Feline Upper Respiratory Tract Disease Complex: What Do 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
The Bottom Line

- Reduce Stress
- Reduce Crowding
- Remove or Isolate Sick Animals
Why do we wind up HERE?

- Infectious Respiratory Disease is borne, for the most part, of stress and over-crowding
- Seen most commonly in shelters, rescues, kennels, breeding facilities, and multi-pet households
• Or pets who have just come from any of those settings
Population Medicine

- Populations may be found almost anywhere IRDC is present and vice versa.

- If you care about IRDC, you care about population medicine and “herd health”.

Prevention

• Once the pets are sick we have lost, AT LEAST, half the battle

• Resource drain
• Risk for the group as a whole
• Treatment may be unrewarding
Scope and Sequellae

- Respiratory disease in most house pets resolves relatively easily and often without treatment.
- FURDC is the second most common reason for euthanasia in shelters.
- Many cats develop chronic sequellae.
Community Impact

- Newly adopted pets
- Multi-pet households
- Role models for the community for husbandry and welfare
Population health management

- Defines goals
- Sets priorities
- Defines practices
- Allows US to choose
- Saves lives
If we don’t think herd health…

- Increased risk of infectious disease transmission
- Increased stress for animals, staff, and volunteers
- Decreased ability to maintain the health of healthy, adoptable animals presented to the shelter
- Decreased animal welfare

- Increased reliance on the effects of stress and disease as selection criteria for euthanasia
How do you define a case of feline URI?
Clinical Signs

- Systemic implications
- Upper respiratory tract
- Oral ulceration
- Gingivitis
- Ocular involvement
- Fever
- Lethargy
- Inappetance
Chronic Sequellae

- Chronic Rhinitis
- Corneal scarring
- Synechea
- Symblepharon
- Enucleation
- Chronic severe gingivitis
- Polyps?
- Pneumonia
- Poor Welfare
- Euthanasia
How does it happen?
Disease Triad

Environment
- Shedding/ Contamination
- Sanitation
- Infectious dose
- Stress

Host
- Exposure
- Immunity
- Stress
- Nutritional Plane

Pathogen
- Pathogenicity
- Infectious dose
- Synergy
Herd Immunity?

• Starts in the community

• Shelter safeguards at intake

• Most important for distemper (parvo and panleuk too!)
Infectious Agents
Etiology of acute feline URI

- Most often Viral
  - Viruses (80-90%)
- Bacteria
- MLV vaccines
  - mild signs
Infectious Agents: Cats

- Feline Calici Viruses
- Feline Herpes Virus
- Mycoplasmas
- Bordetella?
- Secondary Bacterial Infections
Characteristics of Common Pathogenic Agents of FURDC
Feline Herpes Virus

• Double stranded enveloped DNA virus
• Not highly variable
• No vaccine resistant strains reported

• Individual immune system related to clinical signs

• Clinical signs vary
  – Conjunctivitis
  – Sneezing
  – Fading kitten syndrome
  – Herpes dermatitis
Feline Herpes Virus

- Not hard to kill
- Incubation about a week
- Persists in nerve roots
- Reactivated by stress in 50% with or without signs
Feline Herpes Virus
Distinctive Clinical Signs

• Affects the cornea more than other FURDC agents

• Corneal ulceration
• Chronic conjunctivitis
• Anterior uveitis
• Symblepharon
• Eosinophilic keratitis
• Corneal sequestrum
Feline Herpes Virus
Distinctive Clinical Signs

Latent Infection?  Asymptomatic shedding?
Feline Calici Virus

- Highly variable
- Clinical signs related to strain variation
- Vaccine resistant strains common
Feline Calici Virus

- Hard to kill
- Bleach, potassium peroxymonosulfate
- Persists for weeks
- Incubation 1-5 days
- 50% shed at least 75 days post-recovery regardless of stress
- Healthy long term carriers can perpetuate severe disease
Feline Calici Virus

- Distinctive clinical signs
- Oral Ulcers or inflammation
- Some strains associated with pain and swelling in multiple joints
- Acute or chronic
- IN vaccine anecdotally reported to cause ulcers
Virulent Systemic Calici Virus

- Rapid onset (1-3 days) with swelling of the face and/or limbs, areas of hair loss and skin ulceration and oozing in adult, vaccinated cats.

- ~50% mortality

- Jaundice that appears infectious

- “Per acute hepatic necrosis with hepatocellular individualization” commonly reported on necropsy
BUT....

- Dying cats in a shelter setting.....
- Think panleukopenia first!!
Bacterial Infections
Primary

• *Chlamydophila felis*
• The obligate intracellular bacteria formerly known as Chlamydia psittici, var. felis
• *Reservoir on mucosa*
• *Transmission direct (often neonatal), fomite, droplet, activated by pregnancy*
• *Incubation 3-14 days*
• *Shedding may persist 18 months after recovery*
Primary: Chlamydophila felis

- Limited effective antibiotics

- LONG treatment (3-6 weeks) required to clear infection

- If Chlamydophila is suspected or a cat responds markedly to treatment with doxycycline and relapses when taken off treatment, treat for a minimum or three weeks!

- Shedding stops within 2-4 weeks of treatment

- Responsive to doxycycline; doxycycline is more effective than azithromycin
**C. felis**

**Clinical Significance**

- Conjunctivitis (may be unilateral)
- +/- mild to severe URI, fever early in disease
- Polyarthritis (uncommon)
- Abortion (postulated)
- Some clinically normal cats (1-6%)

Higher dose = worse disease*

Bordetella Bronchiseptica

- Aerobic, gram negative coccobacillus.
- Incubation 3-10 days (cats and dogs)
- Shedding may persist up to 3 months after recovery.
- Reservoir is respiratory tract of infected animals. Cats may act as reservoir for dogs.
- Transmission: direct, fomite, droplet (aerosol from dogs).
- Zoonotic in immunosuppressed
Bordetella Bronchiseptica

• Potentially effective antibiotics
• Tetracyclines
• TMS
• Clavamox
• (can have high levels of resistance – transferable multi-drug resistant plasmids documented).
• C+S if implicated in severe disease or herd problem.
• Always resistant to Cephalexin
Bordetella Bronchiseptica

Clinical Significance for cats

• URI, usually mild, ocular and nasal discharge, conjunctivitis, tracheobronchitis.
• *Bordetella* pneumonia in young kittens (primary) or secondary to viral infection or immunosuppression.
• Most infected cats do not show clinical signs.
• Extensive *B. bronchiseptica* associated disease may be a marker for husbandry problems
Mycoplasma species

- Felis, gateae, others
- Obligately parasitic mollicute. No cell wall.
- Reservoir on respiratory and genital mucosa.
- Transmission: direct, fomite, droplet
Mycoplasma species

• Clinical signs:
  - Conjunctivitis
  - Lower respiratory disease (uncommon)
  - Polyarthritis (uncommon)

  - Role in URI uncertain – generally thought to be minor player, but significantly associated in recent survey of shelter cats, recovered from 25% of cats with URI in that study. Isolated from 10/10 cats in two recent outbreaks of unusually severe URI in shelters.

• May be isolated from clinically normal cats.
Secondary Bacterial Infections

- Wide variety, including gram positive, gram negative and anaerobic
- Almost all can be found in normal cats and dogs as well
Less common causes

• Cats who aren’t getting better?
  – FIV?
  – Fungal infection?
  – Polyps?
  – Neoplasia?
Transmission
FURDC Transmission

• Understanding transmission is key to prevention

• Direct Contact
• Fomites
Fomites

- Aerosol transmission is NOT common
- Droplet (4-5 feet)
- Air quality
- Fomite transmission demonstrated for FHV and FCV
Aerosol transmission of feline caliciviruses?

- Naïve cats placed in open wire cage in common airspace 6 feet away from infected, clinically ill cats
- Naïve cats cared for prior to infected cats
  – No transmission of infection
- Cats cared for in random order
  – Transmission within 6-10 days

Transmission of feline herpesvirus

The transmission of feline viral rhinotracheitis (FVR) virus was investigated. Virus could be successfully transmitted between shedding carrier cats and unrelated susceptible kittens, but only if there was intimate contact between them. Experiments using a multistage liquid impinger demonstrated that FVR virus was unlikely to be transmitted between cats by aerosol and this was confirmed by the ability of a sentinel cat to withstand virus shedding from carriers over a six month period, although housed in the same air space.

Fomites

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

• Aerosol transmission of FVR and FCV is unlikely.

• BUT…

• Fomite transmission is a very effective means of inoculation.
Clinical Factors
# Clinical Factors

<table>
<thead>
<tr>
<th>Primary Pathogens</th>
<th>Environmental Contributors to FURDC</th>
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<tr>
<td>• Feline Calici Viruses</td>
<td>• Poor Population Management</td>
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<tr>
<td>• Feline Herpes Virus</td>
<td>• Overcrowding</td>
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<tr>
<td>• Mycoplasmas</td>
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<td>• Chlamydophila <em>felis</em></td>
<td>• Stress??</td>
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Environmental Contributors to FURDC
Environmental Contributors to FURDC

Air Quality sampling in DCHS quarantine
Environmental Contributors to FURDC
A balancing act
Diagnosis and Disease Recognition
Diagnosis

• Most often not necessary
• Often won’t effect your treatment plan
• Consider if signs persist > 1 month
• Severe or frequent disease in a population
• Liability issues
  – diagnostics may be able to distinguish shelter or clinic-origin disease from pre-existing infection
Incidence Tracking

- Evaluate current or new protocols
- Recognize and respond to problems
- Track severity and outcome
- Track treatment success and investment
Incubation and Shedding
FURDC Incubation

- Herpes
  - Recrudescence 7-11 days

- Calici
  - 1-5 days

- Chlamydophila
  - 3-14 days
Shedding periods for common agents of respiratory disease

- Herpes is forever.
- Chlamydophila
  - Shedding stops within 2-4 weeks of treatment
  - May require 6 weeks of treatment
- Calicivirus
  - 50% shed at least 75 days post-recovery regardless of stress
- Chronic snot rockets?
Implications for Reintroduction

• Potential for vicious cycle
• Consider dose effect
• Separate recovered animals if possible
• Adoptions??
Management Tools
The single most important tool for feline URI control in shelters
The single most important tool for feline URI control in shelters

Think Prevention!
Crowd Control

• Crowd control is the best prevention

• Spay / Neuter Outreach
• Diversion Programs
• Realism

• Population Management
Carrier state and dose effect
The Rope Trick
When the INs don’t match the OUTs the middle CAN GET TANGLED?
Medical?

• 89% of all cats treated for URI presented to the shelter healthy
• 50% of those were euthanized for medical reasons
• The number euthanized was equal to the difference between intake and adoptions
• During this time, no healthy, adoptable animals were euthanized
Space?
2006 Statistics

- Intake ~40,000
- Adoption 12,265
- Died in Kennel 2,362
- Medical Euthanasia 9,110
- Mercy 6,378
- Space 1

- Deaths due to disease 17,850

(*does not include deaths after adoption)
Animal Care Days
Stress
Stress
Stress and Herpes

Know Your Enemy

Recrudescent or New Infection?

* Rehousing induced herpes activation in 83% of 14 cats

** “Rehousing resulted in virus re-excretion after a mean lag period of 7-2 days in four of 22 (18%) cats tested on a total of six of 40 (15%) occasions.”

Either way, the answers may be the same.


** Gaskell RM, Povey RC. Experimental induction of feline viral rhinotracheitis virus re-excretion in FVR-recovered cats. _Vet Rec._ 1977;100(7):128-133.
Welfare of cats in a quarantine cattery
Rochlitz et al. 1998

Cats seemed to adjust to their surroundings after 5 weeks!!!
Cats spent most of their time hiding for the first two weeks
Urine cortisol levels were initially elevated and then dropped with time

Behavioral and physiological correlates of stress in laboratory cats. Carlstead et al. 1993

Stressor:
Irregular caretaking

Coping mechanism:
Hiding places


- Correlation between urine cortisol and signs of systemic disease
- Environmental enrichment
- Stress scoring
- Exposure to dogs
Coping Mechanisms
Simple Interventions
Simple Intervention to Reduce Stress and Recrudescence of Latent Herpes Virus Infections in Shelter Cats

- Change
- Evidence
- Compliance

The Universal Shelter Symbol
What are our stressors?

- Use of Resources
- Animal Care Days
- Staff Stress
- Animal Stress
- Community Pressure
- Adoption Guarantee
- Space
- Welfare
Our Coping Mechanisms?
Goals

• Define goals
• Use goals to set policies
• Write and follow protocols to help when things get stressful
Disease Detection
How do YOU track and respond to URI?
Early Detection

- Identifies potentially infectious cats
- Helps reduce transmission
- Prevents post-adoption heartache
Vaccination Programs
Vaccines in context

- Vaccines CAN prevent some disease and reduce severity of others.
- Limiting exposure is the best protection.
- Vaccines will not make up for poor husbandry.
- Consider density, cleaning, enrichment, nutrition, parasite control...

FURDC is NOT vaccine preventable.
FVRC choices: MLV versus killed

• MLV: faster onset, more clinical signs
  – Storage and handling?
  – Turnover?
  – Consequences of sneezing?
    • Isolation or euthanasia
    • Complacency
FVRC choices

• Consequences of sneezing?
• There is no way to distinguish vaccine reaction from field strain infection

Please read!
URI!!!!!!!!!!
LOOK OUT!!!!!!!!!!
FVRC P choices: IN versus SC

• IN: faster, younger, local protection
• More possible signs
  – 30% per licensing trail
  – Maybe less in reality?
• Administration?
• MLV parenteral PANLEUK
• BOTH IN and SC may be best* Or NOT?

If they MUST stay here, IN FVRC at 2-4 weeks

How much do we know about how well all these strategies work in individual shelters?

Very little!
Caution with MLV subcutaneous calicivirus vaccine

- Full blown disease with inadvertent oro-nasal exposure
- Clean spills on cat with alcohol or Trifectant®
- Clean spills in environment with bleach or Trifectant®
- Don’t draw up vaccine near cat’s face
Vaccination: C. felis

- Efficacy: moderate, relatively short term
- Safety: relatively low
  - Up to 3% adverse reactions
- Uncommon cause of clinical disease
  - Use only if demonstrated ongoing problem
  - Review husbandry
- 2 doses 3-4 weeks apart
Feline Bordetella bronchiseptica

- Not = canine vaccine
- Efficacy: moderate
- Safety: moderate
  - May cause signs
  - May increase disease???

- Need?
  - Mostly disease of very young kittens
  - Use only if demonstrated ongoing problem
  - Review husbandry
Cleaning and Sanitation
Cleaning considerations

• What are you trying to clean away?
• What agents are you trying to kill?

• Exposure to other animals
• Exposure to infectious agents
• Stress
What really needs cleaning?
Have a plan

- Make cleaning part of your infectious disease management plan
- Leave enough breathing room to allow safe and thorough disinfection
- When ever possible leave them in
- Cleaning between animals is the most critical
- Don’t forget to dry
Cleaning and Disinfection

- Bleach 1:32 (ideal conditions)
- Potassium peroxymonosulfate (aka Trifectant or Virkon-S)

- Alcohol Sanitizer:
  - 70% ethanol (not 62%)
  - 1-propanol

- Hand washing
What is sitting on your exam tables?
Treatment

*a.k.a. the least effective tool for control of feline URI*
Treatment: When Prevention Fails

- Isolation
- Fomite control
- Droplet Separation

- Mildly affected animals can spread disease
General treatment guidelines

• Antibiotics only when clearly indicated
• Consistent plan based on categories of signs/severity
  – Staff familiarity with dose and side effects
  – Assessment of results
The importance of medical records!

- Multiple cats and observers means written record extra important
  - Daily observation of signs
    - Scoring System
  - Written dose, duration, route as usual
  - Initials of person giving drug
General treatment guidelines

• Practical considerations:
  – Cost
  – Route
  – Frequency
  – Side effects
  – Transmission
  – Stress

• Above all, do no harm
  – One cat, one set of drugs
  – Is treatment indicated?
Lysine for herpesvirus control

• May antagonize growth promoting effects of arginine – essential for herpes replication
  – ↓ severity and frequency of episodes in humans
  – ↓ replication of FHV-1 in vitro*
  – ↓ severity of signs when given before infection**
  – ↓ shedding post-steroids when given to latently-infected cats***

• Caution with prolonged treatment
Lysine treatment

• 500 mgs/adult cat BID
• Most effective before exposure or disease
• Treat all cats?
• Give as powder on food (about ¼ teaspoon)
• No evidence of effect against other URI agents
• Caution with long term use?
Selected Lysine References


Mycoplasma Treatment

• **Systemic**
  – Tetracyclines (doxycycline)
  – Azithromycin
  – Fluorquinolones

• **Topical**
  – Tetracycline
  – Chloramphenicol
  – Erythromycin

• **NOT** penicillins or cephalosporins
Chlamydophila Treatment

- Tetracyclines (doxycyline)
- Q 24hour dosing
- Continue for 3-4 weeks if responding
- Topical tetracycline, chloramphenicol, erythromycin
- NOT Zithromax after all *

In Summary

- Herd health is the bottom line
Questions?
Thanks for all the work you do.

www.sheltermedicine.com

This position results from a partnership between UC Davis School of Veterinary Medicine and PetSmart Charities.