Canine Infectious Respiratory Disease Complex

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KORET SHELTER MEDICINE PROGRAM

INTRODUCTION

Canine infectious respiratory disease complex **(CIRDC)** is a persistent challenge for many shelters

Goals

- **Treatment & Management**
- **Identification & Recognition**
- **PREVENTION**

TERMINOLOGY

- “Kennel cough”
- “Infectious tracheobronchitis”
- “Canine Infectious Respiratory Disease Complex”
- “Upper Respiratory Infection”

What is it exactly?

EPIDEMIOLOGY OF CIRDC

- May be endemic in high density dog housing populations
  - Shelters
  - Breeding facilities
  - Commercial dog colonies
  - Owned animals

Why is it more commonly seen in some shelters and not others?

PATHOGENS

VIRAL PATHOGENS:

Canine distemper (CDV)
Canine parainfluenza (CPiV)
Canine adenovirus-2 (CAV-2)
Canine respiratory coronavirus (CRCoV)
Canine influenza virus (CIV)
Pneumovirus (CnPnV)
Canine herpesvirus (CHV-1)

BACTERIAL PATHOGENS:

Bordetella bronchiseptica

Mycoplasma spp.

Streptococcus equi subsp *zooepidemicus*

PATHOGEN ROLES

Primary Pathogens:

- *Bordetella*
- Parainfluenza
- Adenovirus type-2
- Influenza (H3N8)
- *Strep equi* subsp *zoo*
- Distemper

Unclear Role:

- Respiratory Coronavirus
- *Mycoplasma*
- Pneumovirus
- Herpesvirus-1

MULTIFACTORIAL ETIOLOGY

PATHOGENS:
VIRUSES
BACTERIA

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

*CDV is exception

STRESS

HOUSING

TRANSMISSION

- Respiratory secretions
  - Fomites – STAFF!
  - Direct contact
  - Aerosolization > 20 ft
  - Environmental contamination

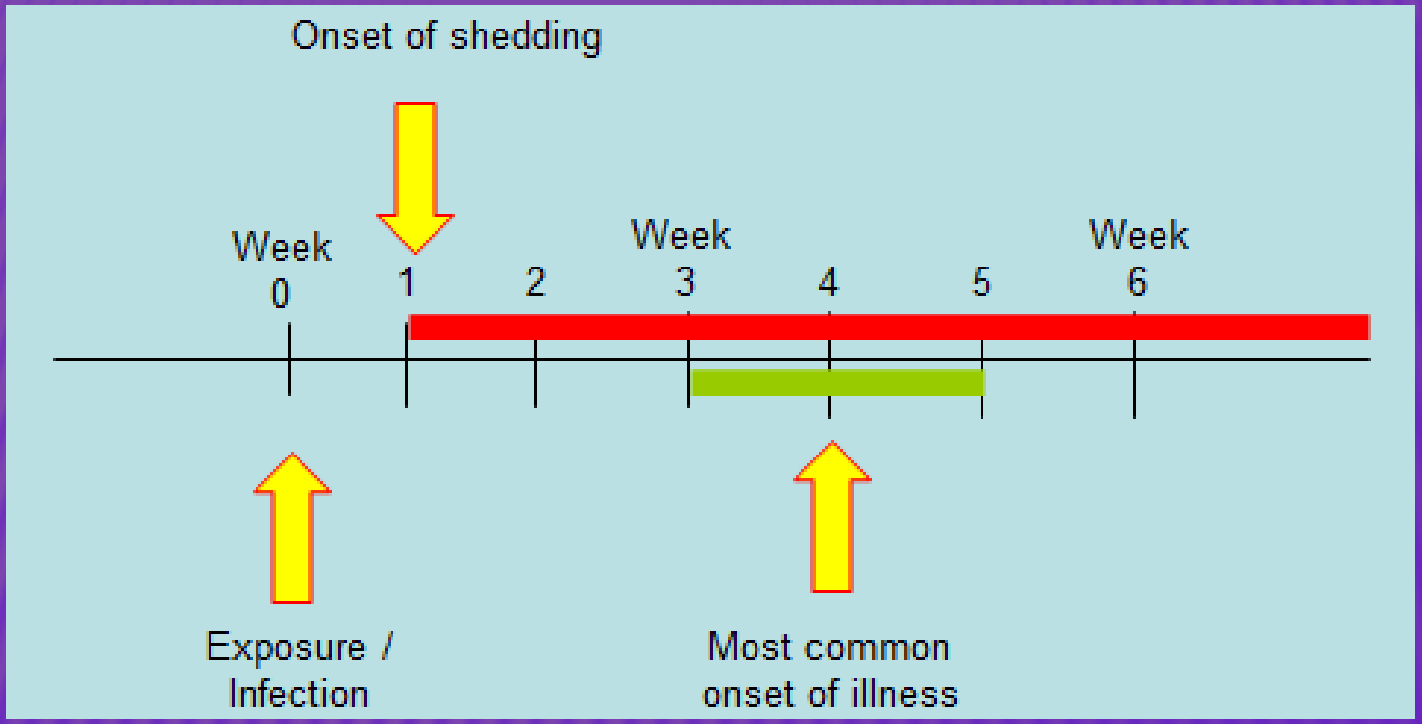
TYPICAL DISEASE COURSE

- Incubation period–typically 2-3 d & up to 14 d
  - Most are only a few days except CDV
  - CIV: short incubation period at 2-5 days
- Variable duration of illness

TYPICAL DISEASE COURSE

- Early shedding occurs for all → monitoring is critical
- Shed for 7-10 days in respiratory secretions
- Post-recovery shedding occurs but is greatly reduced once clinical signs resolve

DISEASE COURSE - DISTEMPER



CDV Disease Course

PATHOGEN CHARACTERISTICS

VIRUS	Incubation Period	Preclinical shedding	Duration of shedding	Subclinical infection	Persistent infection[1]
CRCoV	< 1 week	Yes	2 weeks	Yes	No
CIV	2-4 days	Yes	7-10 days	Yes	No
CHV	< 1 week	Yes	2 weeks	Yes	Yes
CPIV	< 1 week	Yes	1 week	Yes	No
CAV-2	≤ 1 week	Yes	1 week	Yes	No
CDV	1-3 weeks	Yes	< 1 month	Yes	No

BACTERIA	Incubation Period	Preclinical shedding	Duration of shedding	Subclinical infection	Persistent infection
Mycoplasma spp.	1-4 weeks	Yes	Several weeks	Yes	Up to 3 weeks in lung tissue[2]
Bordetella bronchiseptica	3-10 days	Yes	Several weeks	Yes	Recovered up to 14 weeks after clinical signs resolved[3]
Streptococcus zooepidemicus	1-3 weeks	Yes	1-2 weeks[4]	Yes	Possible (seen in other species)

Source: Zoetis Tech Bulletin on CIRDC

Recognition & Identification

RECOGNITION & IDENTIFICATION

Typical: coughing, sneezing, nasal discharge, mild fever

Distemper:

Multi-systemic disease
Puppies
Unvaccinated adults

Influenza H3N8:

Any age
Any health status
Any vaccine status
Can affect lower resp tract

Strep zoo:

Can affect lower resp tract
Severe signs with 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

RECOGNITION & IDENTIFICATION

- All CIRDC pathogens cause similar clinical signs → cannot diagnose based on signs
- Clinical signs vary based on strain, host age/immune status, & co-infections

HOW DO YOU TRACK DISEASE?

- Ideal: computer software disease tracking
- In addition or alternatives:
  - Daily rounds
  - Increased medication ordering/prescribing
  - Increased post-adoption concerns from adopters or local vets
  - Report on # of dogs in isolation weekly

WHY & WHEN TO DO DIAGNOSTIC TESTING

- Purpose: to target treatment & control measures

- Unusual clinical signs
- Increased mortality
- During an outbreak
- Non-resolving signs in an individual animal

AVAILABLE DIAGNOSTIC OPTIONS

- PCR, virus isolation, bacterial culture & sensitivity, ELISA, serology, immunofluorescence & immunohistochemistry, histopathology

- Confirm that pathogen is on requested panel

WHO & HOW TO TEST

- **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 test - PCR**
- Change gloves between dogs
- Individually wrapped swabs
- Swab 2 different sites & place into one red top tube

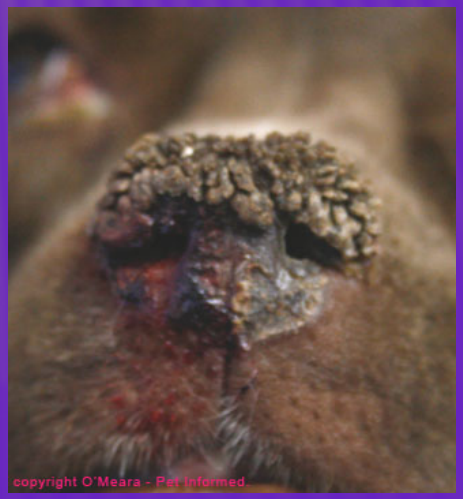
http://sheltermedicine.vetmed.ufl.edu/shelter-services/tools-tips-fact-sheets/

REAL-TIME PCR PANEL

- Best for acute infections
- False negatives – transient shedding
- False positives – recent MLV vx, contamination
- Overlapping clinical signs → difficult to pinpoint single pathogen
- Does NOT imply disease causation
- Many CIRDC pathogens are found in healthy animals

DISTEMPER PCR

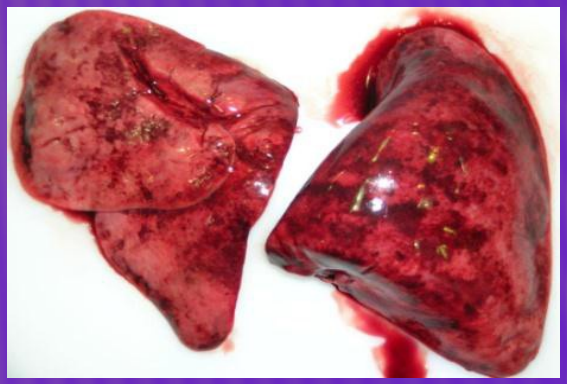
- Many shelter dogs are NOT protected on intake
- PCR for CDV
  - High sensitivity
  - False positives from recent MLV vx
  - IDEXX will differentiate between vaccine & wild type strains
  - Recombinant vx should NOT produce false positives
- Point-of-Care PCR for distemper?
  - + Benefit of fast turn around time
  - + Accuracy?
  - + Cost effectiveness?
  - + Ease of use?



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
  - Nasal sinus, trachea, lung, heart, hilar or thoracic inlet LNs
  - GI, liver, kidney, spleen if systemic disease
  - Formalin (9:1, formalin : tissue)

RISK FACTORS + PREVENTION

WHAT DETERMINES CAPACITY

Capacity for Care is based on the ability to provide the five freedoms

CAPACITY FOR CARE (C4C)

Capacity for Care = Capacity to Provide the Five Freedoms

Freedom from hunger and thirst

Freedom from discomfort

Freedom from pain, injury, and disease

Freedom to express normal behaviors

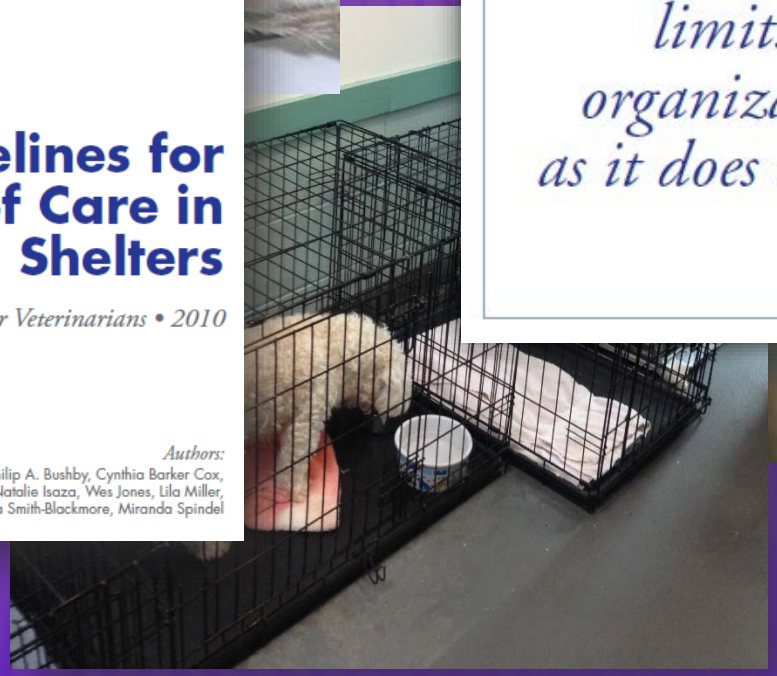
Freedom from fear and distress

What happens if you go beyond your C4C?

Guidelines for Standards of Care in Animal Shelters

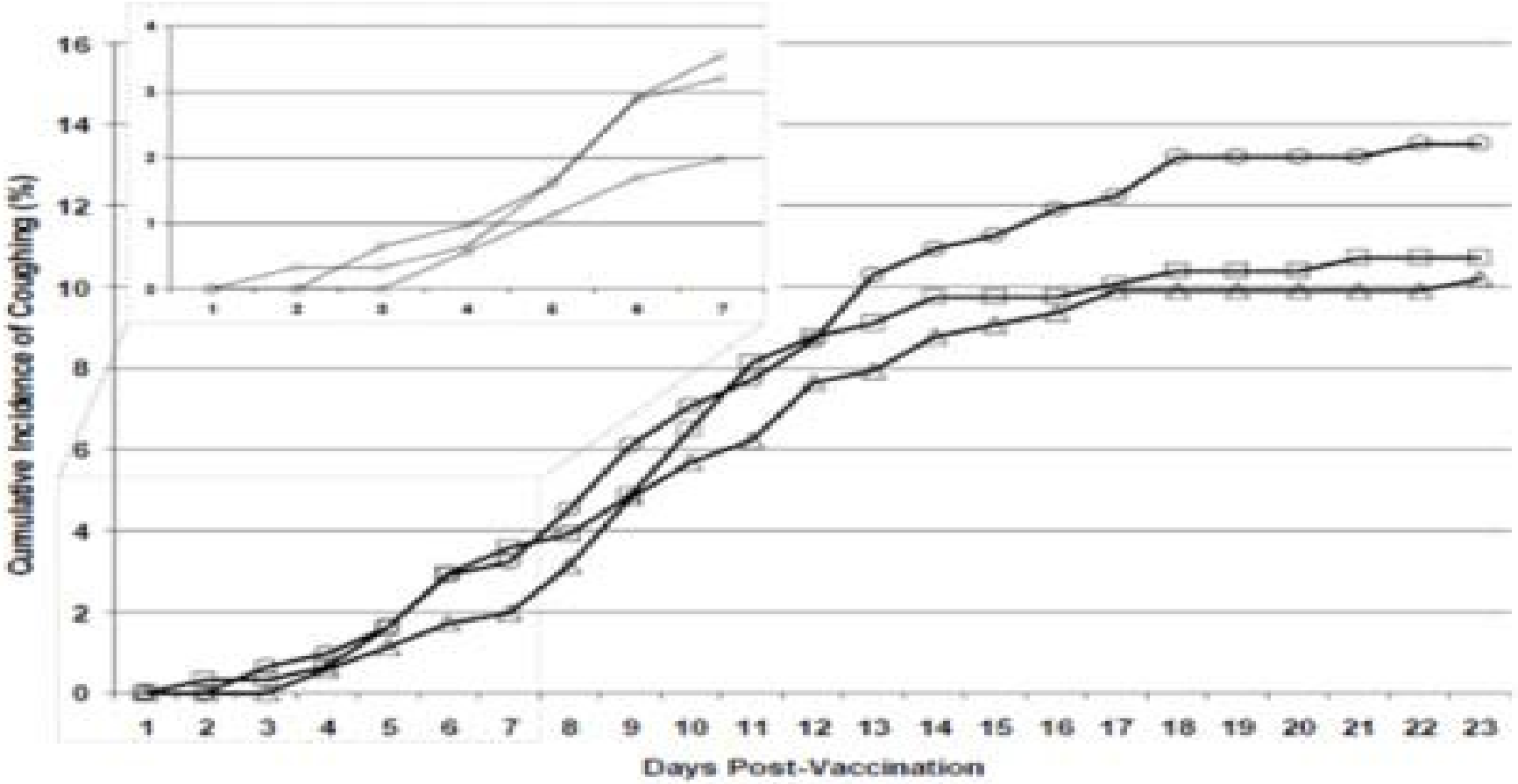
The Association of Shelter Veterinarians • 2010

Authors:
Sandra Newbury, Mary K. Blinn, Philip A. Bushby, Cynthia Barker Cox, Julie D. Dinnage, Brenda Griffin, Kate F. Hurley, Natalie Isaza, Wes Jones, Lila Miller, Jeanette O'Quin, Gary J. Patronek, Martha Smith-Blackmore, Miranda Spindel



Capacity to provide humane care has limits for every organization, just as it does in private homes.

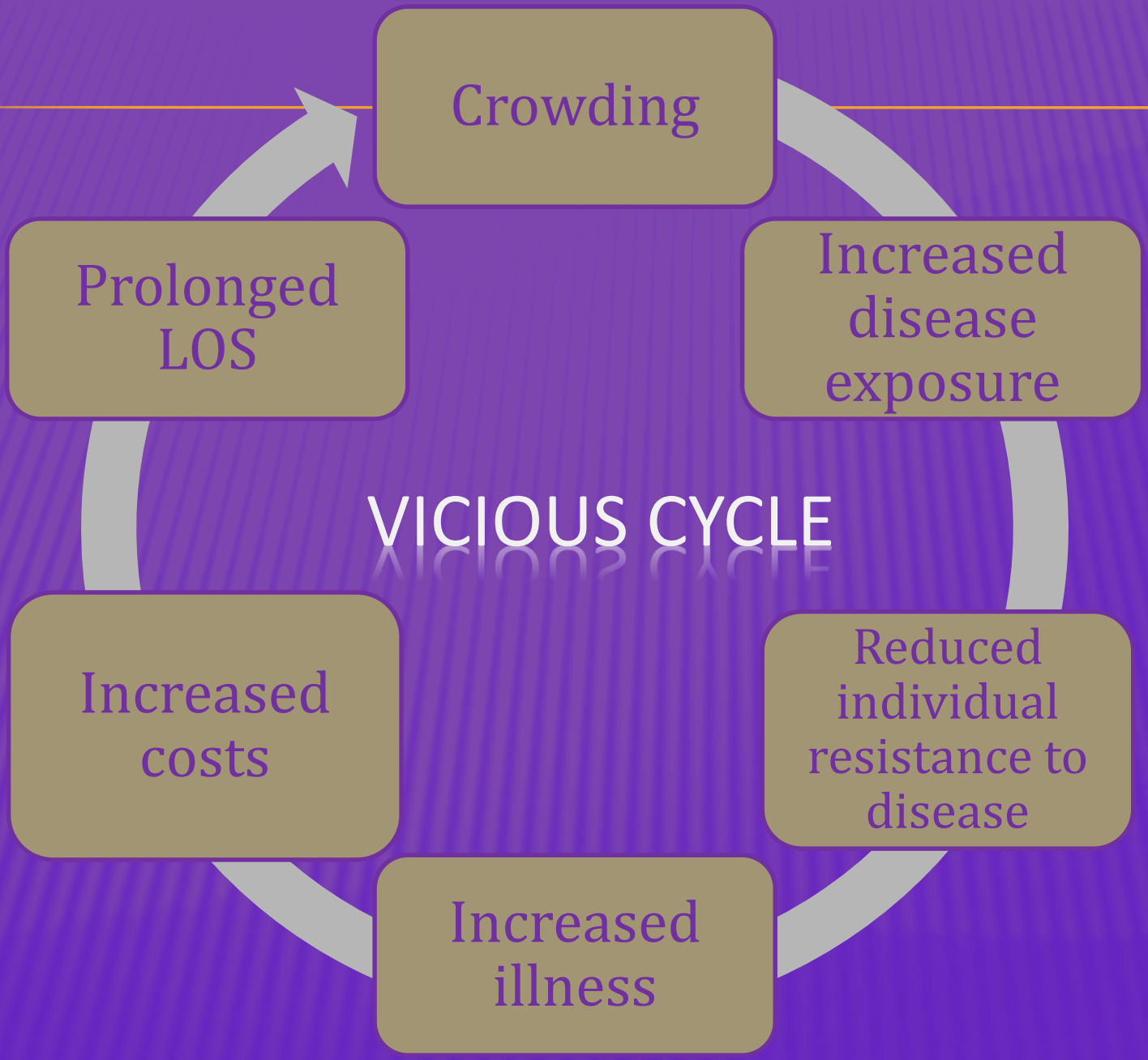
LOS AS A RISK FACTOR FOR CIRDC



CROWDING AS A RISK FACTOR

- Crowding is often associated with increased LOS &….
  - Increased stress
  - Increased contact rates
  - Increased infectious dose
  - Delayed recognition/isolation of sick animals
  - Compromised sanitation & air quality
  - Animals not vaccinated on intake
  - Random co-mingling
  - Inappropriate use of housing

VICIOUS CYCLE



STRESS AS A RISK FACTOR

+ Inappropriate housing
+ Noise
+ Inability to express normal behaviors
+ Transport
+ Diet changes
+ Novel situation/environment

→ Induction of immunosuppression

→ Increased viral shedding rates

PREVENTION

- Prevent Crowding
- Vaccination
- Housing
- Prompt Disease Recognition
- Air Quality
- Cleaning/ Disinfection
- Stress Reduction
- Barking Reduction

PREVENTING CROWDING

- Refer to Drs. Karsten & Bodner's talk "Understanding Capacity for Care "
- Additional resources:

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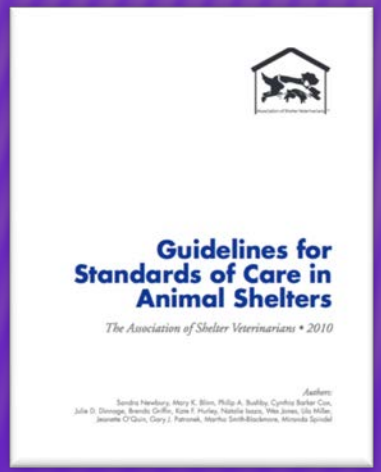


ASPCA
WE ARE THEIR VOICE
ASPCApro.org

MILLION CAT CHALLENGE

APPROPRIATE USE OF HOUSING

- Double-compartment kennels with singly housed dog
- Design: partitions, drains, easy to clean, barrier reactivity

LOW COST ALTERNATIVES

Inexpensive PCV roofing panels as kennel barriers

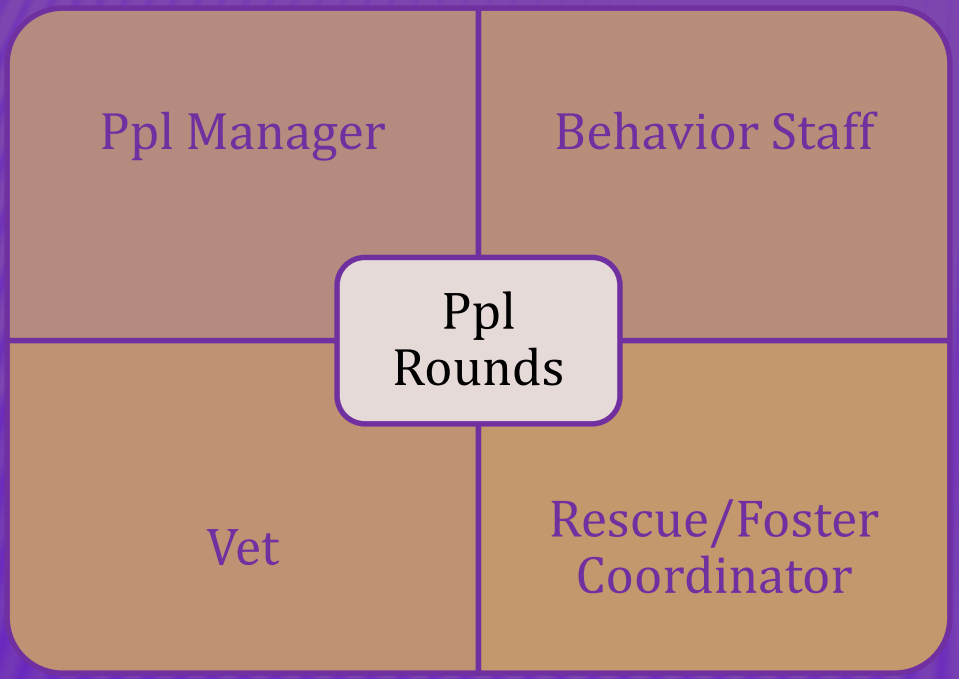
HOUSING CONSIDERATIONS

- Housing arrangements are shelter-dependent
- Factors to consider:
  - Staffing capacity
  - Staff training
  - Level & compliance of biosecurity protocols
  - Population dynamics – LOS, short vs. long-term, daily in-shelter population
  - Human & animal flow

PROMPT RECOGNITION & ISOLATION

- Move into isolation as soon as clinical signs seen
- Intensity of shedding does NOT correlate with severity or duration of signs
- Who should be moved?
  - Any animal with clinical signs
  - Remember: deadly pathogens can cause mild signs in some animals
- Importance of staff training
- Isolation
  - Ideally separate ventilation
  - At least 25 ft
  - Dedicated supplies

DAILY ROUNDS – POPULATION & HEALTH



Who are you?

How are you doing?

Are you where you should be?

Why are you still here?

What can we do to move you through?

EFFICIENT ROUNDS

Yolo County Sheriff-Animal Services

Animal ID: A121571

NO NAME
TOTAL: 1
Intake Date: 01/27/14 11:49
Where Found / Why Surrendered: WILLOW AVE/ASH

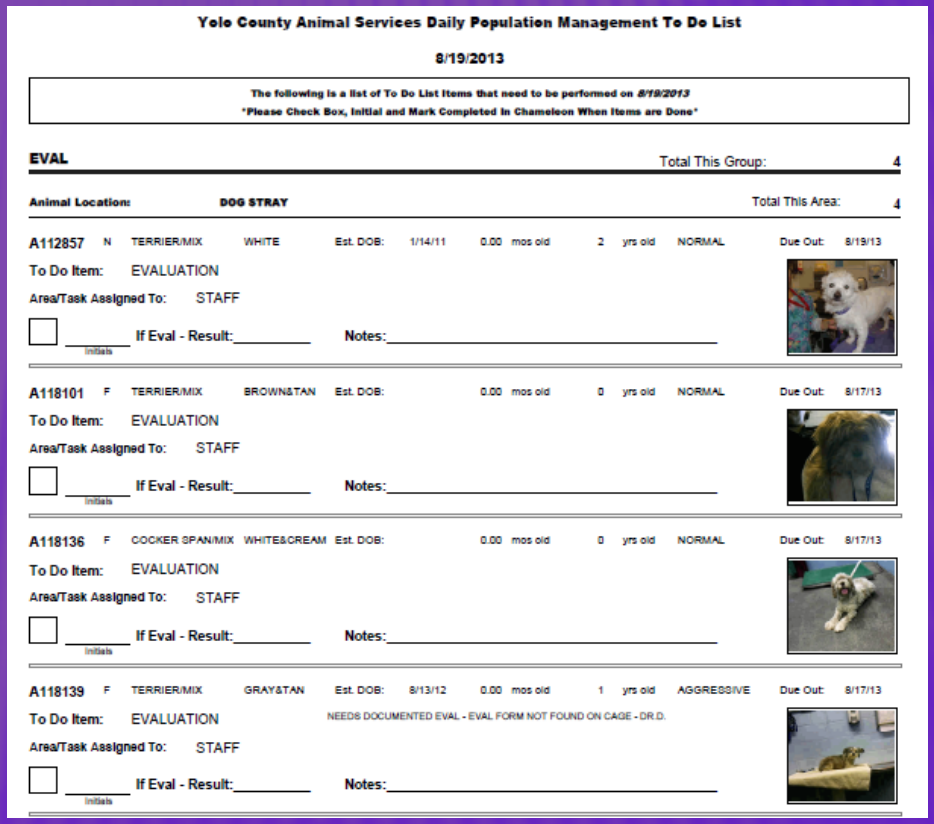
Intake Type: STRAY FIELD
By: 305
Due Out: 01/31/14

Jurisdiction: WEST SAC
Weight ~~54.00lbs~~ 51e.5
Age: 3Y
Sex: MALE
Breed: PIT BULL MIX
Color: GRAY & WHITE
Scanned NIDS
Kennel Status: STRAY WAIT

Feeding Inst: 1/2c 1c 1 1/2c 2c 3c

found by Willow Ave/Ash, West Sac

BEHAVIOR EVALUATION/RESCUE
Eval Date: 1/30/14 Dog or Cat? Init: ULLAS
Rescue Requested: Date: 1/30/14 Init: ULLAS
Rescue in Progress: Date: 1/31 Init: RL
Rescue Declined: Date: Init:



Yolo County Animal Services Daily Population Management To Do List

8/19/2013

The following is a list of To Do List items that need to be performed on *8/19/2013*
Please Check Box, Initial and Mark Completed In Chameleon When Items are Done

EVAL Total This Group: 4

Animal Location: DOG STRAY Total This Area: 4

A112857 N TERRIER/MIX WHITE Est. DOB: 1/14/11 0.00 mos old 2 yrs old NORMAL Due Out: 8/19/13
To Do Item: EVALUATION
Area/Task Assigned To: STAFF
☐ _____ Initials If Eval - Result:_____ Notes:_____

A118101 F TERRIER/MIX BROWN&TAN Est. DOB: 0.00 mos old 0 yrs old NORMAL Due Out: 8/17/13
To Do Item: EVALUATION
Area/Task Assigned To: STAFF
☐ _____ Initials If Eval - Result:_____ Notes:_____

A118136 F COCKER SPAN/MIX WHITE&CREAM Est. DOB: 0.00 mos old 0 yrs old NORMAL Due Out: 8/17/13
To Do Item: EVALUATION
Area/Task Assigned To: STAFF
☐ _____ Initials If Eval - Result:_____ Notes:_____

A118139 F TERRIER/MIX GRAY&TAN Est. DOB: 8/13/12 0.00 mos old 1 yrs old AGGRESSIVE Due Out: 8/17/13
To Do Item: EVALUATION NEEDS DOCUMENTED EVAL - EVAL FORM NOT FOUND ON CAGE - DR.D.
Area/Task Assigned To: STAFF
☐ _____ Initials If Eval - Result:_____ Notes:_____

STRESS REDUCTION

- Appropriate housing
- Physical stimulation
  - Playgroups
- Mental stimulation
  - Food toys

http://sheltermedicine.vetmed.ufl.edu/shelter-services/tools-tips-fact-sheets/shelter-enrichment-resources/

NOISE REDUCTION – BARKING

- Enrichment
  - Reading programs
  - Click for Quiet
  - Walking programs
  - Feeding programs

- Provide control/predictability
  - Partial visual barriers
  - High-sided beds

SIDE NOTE: PLAYGROUPS

- Refer to Aimee Saddler's day-long presentation
- Dogs are social animals
- Calculated risk

http://dogsplayingforlife.com/

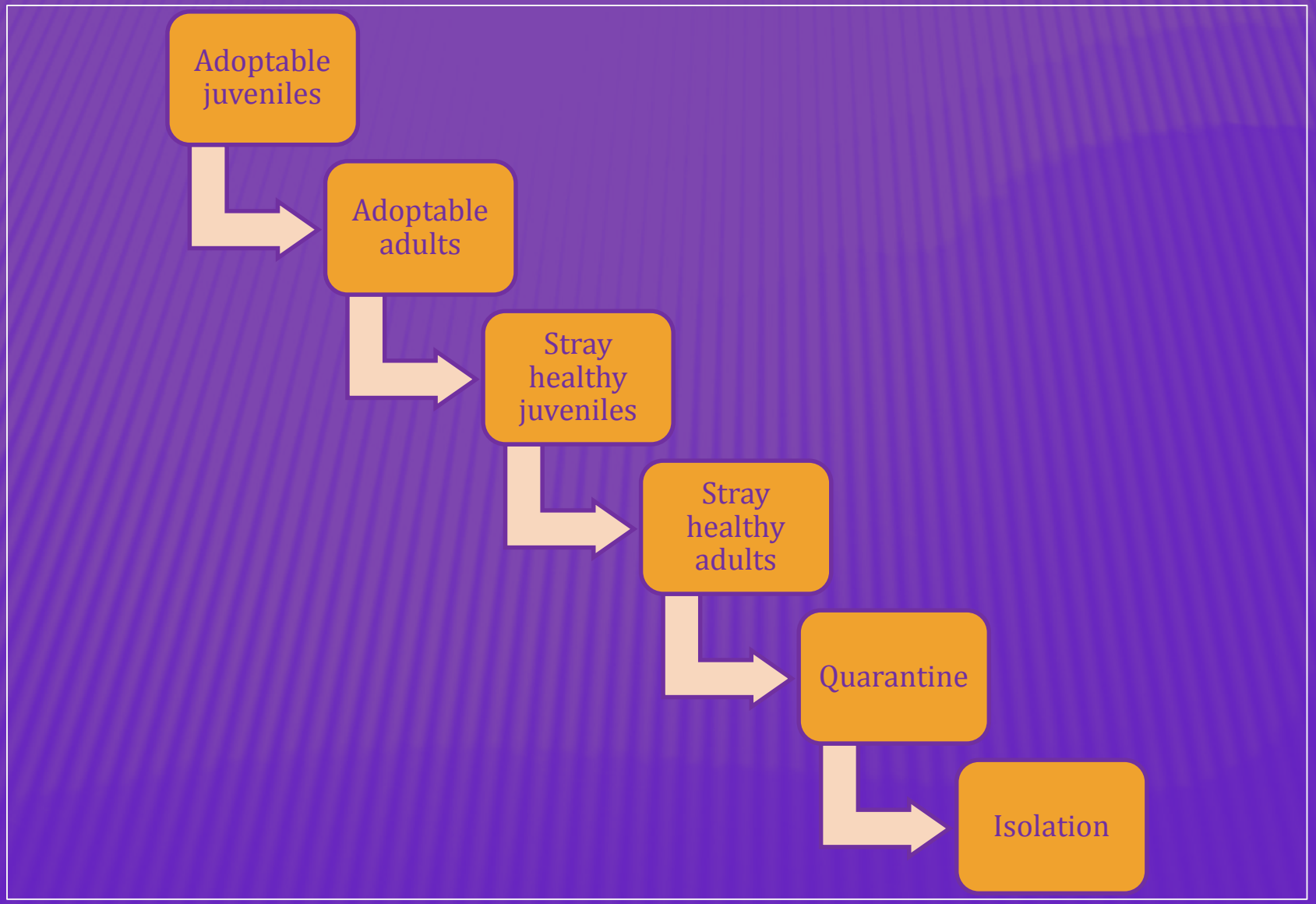
CLEANING/DISINFECTION

- It's not just what you clean with, but how you clean!
  - Most disinfectants inactivate CIRDC pathogen (except CAV-2)

THE CLEANING PROCESS

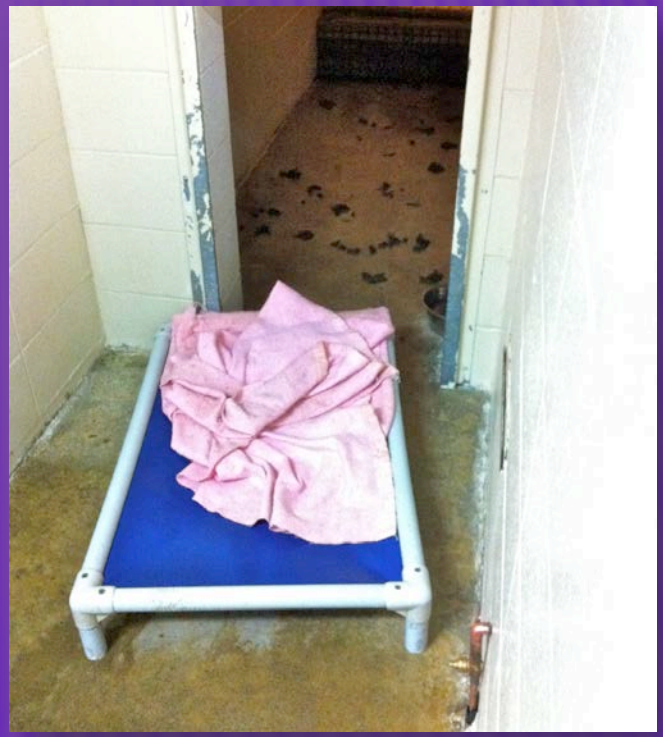
- Avoid mop buckets → contamination
- Avoid high pressure hoses → aerosolization & airway irritation
- Dedicate cleaning supplies → reduce cross contamination
- Handle sick animals last
- Dry surfaces after rinsing → avoid moisture
- Spot clean!

CLEANING ORDER



SPOT CLEANING

- Ensure compliance with flow (sick animals handled last)
- Advantages
  - Less stressful
  - Reduced fomite transmission
  - Increased safety & efficiency
  - Reduced use of irritating disinfectants
  - Allows for environmental familiarity
  - Water conservation
- Thoroughly clean/disinfect once vacated

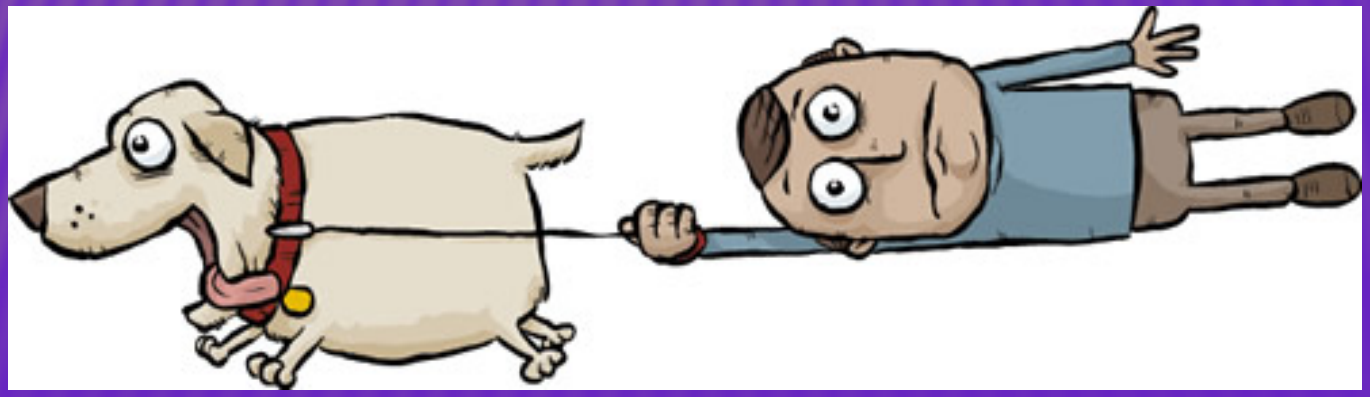


CLEANING: OUTDOOR AREAS

- Prompt removal of solid waste
- Use disinfectant NOT inactivated by organic material
- Maximize sunlight exposure
- Only allow healthy, vaccinated adults (>5 mo)

AIR QUALITY & AIRWAY HEALTH

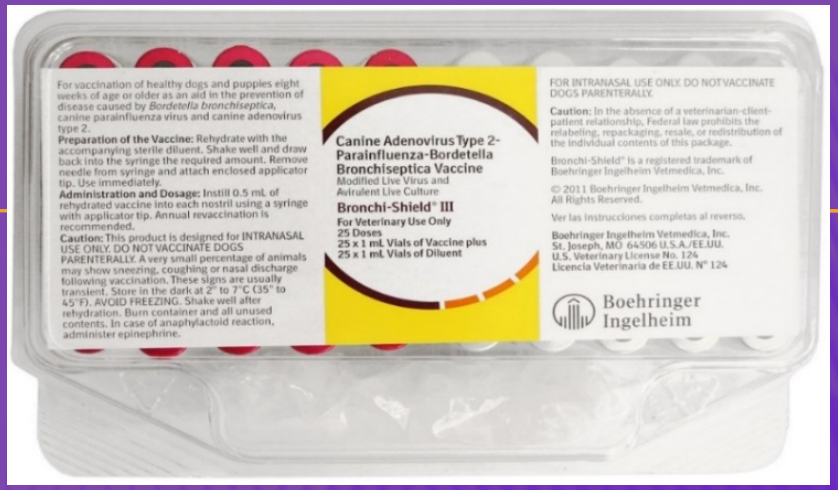
- Prevent crowding
- Maximize outdoor exposure
- Minimize irritants
- Minimize barking
- Minimize leash pulling



VACCINATION

- BB, CDV, CPiV, CAV-2, CIV
- Considerations
  - Immediately on intake
  - Lessen synergistic effects of pathogens
  - Optimal route, timing
  - Remember maternal antibodies in puppies
- Reason: to help control disease & prevent severe disease

BORDETELLA VACCINES



- Parenteral option
  - Inactivated
  - Requires two doses, 3-4 weeks apart, max protection conferred 1 week after 2nd dose
  - Not recommended
- Intranasal options
  - Avirulent live culture
  - Starts protecting within 3 days after single dose
  - Protects in face of maternal antibodies
  - Reduces clinical CIRDC signs more AND can prevent shedding

ORAL BORDETELLA VACCINE

- Live, avirulent - *B. bronchiseptica* only
- Similar to IN vaccine
- Benefit: ease of administration
- Disadvantage: cost
  - $5-7/oral vx
  - $3-4/intranasal vx
- If concerned about other CIRDC pathogens
  - Use multivalent IN coverage

DISTEMPER VACCINE

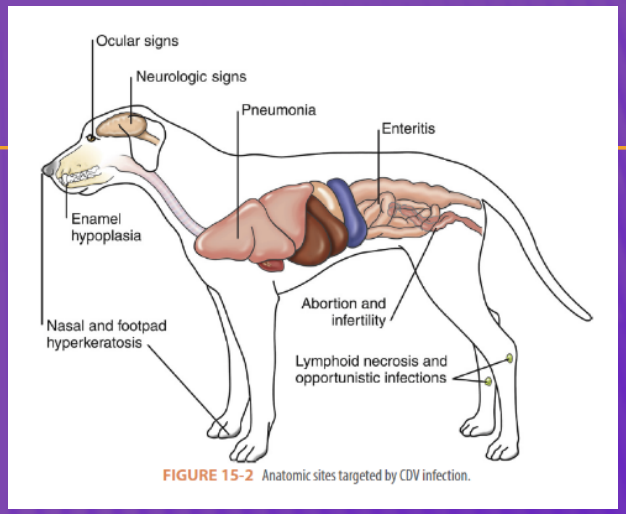
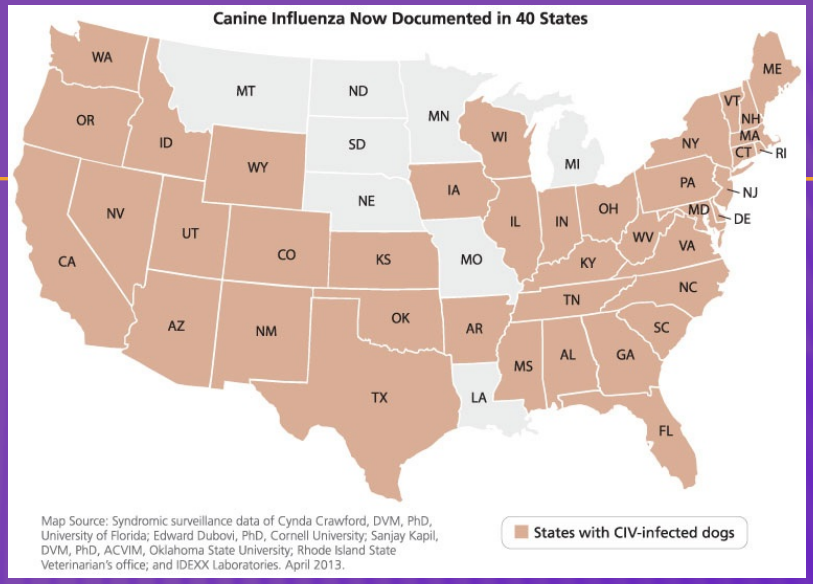


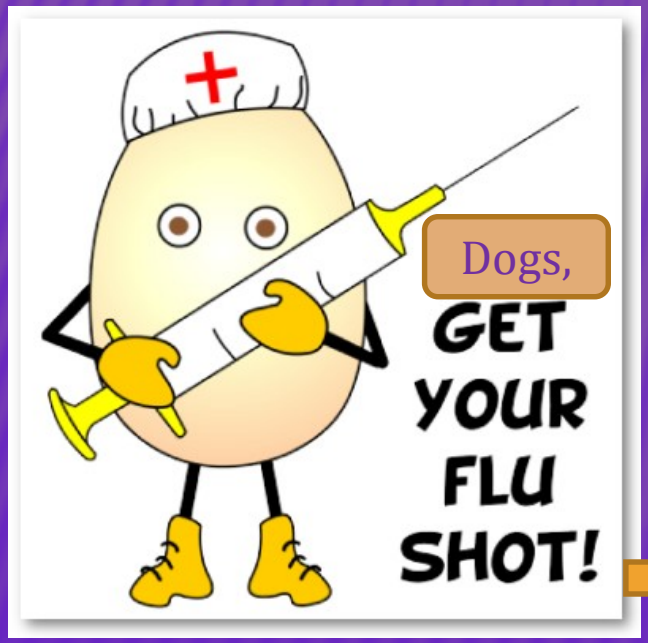
FIGURE 15-2 Anatomic sites targeted by CDV infection.

- Parenteral
  - **MLV** vx starts protecting within 4 hours
    - But takes up to 5 days to FULLY protect
  - **Recombinant** vx
    - Main advantage: can protect very young puppies
    - 3 yr duration of immunity
    - More costly

INFLUENZA VACCINE

- Reduces severity of clinical signs & viral shedding time





- Inactivated, parenteral
  - As young as 6 weeks of age
  - Requires 2 initial doses – 2 to 4 weeks apart
  - Maximum immunity occurs 1 week after second dose → not useful in shelter

If you're in an endemic area

VACCINE RECOMMENDATIONS

- IN or Oral *B. bronchiseptica*
  - If concerned about other CIRDC pathogens, use multivalent IN
- IN CPiV
- Parenteral CAV-2, CDV, CPV-2
- Parenteral CIV if endemic

PREVENTION – SUMMARY

- Support host response
  - Vaccination
  - Airway health
  - Stress reduction
- Lower the infectious dose
  - Transmission opportunities
  - Housing
  - Air quality
  - Prevent crowding

TREATMENT

TREATMENT RECOMMENDATIONS

- Isolate

Most important part!

- Antibiotic use is shelter, animal, & severity dependent

TREATMENT

- Doxycycline 10m/kg PO SID x 7-10 d
  - Best first choice antibiotic
- Prevent coughing:
  - Prevent leash pulling, barking, excitement
- Generally not recommended:
  - Glucocorticoids
  - Antitussives
  - Convenia

TREATMENT

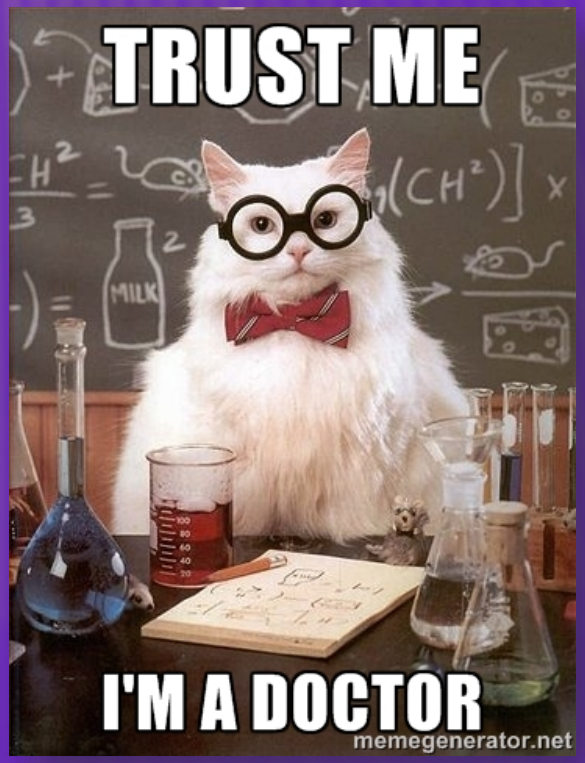
- Minocycline Hydrochloride
- PO: 5-10 mg/kg q12
- If compounding
  - Highly unstable & degrades quickly
  - Can cause esophageal damage
- Activity
  - Equal to or better than doxy

FOSTERING & CIRDC

- Requires disease transmission training
- Designated area
  - Separated from other pets
  - Good ventilation
  - Calm, low traffic
  - Easily disinfectable
  - Dedicated supplies

Treatment & Length of Stay

- Use effective drugs at appropriate doses
- Start & stop treatment promptly
- Re-evaluate treatment consistently
- Monitor daily
- Use shelter software to track



OUTBREAK RESPONSE

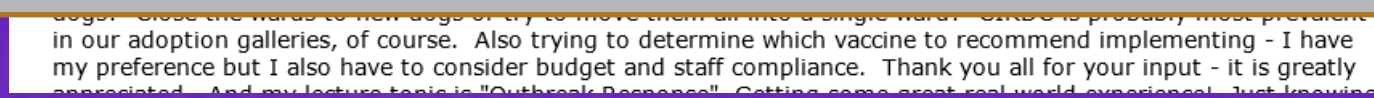
OUTBREAK RESPONSE

- Prompt isolation of sick dogs → reduces infectious dose in environment
- Clean break for un-exposed animals
- Consider points of common contact?
- Communication
  - Staff/Volunteers
  - Adopters

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?


in our adoption galleries, of course. Also trying to determine which vaccine to recommend implementing - I have my preference but I also have to consider budget and staff compliance. Thank you all for your input - it is greatly

CASE STUDY – RISK FACTORS

- **Increased length of stay**
- **Over capacity; not using housing appropriately**
- **Not isolating clinical dogs**
- **Not using mucosal *Bordetella* or CPiV vaccine**
- **Not DHPP vaccinating unhandleable dogs on intake**

CASE STUDY – PLAN

- **Isolation & Biosecurity:**
  - Designated multiple iso wards to create clean break
  - Doggy Tetris = started moving all clinical dogs into iso wards

CASE STUDY – PLAN

- **Diagnostics:**
  - IDEXX Canine Respiratory PCR Panel
  - 10 samples
  - PCR Pros: very sensitive & specific, powerful surveillance tool, polymicrobial
  - PCR Cons: sample handling error, cost ($82-$115), relatively slow turn around time (2-3 days), clinical signs do not always correlate with shedding

CASE STUDY – PLAN

- **Diagnostics**

Test	101014 A772372 10/11/2014	101014 A777541 10/11/2014	101014 A774045 10/11/2014	101014 A776465 10/11/2014	101014 A777587 10/11/2014
CANINE DISTEMPER VIRUS	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
CDV QUANTITY	Below [illegible] 1	[illegible] 3	[illegible] 5	[illegible]imit of Detection 7	Below Limit of Detection
FOLD DIFFERENCE ABOVE CUTOFF	[illegible]				N/A
CDV INTERPRETATION					N/A
BORDETELLA PCR					NEGATIVE
CANINE ADENOVIRUS TYPE 2					NEGATIVE
CANINE HERPES VIRUS					NEGATIVE
K9 PARAINFLUENZA VIRUS					NEGATIVE
CANINE INFLUENZA PCR					NEGATIVE
K9 RESP CORONAVIRUS PCR					NEGATIVE
H1N1 INFLUENZA RealPCR					NEGATIVE
MYCOPLASMA CYNOS PCR					POSITIVE
S EQUI ZOOEPIDEMICUS PCR					NEGATIVE
CANINE PNEUMOVIRUS					POSITIVE 10

Positive results:

2 – CRCoV

All 10 – *Mycoplasma*

5 - Pneumovirus

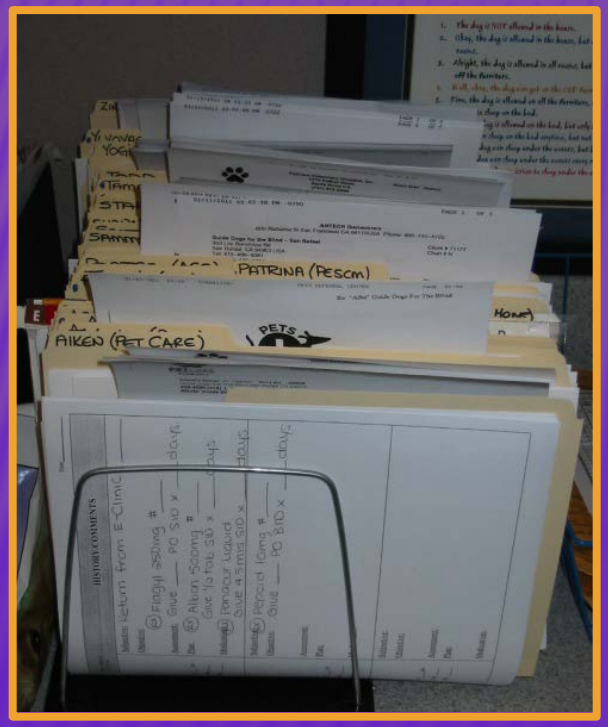
Test	[illegible]	[illegible]	[illegible]	[illegible]	101014 A778433 10/11/2014
CANINE DISTEMPER VIRUS	N[illegible]				NEGATIVE
CDV QUANTITY	B[illegible]			[illegible]ion 7	Below Limit of Detection 9
FOLD DIFFERENCE ABOVE CUTOFF	N[illegible]				N/A
CDV INTERPRETATION	N/A				N/A
BORDETELLA PCR	NEGA[illegible]				NEGATIVE
CANINE ADENOVIRUS TYPE 2	NEGATIVE	[illegible]	[illegible]	[illegible]	NEGATIVE
CANINE HERPES VIRUS	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
K9 PARAINFLUENZA VIRUS	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
CANINE INFLUENZA PCR	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
K9 RESP CORONAVIRUS PCR	NEGATIVE	POSITIVE	NEGATIVE	NEGATIVE	POSITIVE
H1N1 INFLUENZA RealPCR	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
MYCOPLASMA CYNOS PCR	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE
S EQUI ZOOEPIDEMICUS PCR	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE
CANINE PNEUMOVIRUS	NEGATIVE 2	POSITIVE 4	NEGATIVE 6	NEGATIVE 8	POSITIVE 10

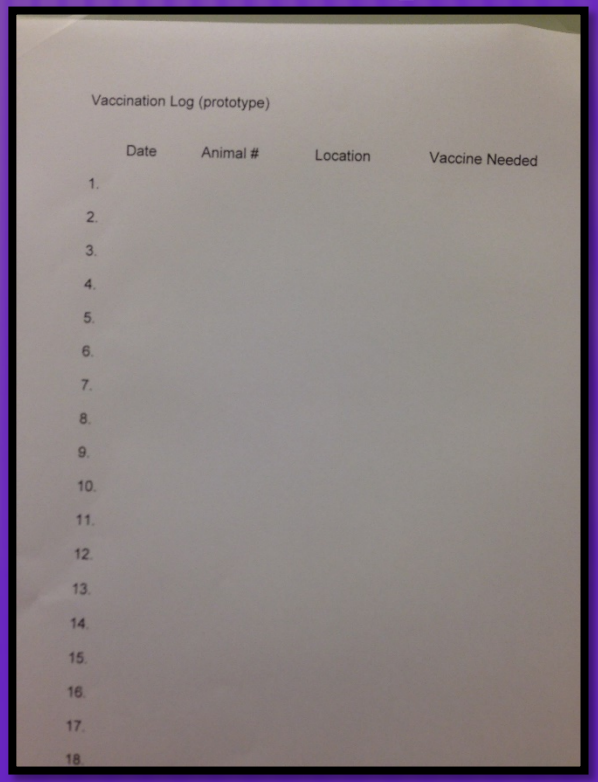
CASE STUDY – PLAN

- **Treatment**:
  - Started intranasal Bordetella, CPIV, CAV-2 vaccine
  - Started doxycycline as soon as first signs are seen
  - Switched to baytril after PCR results returned

CASE STUDY - PLAN

- **Communication**:
  - Staff compliance - challenge
  - Staff, volunteers, local practitioners, adopters





CASE STUDY-CHANGES MADE

- Cont. to use Accel; new focus on drying surfaces
- Sending home CIRDC info sheets
- Allow mild CIRDC cases to be adopted with surgical waiver; must make sx appt before leaving with new pet
- Starting a CIRDC foster program
- Realization that response must be multifactorial

TAKE HOME POINTS

- Diagnosis CIRDC pathogens based on signs alone is not possible
- Vaccinations can reduce the severity & duration of CIRDC but CIRDC is NOT vaccine preventable
- Increased LOS & crowding = most significant risk factors for CIRDC in shelter populations

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THANK YOU!!

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