1-4+ weeks post-infection
  - CNS signs up to 3 months later
  - With or without previous signs
Post-recovery Shedding

- *Bordetella*
  - Infectious risk reduced greatly after resolution of coughing and discharge
  - Up to 90 days (3 months)

- Canine Influenza
  - Up to 7 days post-infection

- Distemper
  - Asymptomatic or mildly affected animals
  - Up to 90 days (3 months) post-recovery
  - Usually < 60 days (< 2 months)
Implications for Reintroduction

- Potential for vicious cycle
- Consider dose effect
- Separate recovered animals if possible
- Adoptions??
Zoonosis?

- Adenovirus
- **Bordetella**
- Distemper
- Canine Influenza
The most environmentally persistent?

- Adenovirus
- Bordetella
- Distemper
- Canine Influenza
Transmission
IRDC Transmission

- Understanding transmission is key to prevention
- Direct Contact
- Fomites***
- Aerosol**
- Environmental contamination
Fomites: Why transmission might seem aerosol.

- HANDS!!!
- Clothing
- Hair on clothes
- Shoes
- VSCV outbreak
- Panleukopenia outbreaks
- even cat litter
Canine RDC Transmission

- Direct contact
- Fomite
- Aerosol transmission IS a reality
  - 20 ft range*
- Environment

*Max Appel, Cornell University, 2006
CDV

- CDV infected animals must be in the shelter to infect other animals.

- Environmental contamination is not a major source of CDV because the virus is very labile.
  (if good disinfection practices are followed)
Canine Transmission
Summary Points

• Isolation and separation are essential for control

• Infected dogs pose a risk to other dogs in the area
Diagnosis

- When?
- Outbreaks
- Unusual presentations
- Unusually severe disease
- Non-resolving signs in an individual animal

- After (or in tandem with) resolving husbandry issues
Disease Detection

• Know your enemies

• Early detection critical tool to control transmission

• Whenever possible, prevent post-adoption heartache
Incidence Tracking

- Recognize level and source of disease
- Evaluate current or new protocols
- Recognize and respond to problems
- Track severity and outcome
- Track treatment success and investment
Prevention
Prevention Toolbox

- Support host response
  - Vaccination
  - Stress reduction
  - Airway health
- Lower the dose
  - Sanitation
  - Population segregation
  - Air quality
Vaccination
Vaccine Available?

- Parainfluenza
- Influenza
- Mycoplasma
- Bordetella
- Coronavirus, Adenovirus
- Herpesvirus
- Distemper
- Streptococcus
Optimizing Vaccination

• Choose effective products against all pathogens of concern (if available)
  – Undermine synergy of pathogens
• Optimal route (IN versus SC)?
• Correct timing (maximum and minimum interval prior to admission)
  – Maximum = duration of protection
  – Minimum = onset to protection
• Realize puppies may not be fully protected
Herd Immunity?

- Starts in the community

- Shelter attempts to safeguard at intake

- Most important for distemper (parvo and panleuk too!)
Kennel Cough Vaccine Options

• **Intranasal (IN)** - monovalent, bivalent, or trivalent
  – Monovalent (Bb)
  – Bivalent (Bb + CPIV)
  – Trivalent (Bb + CPIV + CAV-2)
  – Modified live

• **Injectable (SC)** - inactivated (cellular antigen extract, CAe)
IN vs. SC: IgA Response

Days Post Vaccination

- Intra-Trac
- Bronchicine Cae
- Placebo

IN vs. SC: Cough Score

- Intra-Trac: 1.3
- Bronchicine CAe: 8.8
- Placebo: 6.6

Mean Cough Score
<table>
<thead>
<tr>
<th></th>
<th><strong>Intranasal</strong></th>
<th><strong>Subcutaneous</strong></th>
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</thead>
<tbody>
<tr>
<td>Only 1 dose needed</td>
<td>Easier administration</td>
<td></td>
</tr>
<tr>
<td>Rapid onset of immunity</td>
<td>Reversion to virulence impossible</td>
<td></td>
</tr>
<tr>
<td>Safe &amp; effective in young animals</td>
<td>Monovalent only</td>
<td></td>
</tr>
<tr>
<td>Herd immunity possible</td>
<td>Slow onset of immunity</td>
<td></td>
</tr>
<tr>
<td>Published 1 yr DOI data</td>
<td>No DOI data published</td>
<td></td>
</tr>
<tr>
<td>Post-vaccinal cough possible</td>
<td>Booster required in naïve dogs</td>
<td></td>
</tr>
<tr>
<td>NEVER give by injection!</td>
<td>No efficacy data for current product</td>
<td></td>
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</tbody>
</table>
Which “Kennel Cough” Vaccine?

- IN vaccine does a better job of producing IgA and IgG
- IN vaccine more effectively reduces bacterial shedding and clinical signs
- SC vaccine may be necessary if IN cannot be administered
  - unruly dogs or staff
- No vaccine can completely prevent infection
Vaccination: CDV

• Injectable, modified-live or recombinant
• Very effective
  – Nearly immediate protection in the absence of MDA
• CDV re-emerging in some areas
  – Know your local shelters

Some good news!
Canine Influenza Vaccine

- No commercial vaccine available
- Equine influenza vaccine neither effective nor recommended
- Stay tuned…
Why does CIRDC occur in the face of vaccination?

- Vaccine timing, handling or administration
- Exposure before vaccination
- Massive exposure (dose)
- Overwhelming predisposing factors
- Pathogen not contained in vaccine
- Rarely, vaccine resistant pathogen
Dose Reduction
Dose effect

- Greater likelihood of infection
- Shorter time to onset
  - Less chance for vaccine to protect
- More severe disease
Dose effect

• Increased chances for disease introduction
• Increased contact rate
• Reduced quality of care
  – Housing
  – Husbandry
• Decreased customer service
• Decreased public outreach
Crowd Control

- CROWDING and stress
  - “Some in – some out” housing
- Symptomatic animals not isolated
- Poor sanitation
- Animals not vaccinated on intake
- Mixing of species
- Widespread antibiotic use
Cleaning and Disinfection
Disinfection: break the transmission cycle

• Environment
  – Add parvocidal disinfectant
  – Apply degreaser as needed
  – Limit use of outdoor area during outbreak
  – Dry runs completely
• Fomite
  – That dang mop
  – Staff?
• Aerosol
  – But don’t despair
Prophylactic Sanitation

- Efficient housing in good repair
- Effective products
- Prevent fomite spread
- Clean when & where it counts
  - *Between* animal occupants
  - High-contact surfaces
- Dry surfaces thoroughly
Yes, please

Hose-end foamer preferable to mop whenever possible
Where do I put the dog?

• Guillotine doors
• Move down one procedure
• Avoid common holding areas
• Avoid tie outs
Other environmental management strategies...

Population Management
Prevention - Segregation

• Health check for all *at intake, before cleaning, and several times daily*

• House higher risk and sick dogs separately
  – Recent rescue, transfer, travel, recovery from illness
  – Ideally separate air spaces
  – At least, clear visual separation
  – Separate equipment
  – Handle and walk after lower risk dogs

• Minimize cross contamination with other facilities
Remember Me?
Kennel Stocking
What we can learn from dairy science

- Social Structure
- Stocking patterns
- Stocking Density
- All effect animal health
A bovine behavioral argument for all in all out kennel housing...
Stabilization of social hierarchy

- Two groups of 16 cows established (A & B)
- After 5 weeks, 8 cows from each to a third group (C)
- Monitored number and character of agonistic interactions
  - Physical: Bunting, pushing, fighting
  - Non-physical: Threatening, avoidance

Number of agonistic interactions
Character of agonistic interactions

Physical
Non-physical
Social turmoil profile of a pen

etc.....
And now, back to the shelter!
Social Turmoil
All in / All out
Intervention
Treatment Considerations

Who are you treating?
– One dog or many?

Where are you treating?
• In a home or in a kennel?
• Isolation facilities?

What are you treating?
• Environment and animals
• Which pathogens?
Treatment: A Single Antibiotic Effective Against CIRDC?

Viral pathogens

No one drug does it.

Antibiotic resistance

Getting the drug to the bug
Treatment Options

- Consider risk of bacterial bronchopneumonia
- Antibiotic resistance is a reality
- Best choice for *Bordetella* often different than best choice for secondary invaders
- Culture and sensitivity
  - non-responsive to treatment
  - outbreak
Additional Treatment Considerations

- **For sure:**
  - Supportive care
  - Minimize barking, walk on harness

- **Definitely not:**
  - Narcotic antitussives in the face of pneumonia
  - Human anti-viral therapy

- **Maybe:**
  - Glucocorticoids
  - Over-the-counter antitussives/expectorants
    - Probably ineffective
  - Nebulization +/- antibiotics
    - Usually not necessary
Adoptions?
Pre, Post or Mid-Treatment Adoptions?

- “We wait until the dog has gotten past the critical symptom period, usually 2-3 wks and treat them while in the facility.”

- “For dogs that start showing signs waiting to be adopted, we either treat them in iso or in foster care, so they're not really available for adoption until they're well again.”

- “We will even have photos of our isolated Kennel Cough dogs so that they can find homes.”
Pre, Post or Mid-Treatment Adoptions?

• “Medication is dispensed with the adopted dog and adopters are advised of the contagious nature of the disease regarding exposure to other dogs i.e. the neighbors animals, dog parks etc.”

• “I will alter them and send them home with meds rather than euthanize them or not alter them at all.”

• “Standard kennel cough dogs that are otherwise BAR are sent home with initial meds. Anything that looks atypical or is sicker we would keep here until condition is resolving.”

• “We send our kennel cough dogs home with meds. We would often not get any dogs out of here otherwise!”
Pre, Post or Mid-Treatment Adoptions?

• “Our worst cases usually are those who never catch it in shelter, but then get sick at home and those can be pretty profound sometimes. And area vets usually think it is distemper.”
Don’t Forget Communication

- Adopters!
- Veterinarians
- Shelters
- Rescues
- Owners
- Media?
The Bottom Line(s)

• A multi-faceted approach is needed for a complex disease

• An ounce of prevention is still worth a pound of cure, and maybe more
Thanks for all you do!

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