vca animal hospitals SPECIALTY CARE

Specialty Hospitals of San Diego Present:

SEASIDE VETERINARY FORUM

Sunday May 17, 2026
8:00am-5:30pm

VCA Animal Specialty Group

VCA California Veterinary Specialists - Carlsbad

VCA Emergency Animal Hospital & Referral Center

VCA Eye Clinic for Animals

Hilton San Diego/Del Mar
15575 Jimmy Durante Blvd
Del Mar, CA 92014

vca animal hospitals SPECIALTY CARE

Specialty Hospitals of San Diego
Seaside Veterinary Forum

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Veterinarian Track

vca animal hospitals SPECIALTY CARE

Specialty Hospitals of San Diego
Seaside Veterinary Forum

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Leadership Track

Technician/Assistant Track

STRATEGIES TO MANAGE OCULAR MANIFESTATION OF FELINE HERPESVIRUS-1 (FHV-1)

PETER CHO, DVM, MS, DACVO

OUTLINE

- What is FHV-1
- Pathogenesis
- Diagnosing FHV-1
- Treatment

WHAT IS FHV-1?

Gaskell et al, 2007

- **DNA VIRUS**
  - **Herpesvirus subfamily alphaherpesvirus**
    - Host species specific
    - Rapid intracellular replication
    - Lifelong latency in neuronal cells
  - **Extremely labile in environment**
    - Survives 12 hours in dry, and 18 hours in moist
    - Susceptible to most disinfectants

WHAT IS FHV-1?

Studdert and Martin, 1970
Maggs et al, 1999
Ellis, 1981

Prevalence

- **Estimated 75% - 97% cat population is seropositive**
- 45% of all upper respiratory infections
- Responsible for majority of corneal ulcers in cats

WHAT IS FHV-1?

Why doesn't every cat show signs?

OUTLINE

- What is FHV-1
- Pathogenesis
- Diagnosing FHV-1
- Treatment

PATHOGENESIS

Gaskell et al, 2007

- **Transmission**
  - **Direct transfer**
    - Virus-containing macrodroplets
      - Oral, nasal, conjunctival mucosal surfaces
  - **DO NOT form aerosols of any virus during normal respiratory movements**

PATHOGENESIS

Li et al, 2015
Gaskell et al, 2007

- **Acute Phase**
  - **Viral replication primarily within epithelium**
    - **Upper respiratory tract**
      - Nasal turbinates and nasopharynx
    - **Eye**
      - Conjunctiva and corneal epithelium
  - **Viremia is rare**
    - Replication limited to areas of lower body temperature (i.e. respiratory tract)

PATHOGENESIS

Gaskell et al, 2007
Townsend et al, 2013

- **Acute Phase**
  - **Clinical signs development**
    - **Day 6** = 1st onset clinical signs
    - **Day 10** = Peak ocular and respiratory signs
  - **Cell damage through lysis or rupture**
    - Viral release
  - **Conjunctiva and cornea**
    - Erosions and ulcerations of epithelium

PATHOGENESIS

Stiles, 2014

- **Acute Phase**
  - **Conjunctivitis**
    - Chlamydia sp. or Mycoplasma sp.
  - **Secondary infections**
    - Corneal stromal ulcers

PATHOGENESIS

Townsend et al, 2013

- FHV-1 is commonly self-resolving
- Clinical signs
  - **Day 30** = resolution of clinical signs and establishment of latency
- **About 80% of infected cats establish latency**

PATHOGENESIS

Gaskell & Povey, 1977
Townsend et al, 2004

- **Latency**
  - **Virus cannot be cultured**
  - **LIFE LONG!!!!**
  - **Occurs following acute phase**
    - **Periodic viral reactivation**
  - **Latent infection demonstrated in trigeminal ganglia**
    - **Identified within cats without signs of ocular disease**

PATHOGENESIS

Gaskell et al, 1985
Stiles & Pogranichniy, 2008

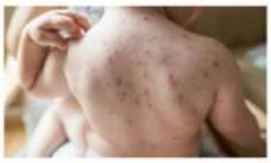
- **Reactivation (recrudescent)**
  - **STRESS!**
    - Rehousing, transport, parturition, lactation
    - Systemic corticosteroids or epinephrine

Theorized to descend same sensory nerve axon it ascended to peripheral epithelial tissue

PATHOGENESIS

Lachiewicz and Srinivas, 2019

- **Reactivation (recrudescent)**
  - **Human alphaherpesvirus**
    - Varicella zoster virus (VZV)
    - **Children = "Chicken pox"**
      - Red, intense itchy spots over body
    - **Adults over 50 years = "Shingles"**
      - Fatigue, stress, or immunocompromised individuals
      - Hyperesthesia and blistering rash over body



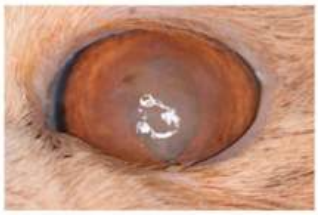
PATHOGENESIS

Gaskell et al, 2007
Stiles & Pogranichniy, 2008

- **"Persistent" State**
  - **Mimics aspects of latency**
    - Inability to culture virus

Chronic, low grade, inflammatory response

- **Immunopathologic disease**
  - **Herpetic stromal keratitis**
  - Lymphoplasmocytic conjunctivitis
  - Eosinophilic keratitis
  - Herpetic dermatitis



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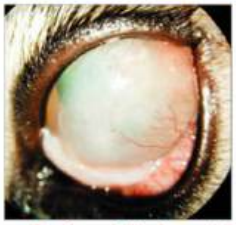

- **Eosinophilic keratitis**
- Herpetic dermatitis

PATHOGENESIS

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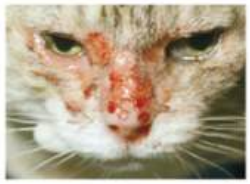


- Eosinophilic keratitis
- **Herpetic dermatitis**

PATHOGENESIS

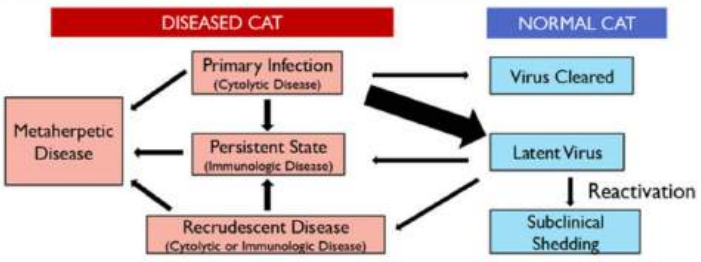
Lim et al, 2009
Sebbag et al, 2021

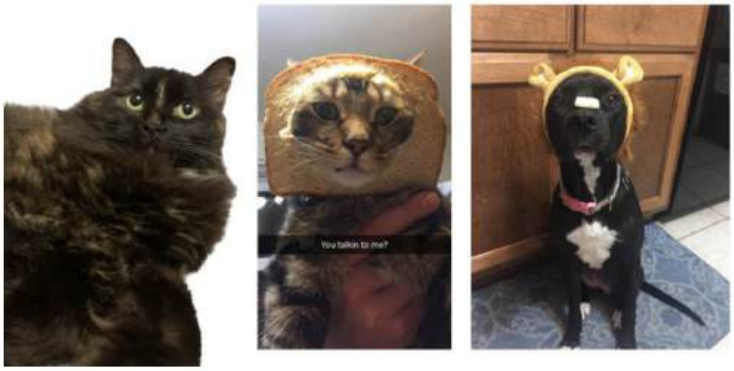
- **Metaherpetic Disease**
  - Permanent or semi-permanent anatomic changes

Ulcerative herpetic disease	→	Symblepharon
Chronic conjunctival goblet cell depletion	→	Tear film dysfunction
Herpetic injury to trigeminal nerve	→	Neurogenic dry eye

PATHOGENESIS

Maggs, 2005





DIAGNOSING FHV-I

Maggs, 2005

Primarily through CLINICAL SIGNS

- History of recurrent episodes
- Accompanied by sneezing or congestion
- **Conjunctivitis**
  - Chemosis
  - Conjunctival hyperemia
  - Mucoid discharge
- **Ulcerative**
  - Should only affect corneal epithelium
  - If deep, then secondary bacterial infection

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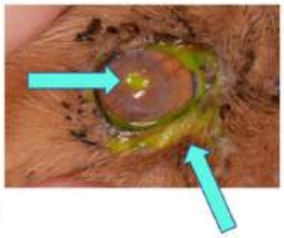
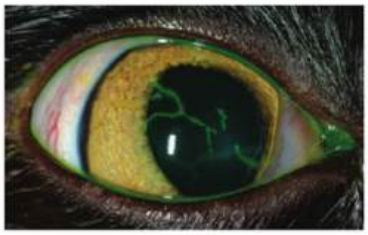


DIAGNOSING FHV-1

Maggs, 2005

Primarily through CLINICAL SIGNS

- **Ulcerative**
  - Dendritic ulcer
  - Rare
  - Pathognomonic for FHV-1



DIAGNOSING FHV-1

Maggs, 2005

Diagnostic testing

- Interpretation is problematic
- More valuable in chronic disease
- **Useful in cases where patients are unresponsive to treatment**
  - Rule out herpesvirus

DIAGNOSING FHV-1

Townsend et al, 2004
Hill et al, 1983

PCR

- Diagnostic test of choice
- Sample both eye and oropharynx
- Highly sensitive and specific
  - Useful to rule out FHV-1
- Problem
  - Several studies demonstrate **clinically normal cats** with **positive PCR** for FHV-1

DIAGNOSING FHV-1

Maggs et al, 1999

PCR

- What does a positive test mean?

1) Presence is coincidental (unrelated to primary disease)
2) Presence is consequence of primary disease
3) Presence is cause of primary disease

DIAGNOSING FHV-I

Maggs et al, 1999

Immunofluorescence Assay (IFA)

- One of the original methods for testing
- Infrequently used in clinics
  - Acute FHV-I infection
    - Positive in 50%
  - **Clinically normal cats**
    - **Positive in 28%**

DIAGNOSING FHV-I

Maggs et al, 1999
Stiles & Pogranichniy, 2008

Virus Isolation (VI)

- Infrequently used clinically
- Dacron swabs with plastic handles
- Cotton and alginate swabs and wooden swab handles
  - **Inhibitory to herpesviruses**

TREATMENT

1) Antiviral drugs
- General concepts of antiviral drugs
- Common questions on use of antiviral drugs

2) Ancillary therapy

TREATMENT - ANTIVIRALS

Thomasy and Maggs, 2016

Important General Concepts about Anti-Viral Agents

- Developed for humans infected with other herpesvirus (i.e. HSV-1)
- Metabolism and safety in cats NOT predicted from efficacy in humans
- **Greater host toxicity than antibacterial drugs**
  - FHV-1 utilizes intracellular host machinery
  - Limits many agents to **topical application**

TREATMENT - ANTIVIRALS

Thomasy and Maggs, 2016

Important General Concepts about Anti-Viral Agents

- **No antibacterial activity**
- **All antiviral agents are VIROSTATIC**
  - Acts on replicating virus (no effect on latent virus)
  - **Induce resistance if underdosed**
- Antiviral should be considered in:
  - **Severe**
  - **Persistent**
  - **Recurrent**

TREATMENT - ANTIVIRALS

Which antiviral should I use?

TREATMENT - ANTIVIRALS

Which antiviral should I use?

- Idoxuridine
- Vidarabine
- Trifluridine
- Cidofovir
- Acyclovir
- Ganciclovir
- Famciclovir

TREATMENT - ANTIVIRALS

Thomasy and Maggs, 2016

Which antiviral should I use?

Idoxuridine

- Formulations available (compounded)
  - Ophthalmic solution 0.1%
  - Ophthalmic ointment 0.5%
- Can cause ocular irritation
- No veterinary data for dosing
  - **5-6 times daily**

epicur PHARMA
$42

TREATMENT - ANTIVIRALS

Thomasy and Maggs, 2016

Which antiviral should I use?

Cidofovir

- Topical formulation of choice
- Formulations available (compounded)
  - Ophthalmic solution 0.5%
- BID dosing
  - **Reduced viral shedding and clinical disease**

epicur PHARMA
$79

TREATMENT - ANTIVIRALS

Thomasy and Maggs, 2016

Which antiviral should I use?

Famiciclovir

- **Orally administered**
- Highly bioavailable prodrug of penciclovir
  - Penciclovir effective against FHV-1 in vitro
  - Must be metabolized to penciclovir
- Pharmacokinetics in cats extremely complex and non-linear
  - Doubling dose does NOT double plasma concentration

TREATMENT - ANTIVIRALS

Thomasy et al, 2012
Sebbag et al, 2016

Which antiviral should I use?

Famiciclovir

- Effective doses
  - **90 mg/kg BID**
  - **40 mg/kg TID**
- Tablet sizes
  - 125mg, 250mg, 500mg
- May be difficult to administer

125 mg
8mm x 8mm

250 mg
10mm x 10mm

500 mg
18mm x 8mm

TREATMENT - ANTIVIRALS

Thomasy et al, 2012
Sebbag et al, 2016

Which antiviral should I use?

Famciclovir

- Adverse effects
  - Reported 17% of cats
  - Very minimal (non-specific GI signs)
  - Transient and mild
    - Reversible upon discontinuation

GoodRx for Pets

125 mg tablet = $0.35 / tablet

250 mg tablet = $0.46 / tablet

500 mg tablet = $0.88 / tablet

TREATMENT - ANTIVIRALS

Should I prescribe both famciclovir and a topical antiviral to the same patient?

TREATMENT - ANTIVIRALS

Should I prescribe both famciclovir and a topical antiviral to the same patient?

Sebbag et al, 2016

- Famciclovir (90 mg/kg BID) achieves efficacious antiviral concentrations of penciclovir in tears

Concurrent topical antiviral drug with famciclovir at 90 mg/kg appears unnecessary

TREATMENT - ANTIVIRALS

How long should I keep the patient on the antivirals?

TREATMENT - ANTIVIRALS

How long should I keep the patient on the antivirals?

- **Treat until remission of clinical signs followed by an additional 2 weeks**
- **DOSE SHOULD NEVER BE TAPERED**
  - Development of resistance

TREATMENT - ANCILLARY

Ancillary Therapy – Supportive care

Conjunctivitis

- **Mucoid discharge and tear film insufficiency**
  - Goblet cell depletion → Artificial tear solution (BID-QID)
- **Concurrent infection** → Erythromycin ophthalmic ointment (TID-QID)

TREATMENT - ANCILLARY

Ancillary Therapy – Supportive care

Corneal ulcer

- **Superficial ulcer** → Erythromycin 0.5% ophthalmic ointment (TID-QID)
- **Stromal loss**
  Dx tests
  - Corneal cytology
  - Corneal culture and sensitivity

  → Ofloxacin 0.3% ophthalmic solution (6-8 times a day)

CASES

Case 1

1 year old FS DSH

- Elderly, retired owner with minimal funds
- 1 month history of ocular discharge and intermittent squinting in both eyes.
- **Exam**
  - Fluorescein stain negative OU, normal IOP OU
  - Blepharospasm OU, Conjunctival hyperemia OU
  - Rest of ocular exam unremarkable

TREATMENT

Treatment

- **Antivirals**
  - Cidofovir 0.5%
    - OU BID

  Or

  - Idoxuridine 0.1%
    - OU 6 times a day

- **Ancillary**
  - Artificial tears
    - Oculenis, Ocunovis, OptixCare Plus
    - OD BID-TID
  - Reduce environmental stressors

TREATMENT

Recheck

- 1 month
- If signs resolved
  - continue antiviral for 2 weeks, then discontinue
- If no improvement
  - Consider other etiologic agents

TREATMENT

Case 2

6 year old MN DSH

- Presented for 1 week duration of squinting right eye
- Six month history of intermittent nasal congestion and sneezing
  - Adopted new puppy
- **Exam**
  - Mucoid discharge, chemosis, and blepharospasm OD
  - Fluorescein stain positive OD, negative OS
    - Superficial

TREATMENT

Treatment

- **Antivirals**
  - Can owner give oral meds?
    - **Yes**
      - Famciclovir 90 mg/kg PO BID
    - **No**
      - Cidofovir 0.5% OS BID

- **Ancillary treatment**
  - Oculenis, Ocunovis, OptixCare Plus
    - OD BID-TID
  - Erythromycin 0.5% ophth. ointment
    - OD TID-QID
  - E-collar (+/-)
  - Reduce environmental stressors

TREATMENT

Recheck

- **One week**
  - Re-assess corneal ulcer and herpetic disease
  - If clinical signs resolved and ulcer healed
    - Discontinue erythromycin
    - Continue antiviral for 2 weeks, then discontinue
  - If no improvement
    - Continue treatment and recheck in 3-4 weeks.
      - If no improvement
        - Consider other etiologic agents

SUMMARY

- Diagnosing FHV-1 should primarily be through clinical signs and history
- Diagnostic test results for FHV-1 difficult to interpret for clinical picture
  - Use to rule out FHV-1
- Treatment of FHV-1 is largely supportive care
- Antiviral therapy should be administered during severe, persistent, or recurrent disease
  - Treat until clinical remission and then additional two weeks

QUESTIONS?

References

TREATMENT

Kaplan et al, 1970
Maggs et al, 2000

Should I recommend oral lysine?

Lysine

- Interest arose from in vitro human data
- Hypothesized MOA
  - Lysine antagonizes arginine availability for viruses
    - Arginine = essential amino acid for protein synthesis for FHV-1 replication
- In-vivo data (variable)
  - Studies seem to be contradictory

TREATMENT

Should I recommend oral lysine?

Stiles et al, 2002 and Maggs et al, 2003

- Exhibited less severe clinical signs of conjunctivitis than cats receiving placebo
- Viral shedding difference between groups variable
  - Stiles et al, 2002 = No significant viral shedding difference
  - Maggs et al, 2003 = Significant fewer viral shedding episodes after rehousing between groups
- Significant elevations in plasma lysine but no change in plasma arginine concentrations

TREATMENT

Should I recommend oral lysine?

Rees and Lubinski, 2008

- Shelter cats received oral L-lysine to assess prevention of URI
- Cats receiving L-lysine (n=144) and cats without L-lysine (n=147)
  - Outcomes compared for duration of stay
  - No significant treatment effect for incidence of infectious URI
- Did not assess viral shedding FHV-1 or if other pathogens involved

TREATMENT

Should I recommend oral lysine?

Maggs et al, 2007 and Drazenovic et al, 2009

- Maggs et al, 2007 = cat colony Drazenovic et al, 2009 = shelter
- Assessed upper respiratory tract disease with oral lysine
- Cats fed L-lysine had **MORE severe clinical disease** than control
- Viral shedding MORE frequent in cats receiving lysine

Fascetti et al, 2004

TREATMENT

Should I recommend oral lysine?

Lysine supplementation is safe

- **No major signs of toxicity**
  - **Mild, reversible GI disturbances**
- **Normal plasma arginine concentrations**
- **Give normal food intake**
  - **Should not restrict cat's arginine intake**
    - **Fatal encephalopathy**

TREATMENT

Should I recommend oral lysine?

Summary of Lysine

- Variability among studies
  - Methodology, study population, dose, etc
- Safe to give when orally administered
- May reduce viral shedding in latently infected cats and clinical signs in cats with primary exposure
- Do not restrict cat's arginine intake

TREATMENT

Which antiviral should I use?

Trifluridine

- Inhibitor of DNA synthesis (not well understood)
- Formulations available
  - Ophthalmic solution 1%
  - Ophthalmic ointment 1%
- Most effective for HSV-1 keratitis
  - Marked ocular irritation in cats
- No veterinary data for dosing (human studies)
  - **5-6 times daily**

CHLAMYDIA

Dx tests

1) Cytology
   1) Intracytoplasmic inclusions
   2) IFA
   3) PCR

Treatment

1) Topical tetracycline/erythromycin
2) +/- systemic tetracycline (doxycycline) / macrolide antibiotic

VACCINATION

1) Vaccination does not prevent against infection but rather lessens clinical signs

2) Usually combined with FCV and panleukopenia in core vaccines

3) MLV in SQ and intranasal vaccine

SHELTER SETTINGS

Movement control
- Cats showing upper respiratory tract disease should be transferred to isolation

Hygiene
- Disinfect kennels

Stress reduction
- Housing
  - Large density or large groups display more signs of stress than cats housed singly.
  - Cats that have not been socialized to other cats experience more stress in housing
  - Stable groups preferred. Introduction of new animals creates stress.
  - Environment enrichment (hiding, playing, climbing, perching, watching outside activities)
  - Pheromones (no firm recommendations available)

SHELTER SETTINGS

Kittens more susceptible than adults to get infection due to lack of immunity from maternal antibodies

OTHER POTENTIAL TREATMENT

Red seaweed extract (λ-carrageenan)
- **Ineffective in experimentally infected cats when 1 drop of 250** µg/ml solution was applied before and after infection or after infection only

Interferons (IFNs)
- Group of cytokines with immunologic and antiviral function
- Viral infection stimulates cells to secrete IFNs into extracellular space
  - Binds to neighboring cells to limit spread of viral infection
  - Unknown mechanism
  - In-vitro studies lack supporting data. No difference in clinical signs.

FAMCICLOVIR DOSING

- **In the only masked, placebo-controlled efficacy trial to date, cats known to be infected with FHV-1 and given 90 mg/kg famciclovir PO TID achieved an approximate peak plasma penciclovir concentration of 2100 ng/mL (adequate IC50)**
  - **Thomasy et al, 2011**
  - Relative to control cats, treated cats had significantly reduced clinical signs, decreased serum globulin concentrations, reduced histologic evidence of conjunctivitis, decreased viral shedding, and reduced serum FHV-1 titers, as well as increased goblet cell density

FAMCICLOVIR DOSING

- A subsequent study showed that administration of a single dose of 40 mg/kg to uninfected healthy cats achieved nearly identical plasma penciclovir concentrations to those achieved with a single dose of 90 mg/kg
- A third study revealed that cats receiving 40 mg/kg TID had tear penciclovir concentrations likely to be effective against FHV-1
  - Using a target IC50 of 305 ng/mL for at least 3 hours after each dose.
- In the most comprehensive pharmacokinetic study to date, healthy cats were administered famciclovir at 30, 40, or 90 mg/kg twice or thrice daily at 30, 40, or 90 mg/kg twice or thrice daily
  - Resulted in the recommendation that cats should receive 90 mg/kg PO BID

FAMCICLOVIR DOSING

- Cats received famciclovir at approximately 40 or 90 mg/kg TID. Median duration of therapy required for clinical improvement was significantly longer in cats administered 40 vs 90 mg/kg. Furthermore, cats in the 90 mg/kg group showed significantly greater and faster improvement than cats in the 40 mg/kg group.
  - The reduction in treatment duration with the higher famciclovir dose was estimated to decrease overall client costs due to a reduction in total famciclovir administered and potentially the number of recheck examinations required.
- Meanwhile, pharmacokinetic data (Sebbag et al, 2016b) suggest that tear and plasma penciclovir concentrations are similar whether cats receive 90 mg/kg famciclovir BID or TID.
- When assessed in tandem, data from these two studies (sebbag et al 2016b and Thomasy et al, 2016) suggest that 90 mg/kg PO BID is likely to be effective in treating cats with herpetic disease.

DETERMINING LATENCY

- **Detection of viral DNA using PCR**
  - Followed by RNA isolation of detected DNA
  - Followed by RT PCR (reverse transcriptase) assay used to detect LATs
- **Latency associated transcipts (LATs)**
  - small strands of RNA transcribed by the virus within latently infected neurons
  - Shown to be present within latently affected trigeminal ganglia.

Choose to Culture – Cases in Antimicrobial Stewardship

Silene St. Bernard, DVM, DACVPM

There is widespread acknowledgement in veterinary medicine that antibiotic resistant organisms in our livestock, and in exotic companion species like turtles, are impacting human health. However, in companion animal medicine, especially when we focus on cats and dogs, there is less attention paid at the clinical level to the impact we are having and what we could be doing to decrease the risk of resistance both to humans and to our animal patients.

Antibiotic resistance can be passed between bacterial organisms in a variety of ways including transformation, transduction and conjugation. For example, Staphylococcus organisms are often commensal in both humans (S. aureus) and animals (eg. S. pseudintermedius in dogs). They are among the most common opportunistic bacteria causing infections in many species. These organisms themselves are both zoonotic and reverse zoonotic and can transfer and share genetic material.

A study by R. Somayaji, et. al. in 2016 of 24 human S. pseudintermedius (S.pseud) infections noted that 22/24 had concurrent dog contact and 6/27 isolates were both methicillin (MRS) and multi-drug resistant (MDR). Another study by B. Walther, et.al., looked at 108 human/dog pairs at a dog show and identified that 13.9% of dogs and 5.6% of humans carried S. pseud, and all showed some level of resistance. EH Ference, et.al. evaluated 33 human patients with chronic rhinosinusitis caused by S. pseud and identified that 32/33 had dogs, 82% were MRS and many were also MDR.

Bacterial culture and antimicrobial susceptibility testing (AST) are crucial diagnostic tools for evaluating infections and determining the best treatment options. As with many diagnostics, we have seen significant improvements in these tests over the past few years.

So, how does the process work?

- The lab takes the sample provided, puts it into a growth media and identifies what bacteria are growing. Then, the bacteria are put into a set of wells/tubes with different concentrations of antibiotics to see at what point it/they no longer grow.
- The level of antibiotic at which the bacteria stops growing is called the MIC or minimum inhibitory concentration
- The formal definition of MIC is the lowest concentration (in µg/mL) of an antibiotic that inhibits the growth of a given strain of bacteria
- It is important to note that an MIC is a "bug:drug" specific combination and MICs cannot be compared across bacteria or antibiotics.
- The C&S report printout, lists the MIC as the test result. So what's next?

Next we need to define and understand the concept of a breakpoint.

- A breakpoint is the MIC range that categorizes organisms as susceptible, susceptible dose dependent, intermediate or resistant.
    - Susceptible dose dependent is a new category that replaces "intermediate" in some circumstances. At this time, it is primarily for fluoroquinolones (concentration dependent antibiotics). The lab results will let you know if you can use the drug at a higher dose than standard (for example, enrofloxacin at 10mg/kg SID vs 5 mg/kg SID – obviously only appropriate in a dog, not a cat)
- As organisms mutate and become more resistant, the breakpoints and ranges decrease indicating less effectiveness for that antibiotic against the bacteria
- A bacteria with an MIC </= 0.5 and a breakpoint range for an antibiotic of 1-4 would be sensitive and the antibiotic could be used at standard dosing, versus if the MIC was =2, it would have intermediate susceptibility and may not be the best choice or would have to be dosed more frequently or at a higher dose to be effective.

There is an organization called CLSI (Clinical Laboratory Standards Institute) that develops the breakpoints laboratories use to generate veterinary C&S reports and they create updates approximately every 4 years

- AST and breakpoint determination is a complex evaluation that includes drug characteristics like absorption, distribution, metabolism, excretion, concentration vs time dependency, drug dose/frequency; drug formulation; protein binding; body site conditions; resistance mechanisms; patient species; and more.
- In 2024, there were significant updates to the breakpoints.
    - New species specific breakpoints. This means that many of the results coming back on the C&S report will no longer be reliant on human data. The following species now have their own identified breakpoints: feline; canine; bovine; porcine; equine; fish; poultry
    - New system specific breakpoints. These are available for soft tissue, urine and respiratory. Why is this important? Bacterial susceptibility in urine is often different than in soft tissue because many drugs concentrate in the urine. This means a drug may be effective for a simple bladder infection (UTI) but may NOT work for pyelonephritis or prostatitis. These need TISSUE breakpoints, even if urine is sent in as the sample to test. Additionally, there are breakpoints specifically for the respiratory system, so ensure the lab is aware if the sample is from a bronchoalveolar lavage (BAL) or transtracheal wash (TTW).

These updates and changes have resulted in some critical changes to breakpoints so that some bacteria that we used to think were susceptible to certain antibiotics or doses in our patients, actually are not susceptible.

- ALL Enterobacterales (E.coli, Klebsiella, etc) test as resistant to ampicillin and amoxi-clav except in urine, so it is IMPORTANT to fill out source of culture info
- Fluoroquinolone susceptibility CANNOT be extrapolated to ciprofloxacin because PK/PD does NOT support its use in dogs
- Increasing resistance trends are evident with lower breakpoints for many "bug:drug" pairs including amoxi-clav and doxycycline to E.coli

So how does one choose an antibiotic? Consider the following questions as you review your options for each patient.

- Is there a bacterial infection?
- Are there current guidelines for the disease process?
- Will prescribing an antibiotic impact the clinical outcome?
- What is the site of infection?
- Do we need to culture or are there empirical options we can try first?
- What drug, dose, duration should be chosen?
- Take into consideration the patient's history
- What are the potential side effects and risk of resistance?
- Only lastly, consider price and convenience
-

Remember, an "S" is not sufficient and testing is in vitro so correlate with specific patient situations. Consider the following: site of infection; do all bacteria on the report need to be treated or can the most likely culprits be identified; patient factors – health status, underlying conditions, allergies; previous antibiotic use/history; clinical signs (severity of disease); owner factors; drug side effect profile; risk of resistance.

The 2019 ISCAID urinary guidelines recommend a urinalysis with cytology for all suspected urinary tract infections. Female dogs and male intact dogs more commonly get uncomplicated urinary tract infections (UTIs) and can be treated empirically with amoxicillin or amoxicillin-clavulanate with a recommendation duration of 3-5 days at standard dosages. However, if no improvement is noted within 48 hours, a culture is recommended. A C&S is recommended for all cats, due to the lower incidence of bacterial cystitis vs stress or urolith induced disease, and for male intact dogs, due to the risk of prostatitis. Both prostatitis and pyelonephritis require tissue based (higher) dosing and may not be responsive to the same drugs or dosages that result from a urinary C&S evaluation, so ensure the laboratory is aware of the disease process and what breakpoints are being requested.

While the updated ISCAID dermatology guidelines were not in print as of the time these notes are being shared, the content for canine pyoderma is available via an online webinar from the World Association of Veterinary Dermatology (

https://wavd.org/wvdd25-review/). Pyoderma is classified into three general categories, surface (eg. hot spots), superficial (eg. pustules) and deep (eg. furunculosis). Cytology is recommended for every pyoderma case and if a culture is performed, correlate the results from the two tests.

All pyoderma is considered a secondary disease, therefore, to appropriately manage patient care, identifying the primary cause is crucial. This can be anything from fleas to atopy to endocrine disorders. Topical treatment, starting with antiseptics such as chlorhexidine should be the first choice for all surface and superficial pyoderma cases and they should be re-checked after 2 weeks of treatment. If new lesions are appearing, re-evaluation is recommended. Topical antibiotics could follow and/or if not improving, a C&S should always be performed prior to recommending systemic antibiotic treatment. For deep pyoderma, a C&S is always recommended, because often the bacteria causing these are not treatable with standard empirical drugs or dosages.

Systemic antibiotic treatment is recommended for an initial 14 day course with re-evaluation by the veterinarian prior to considering refills. If no new lesions are occurring, many cases can switch to topical treatment until all lesions are fully resolved.

Antibiotic prescribing is a key part of a patient's treatment plan and should be considered carefully, taking into account patient specific factors and risks to both the patient and the human family members.

- Remember the "D"s
    - Confirm the **Disease** is bacterial and requires an antibiotic to treat
    - Choose the correct **Drug** for the bacteria
    - Choose the correct **Dosage** for the patient and condition
    - Choose the correct treatment **Duration**
    - **Do** Choose to Culture (and perform cytology)

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11. GI Intervention: Approach to Diagnosis and Therapy of the Patient with Acute Diarrhea; Today's Veterinary Practice May/June 2013; 20
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14. The Use of Antibiotics in Veterinary Dentistry; TVP; May/June 2023

Indications For Open Thoracotomy

- **INTRODUCTION TO OPEN THORACIC SURGERY**

- **REASONS AND CASE SELECTION**
- OPEN INCISION INTO THE THORAX, not minimally invasive
  - Better exposure most of the time
  - Equipment availability
  - Hands-on surgical capability
  - Easily remove large and/or adherent masses/structures
  - Depending on the procedure, operative time may actually be shorter with open thoracotomy
  - Minimally invasive approaches to the thorax may need to be converted to open thoracotomy; in one study in humans, 23% of thoracoscopy patients were converted to open thoracotomy; veterinary studies show ~ 5% - 26% conversion rates.

- **REQUIREMENTS FOR SUCCESSFUL OPEN THORACOTOMY**
  - Appropriate patient and case selection
  - Experienced surgeon and technician team
  - Human vs mechanical ventilator, +/one lung intubation capability
  - Strong knowledge and application of critical ANESTHETIC monitoring and ANALGESIA techniques

- **PROCEDURES WHERE MINIMALLY INVASIVE THORACOSCOPY SURGERY IS OFTEN A SUCCESSFUL CHOICE:**
    - Thoracic exploratory
    - Subtotal pericardiectomy
    - Biopsies of: lung, thoracic lymph nodes, intrathoracic masses,
    - Near-infrared node mapping
    - thoracic duct ligation
    - partial lung lobectomy

- **INDICATIONS FOR OPEN THORACOTOMY**

Indications For Open Thoracotomy

- **THORACIC WALL CONDITIONS**
    - **Rib/Sternal Fractures**
    - Rarely surgical, usually treated with thoracic bandaging (if needed)
    - If surgical, rarely needs open thoracotomy
    - Flail chest
    - 3 or more sequential ribs, fx'd in 2 or more places
    - "floating segment" moves paradoxically with breathing
    - Usually treated with bandaging, occasionally need surgery (circumcostal sutures, passed percutaneously)
    - Rarely need open surgical stabilization of rib fractures – if so, interfragmentary "basketweave" suture pattern, mesh grafts. Avoid wires. Larger ribs - +/- small bone plates/screws/K-wires, intersegmental wire or suture placement, Rarely need excision of rib fragments

    - **RIB/STERNAL NEOPLASIA**
    - Rib uncommon (sternal - rare)
    - Dogs: 90% are osteosarcoma (OSA, 60%) or chondrosarcoma (CSA, 30%), 10% other (hemangiosarcoma(HSA), fibrosarcoma (FSA), rarely other metastatic neoplasia.
    - 15 - 45% have mets at time of dx
    - Dogs - Rib OSA aggressive, high metastatic rate
    - Chondrosarcoma – best prognosis w/sx alone, low metastatic rate.
    - Cats – rare – OSA possibly less aggressive than in dogs, HSA second most common, CSA, FSA

- **INTRA-THORACIC EFFUSIONS**
    - Pleural effusion:
        - **HEMOTHORAX**
            - **SURGICAL INTERVENTION RARELY INDICATED**
            - Procedural Complications
            - Sx complications from recent thoracotomy
            - Central IV catheter placement/other IV interventions

Indications For Open Thoracotomy

- Chest tube placement
- Idiopathic hemithorax
- Idiopathic hemothorax in dogs
- dissecting aortic aneurysms, bleeding thymic neoplasms, and various coagulation disorders, including vitamin K-responsive coagulopathy and anticoagulant rodenticide toxicosis.
- Traumatic cardiac/great vessel laceration/rupture
- Neoplasia

- **PYOTHORAX**
- SURGICAL INTERVENTION LESS COMMONLY INDICATED
- Usually managed medically w/bilateral chest tubes and thoracic flushing
- Surgery is treatment of choice
- If effusion very thick and doesn't drain well
- If foreign body is present
- If dead tissue present
- If not responding to medical management
- Goal of Surgery: Lavage chest and break down adhesions, excise damaged lung tissue if present
- Can usually be done via lateral thoracotomy if mostly unilateral
- Sternal split or bilateral, lateral thoracotomies if significant bilateral involvement

CHYLOTHORAX

- Traumatic, idiopathic, secondary to other diseases

- **PNEUMOTHORAX**
  - traumatic lung lobe laceration
  - pulmonary blebs/bullae
  - thoracic tracheal avulsion

Indications For Open Thoracotomy

- **ANTERIOR MEDIASTINAL CONDITIONS**
  - Masses – thymoma, LSA,
  - Cystic masses – branchial cyst, thyroid cyst

- **PERICARDIAL CONDITIONS**
  Idiopathic effusion, Tumors, fungal plaques, restrictive pericardial conditions

- **CARDIAC CONDITIONS**
  - Valvular stenosis
  - Primary cardiac chamber neoplasia (atria, ventricles)
  - Valvular neoplasia
  - Heart based masses (aortic/carotid body)

- **GREAT VESSEL CONDITIONS**
  - tumors of the great vessels
  - kinked caudal vena cava syndrome
    -
  - congenital anomalies
    - PDA
    - PA banding for VSD
    - VRA, PRAA

- **ESOPHAGEAL CONDITIONS**
  - Neoplasia
  - Foreign body

- **TRACHEOBRONCHIAL CONDITIONS**
  - Foreign body
  - Neoplasia
  - Tear/avulsion

- **PULMONARY CONDITIONS**
  - Primary lung tumors, metastatic lung tumors, bullae and blebs, lobar torsions, lobar abscess

Pharmaceutical Management of Epilepsy

David A. Geiger, DVM

VCA Seaside Forum
May 17, 2026

Key Topics

- Characterizing seizure-like episodes
- When to begin pharmaceutical therapy
- Principles of seizure management
- Choosing a first-line antiepileptic drug (AED)
- Major and minor features of useful AEDs
- Monitoring/followup care for epileptic patients
- Multidrug therapy and miscellaneous tips

Characterizing seizure-like episodes

Is this a seizure? Or something else?

Describing seizure-like episodes

- What do you see?
- What body part(s) affected? Positions/postures?
- Regular or irregular movements? Single or multiple? High or low frequency? Does this change?
- other conditions influencing movements?
- mentation/mobility/function during episode?

Describing seizure-like movements

- myoclonus (affecting muscles of mastication)
- constant (independent of body posture, voluntary movement, or sleep).
- repetitive (regular, moderate frequency)
- mentation and voluntary movements unaffected
- constant repetitive myoclonus
- distemper virus encephalitis

Characterizing seizure-like episodes

Is THIS a seizure? Or something else?

Video copyright Cornell University

Describing seizure-like movements

- myotonia (affecting antigravity muscles of the limbs)
- action-induced
- transient (resolves spontaneously with rest)
- mentation unaffected/voluntary movements impaired
- myotonia/tetany
- ddx: congenital myotonia, metabolic tetany, tetanus

Characterizing seizure-like episodes

Are any of these seizures??

Video copyright Cornell University

When to begin pharmaceutical therapy

Are the seizures dangerous?

- single episode (ictus) lasting longer than 5 min
- sequential episodes without complete recovery in between
- 3 or more generalized seizures within a 24-hour period
- violent/injurious episodes
- compromised breathing pattern

When to begin pharmaceutical therapy

Are the seizures excessively frequent?

- two or more episodes within six months (ACVIM consensus)
- consider quality of seizures
- does frequency impact quality of life (patient or owner)?

"Natural" (pretreatment) frequency must be known to properly assess the effects of future therapy.

When to begin pharmaceutical therapy

What is the suspected (or known) cause of the seizures?

- transient etiology: reversible metabolic disease, intoxication, trauma, cerebrovascular accident, juvenile idiopathic epilepsy (maybe)
  -start immediately
- progressive etiology: neoplasia, encephalitis, hydrocephalus, neurodegenerative disease, etc.
  -start early, especially if limited to palliative therapy
- static etiology: idiopathic epilepsy
  -start only if/when routine criteria are met

Principles of pharmaceutical seizure management

- Seizure "control" is individualized for each patient and family
- Aim for 50% reduction in frequency or <1 per 1-2 months
- Balance therapeutic effect with side effects
- Consider patient and family when choosing a drug
- Use each drug to it's full extent/limit before adding another
- Change only one thing at a time!
- Teach clients to assess and communicate effects of therapy
- Attention to detail

Choosing a first-line anticonvulsant drug

Choosing a first-line anticonvulsant drug

Phenobarbital

- 82% effective (>50% reduction in seizure frequency)
- 31% became seizure-free
- safe (with routine blood level monitoring)
- inexpensive (historically!)
- convenient dosing
- variable side effects (transient and persistent)
- paradoxical hyperactivity/aggression at low blood levels
- drug interactions due to hepatic enzyme induction
- tolerance (variable)
- controlled drug (Schedule IV)

Choosing a first-line anticonvulsant drug

Phenobarbital use

- 2-3 mg/kg PO q12h initial dose (or load as needed)
- steady-state reached in 10-14 days
- check level after 2-3 weeks, 2-3 months, & then every 6 months
- recheck level 2-3 weeks after dose increase or to investigate clinical problem with seizure management
- wait 2-3 weeks for transient side effects to dissipate
- damaging side effects: hepatic failure (dose-dependent), cytopenias (idiosyncratic), necrolytic dermatitis
- monitoring: CBC, liver chemistry, serum bile acids (ideal) - pretreatment, after 2-3 months, and then every 6 months

Choosing a first-line anticonvulsant drug

Bromide

- 74% effective (>50% reduction in seizure frequency)
- 52% became seizure-free
- very safe; toxicity (rare) is reversible
- inexpensive
- convenient dosing
- variable side effects (transient and persistent)
- requires consistent dietary salt intake (keep diet unchanged)
- long period of time to steady-state
- absolute contraindication in cats

Choosing a first-line anticonvulsant drug

Bromide use

- 40 mg/kg PO q24h initial dose (or load as needed)
- steady-state reached in 3-4 months without loading
- check level after 1 month (optional), 3 months, & then every 12 months
- recheck level 1 month after dose increase or diet change or to investigate clinical problem with seizure management
- wait 2-3 weeks for transient side effects to dissipate
- side effects (dose-dependent): polyphagia, PU/PD, acute bromism, pancreatitis (possible), GI intolerance
- monitoring: biochemical profile every 6-12 months
- artifactual hyperchloremia

Choosing a first-line anticonvulsant drug

Bromide tips

- Dogs who drink seawater or raid the cold cuts
- Caution with chloride-containing IV fluids
- Discuss dietary management with owners

Choosing a first-line anticonvulsant drug

Zonisamide

- 50-60% effective (>50% reduction in seizure frequency)
- inexpensive
- convenient dosing
- comparatively mild side effects (transient and persistent)
- sulfonamide; caution with patients with sensitivity (KCS, IMPA)
- acute hepatopathy and renal tubular acidosis (rare, idiosyncratic)
- concurrent phenobarbital use increases metabolism
- potential actual and artifactual depression of thyroid levels
- potential transient ("honeymoon") effect

Choosing a first-line anticonvulsant drug

Zonisamide use

- 5-10 mg/kg PO q12h (start at low end)
- steady-state reached in 2 weeks
- check level after 2 weeks (optional, controversial)
- levels may be valuable if investigating poor effect or when used with phenobarbital
- wait 2-3 weeks for transient side effects to dissipate
- side effects (dose-dependent, mild): sedation, ataxia, GI upset
- monitoring: CBC, biochemical profile every 6 months
- monitor for clinical evidence of hypothyroidism, KCS
- once-daily dosing is feasible in cats

Choosing a first-line anticonvulsant drug

Levetiracetam

- no evidence for single-agent use for idiopathic epilepsy
- potential single-agent for seizures secondary to structural brain disease
- inexpensive
- mild and limited side effects only at very high doses
- Rapid onset with IV loading (immediate) or oral dosing (<48h)
- rapid elimination - q8h dosing (extended release in limited sizes)
- concurrent phenobarbital use increases metabolism (dose increase is safe)
- potential transient ("honeymoon") effect

Choosing a first-line anticonvulsant drug

Levetiracetam use

- 15-20 mg/kg PO q8h (safe to increase) or 15-20mg/kg PO q12h for extended-release form
- blood levels available but no evidence for utility
- monitoring: routine health checks; may need to dose-reduce with renal failure
- pulse therapy for cluster seizures (2-3x dose for 3 days after first seizure)
- safe to use as a bridge to other therapies (i.e. prior to more complete assessment/workup)
- poor choice for single-agent use for dangerous seizures
- XR caplets excreted whole in stool (note to owners)

Multidrug therapy

- explore first-line drug to safe/tolerable limit first
- change only one thing at a time
- note positive/negative effects of each drug/dose change
- use add-on drugs to allow dose-reduction of first-line drug
- consider drug interactions (especially with phenobarbital)
- short-acting drugs can stabilize seizures while long-acting drugs (i.e. bromide) take effect

Blood levels of anticonvulsant drugs

- timing of phenobarbital blood draw is not important in 90% of dogs; use peak/trough if excessive metabolic fluctuations suspected
- only phenobarbital levels predict safety (do not exceed upper limit)
- bromide levels are only significant in clinical context (upper limit is determined only by clinical side effects)
- "subtherapeutic" is determined by seizure control (not by level)

When to stop anticonvulsant drugs

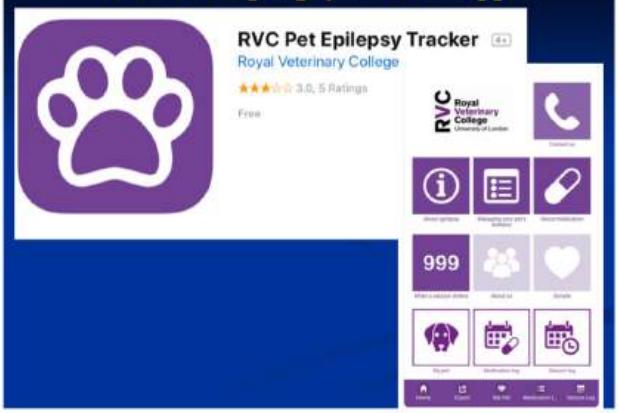
- transient seizure etiology: 3-4 months after condition is completely resolved (only if seizures have ceased)
- progressive seizure etiology: likely never, unless underlying condition is definitively treated and seizures have ceased for 8-12 months
- static seizure etiology (idiopathic epilepsy): likely never - consider weaning carefully only if seizure-free for at least 1 year
- wean drugs over at least 6 weeks if used transiently (<6 months)
- if used longer term wean over months (refer to natural seizure frequency), waiting to reassess at each new steady-state level

Miscellaneous tips

- keep good records; best to have a single clinician oversee management (benefit of referral)
- goal of therapy is to balance seizure reduction with side effects (target at least 50% reduction in seizure frequency)
- apps available to aid owners in tracking/logging seizures
- use Costco pharmacy for baseline price reference
- rectal diazepam kits for emergency use at home (store in glass); avoid tolerance - 1-2 mg/kg up to three times
- intranasal midazolam (using atomizer) likely superior to rectal benzodiazepenes - 0.25mg/kg
- frequency of hospitalization is predictive of mortality in dogs with idiopathic epilepsy (euthanasia due to escalating cost)

Mucosal atomization device

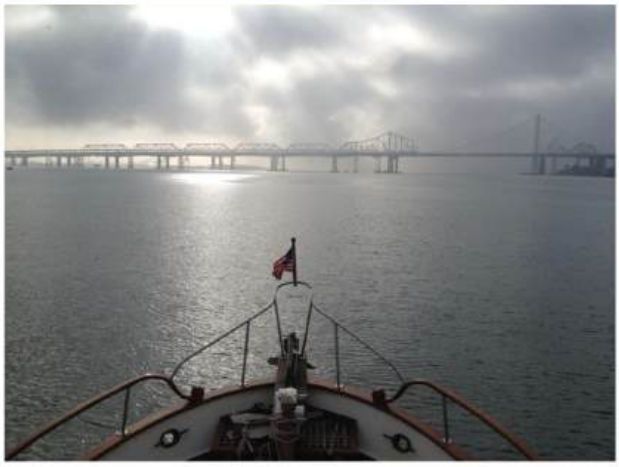
RVC Pet Epilepsy Tracker App



Case Study

- 10-year-old FS Yorkshire terrier
- Adopted 1 month ago with unknown prior health history
- Walking in circles for the past 3-5 days, intermittently vocalizing
- Generalized seizure occurred 1 hour prior to presentation, lasting ~1 minute

Case Study



Neurology/Neurosurgery at VCA Animal Specialty Group

- Monday-Friday, plus ER services 24/7/365
- Regular appointments and direct transfer via Emergency/ Critical Care
- Phone and email consultations available for referral and non-referral cases
- On-site high-field MRI, CT, electrodiagnostics

david.geiger@vca.com

VCA Animal Specialty Group
5610 Kearny Mesa Rd., Suite B
San Diego, CA 92111
858-560-8006
Fax: 310-442-4548

HEATSTROKE IN DOGS

ANN-MARI OSGOOD, BVETMED, DACVECC

LEARNING OBJECTIVES

- IDENTIFY THOSE PATIENTS AT RISK
- PATHOPHYSIOLOGY OF HEATSTROKE
- TARGET ORGANS
- TREATMENT
- PROGNOSTIC INDICATORS

FRANKIE

- 3 YEAR OLD MN LABRADOR
- HIKING WITH HIS FAMILY TO POTATO CHIP ROCK
- OUTSIDE TEMPERATURE : 75 DEGREES F AND SUNNY
- NOTED TO BE WALKING "A LITTLE FUNNY" ON HIKE BACK BUT PRIOR TO HAD BEEN RUNNING AROUND EXUBERANTLY
- SMALL VOLUME DIARRHEA NOTED AS WELL
- THEY OFFERED HIM WATER AND FOOD. CONSUMED A SMALL VOLUME OF WATER BUT VOMITED IT UP
- TIME FROM TRAILHEAD TO CLINIC ~ONE HOUR

FRANKIE'S PHYSICAL EXAM

- T: 102.4 P: 180: R: 50, WEIGHT: 32KG
- MENTATION: DULL BUT RESPONSIVE, BCS 5/9
- CVS: MM RED/PINK & TACKY, 7-10% DEHYDRATED, PULSE QUALITY FAIR TO WEAK
- RESP: TACHYPNEA, INCREASED BRONCHOVESICULAR SOUNDS
- NEURO: DULL MENTATION, WEAK BUT NERVOUS FUNCTION INTACT
- MS: VERY WEAKLY AMBULATORY X4, PREFERS RECUMBENCY
- RECTAL: DIARRHEA WITH SLIGHT HEMORRHAGE PRESENT ON RECTAL

- YOU ASK YOUR TECH TO PLACE A CATHETER. SHE THINKS SHE IDENTIFIES SOME BRUISING WHILE SHE'S SHAVING, BUT SHE ISN'T SURE.

DEFINITIONS

- "HYPERTHERMIA ASSOCIATED WITH SYSTEMIC INFLAMMATORY RESPONSE SYNDROME LEADING TO A SYNDROME OF MULTIORGAN DYSFUNCTION IN WHICH ENCEPHALOPATHY PREDOMINATES." EPSTEIN 2019
- HALLMARKS:
  - ELEVATED CORE BODY TEMPERATURE (>105.8°F OR 41°C)
  - CENTRAL NERVOUS SYSTEMIC DYSFUNCTION
  - +/- MULTI-ORGAN DYSFUNCTION

DEFINITIONS (CONT'D)

- HEAT CRAMP:
  - MUSCLE SPASMS RESULTING FROM SODIUM AND CHLORIDE DEPLETION
- HEAT EXHAUSTION
  - FATIGUE, WEAKNESS, MUSCLE TREMORS, VOMITING, DIARRHEA

GENERAL TYPES OF HEATSTROKE

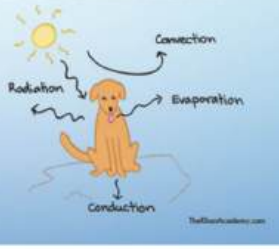
- ENVIRONMENTAL OR CLASSICAL
  - RESULT OF HOT OR HUMID ENVIRONMENT
- EXERTIONAL
  - EXCESSIVE STRENUOUS EXERCISE
  - PROLONGED & UNCONTROLLED MUSCLE TREMORS
  - SEIZURES
  - TOXICITIES

PROTECTIVE MECHANISMS

- THERMOREGULATION
- ACUTE-PHASE RESPONSE
- HEAT SHOCK PROTEINS

THERMOREGULATION

- REGULATED BY TEMPERATURE SENSITIVE CENTERS OF HYPOTHALAMUS
- HEAT DISSIPATION CONTROLLED BY:
  - CONVECTION*
  - CONDUCTION
  - RADIATION*
  - EVAPORATION



THERMOREGULATION: HEAT LOSS

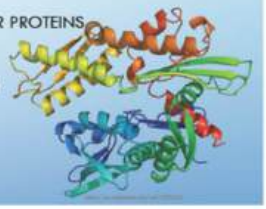
- INCREASED CUTANEOUS CIRCULATION
- EVAPORATIVE LOSSES- PANTING
  - NASAL TURBINATES
- PAW PADS
  - THIS IS A TINY REGION TO RELY ON

ACUTE PHASE RESPONSE

- RESTORE HOMEOSTASIS IN THE BODY
- PRO & ANTI-INFLAMMATORY CYTOKINES
- PROMOTE ACUTE PHASE PROTEINS
- ACTIVATION OF ENDOTHELIAL CELLS & WHITE BLOOD CELLS
- PROTECTIVE WHEN IN BALANCE

HEAT SHOCK PROTEINS

- PRODUCED BY NEARLY ALL CELLS IN RESPONSE TO HEAT
- PARTICIPATE IN FOLDING & UNFOLDING IN PROTEIN SYNTHESIS & DEGRADATION
- STABILIZE THE CELL IN OTHERWISE LETHAL STAGES
- PROTECT AGAINST DENATURATION OF INTRACELLULAR PROTEINS
- REGULATE BARORECEPTOR RESPONSE
  - PREVENT HYPOTENSION AND PROTECT THE HEART



Hospitalized dogs recovery from naturally occurring heatstroke; does serum heat shock protein 72 can provide prognostic biomarker?

Yaron Bruchim[1] · Gilad Segev[2] · Efrat Kelmer[1] · Carolina Codner[1] · Ahmad Marisat[1] · Michal Horowitz[1]

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HEATSTROKE IN A NUTSHELL..

Direct heat insult → **Failure of heat dissipation mechanisms** → **Initiation of inflammation, hemostatic, tissue damage** → **Systemic Inflammatory Response activation** → **Progresses to Multiple Organ Dysfunction Syndrome**

RISK FACTORS FOR HEATSTROKE

- BREEDS
  - BRACHYCEPHALICS, GOLDENS, LABRADORS, MILITARY WORKING BREEDS, ASSISTANCE DOGS
- OBESITY
- PREVIOUS HEAT STROKE EVENT
- HIGH ACTIVITY & HEAVY EXERCISE
- LACK OF FITNESS
- CARDIAC DISEASE
  - BETA-BLOCKERS
- LACK OF ACCLIMATIZATION
- ACUTE EXPOSURE TO HEAT, HUMIDITY, OR BOTH

WHY THOSE BREEDS?

- MILITARY WORKING DOGS
  - FREQUENT EXPOSURE TO INTENSIVE TRAINING AND WORK IN HARSH ENVIRONMENTS
  - THEORETICALLY BETTER ACCLIMATIZATION
- GOLDENS & LABRADORS
  - ENERGETIC DISPOSITION
  - OFTEN OVERWEIGHT
- ASSISTANCE BREEDS
  - ACCOMPANY THEIR HUMANS ALMOST EVERYWHERE

WHEN HEATSTROKE IS UNEXPECTED…

- STRESSED PATIENTS IN KENNELS OR WAITING ROOM
- SEIZURE PATIENTS
- LARYNGEAL PARALYSIS YOU DIDN'T KNOW ABOUT
- AIRWAY MASSES OR COLLAPSING TRACHEA
- ANXIOUS BRACHYCEPHALICS WAKING UP FROM ANESTHESIA

SEASONALITY

- USUALLY WHEN WARM, HUMID WEATHER BEGINS
  - >35% HUMIDITY MAKES PANTING LESS EFFECTIVE
  - > 80% HUMIDITY NEGATES PANTING
- SPORADIC HOT DAYS WHEN IT SHOULD BE WINTER..
- LATE SUMMER LESS COMMON
  - ACCLIMATIZATION?
  - OWNER AWARENESS?

PHYSICAL EXAM FINDINGS

- ELEVATED BODY TEMPERATURE
  - NOT ALWAYS! CAN BE NORMAL OR LOW
- ALTERED MENTATION
- HYPEREMIC MUCOUS MEMBRANES
- DECREASED CAPILLARY REFILL TIME
- TACHYPNEA
- TACHYCARDIA
  - SOMETIMES ARRHYTHMIAS
- WEAK PULSES

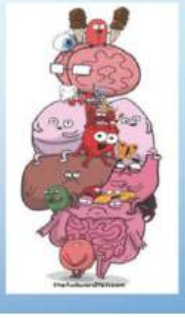
- FRANKIE'S PE:
  - NORMAL BODY TEMPERATURE-102.4 ✓
  - DULL MENTATION ✓
  - PINK/RED MUCOUS MEMBRANES ✓
  - TACHYCARDIA 180 ✓
  - TACHYPNEA 50 ✓
  - FAIR PULSES✓

CORE BODY TEMPERATURE

- >105.8F CAN LEAD TO PERMANENT BRAIN DAMAGE
- >107.6F INCREASED PLATELET AGGREGATION
  - ACTIVATES COAGULATION CASCADE & FIBRINOLYSIS
  - COOLING ONLY DECREASES THE FIBRINOLYSIS
- >109.4F RESULTS IN ORGAN DAMAGE
- >120.2F CAUSES CELLULAR NECROSIS

BODY SYSTEMS AFFECTED

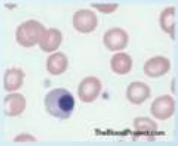
- ANY.
- MUSCLE
- CARDIOVASCULAR
- NEUROLOGIC
- COAGULATION
- RENAL
- GASTROINTESTINAL
- HEPATIC
- RESPIRATORY



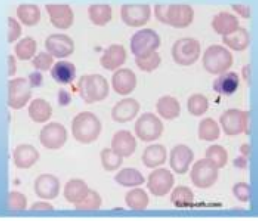
DIAGNOSTICS

- TEMPERATURE
  - DON'T FORGET RECHECKS!
- CBC & CHEMISTRY- PLEASE DON'T SEND OUT
  - MINIMUM: PCV/TS, BUN, GLUCOSE, NA+, K+
- PT/APTT OR VISCOELASTIC MONITORING
- EKG
- BLOOD PRESSURE
- URINALYSIS

BLOODWORK

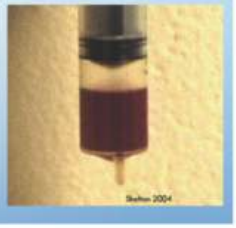


- CBC
  - NRBC: >18 PER 100 LEUKOCYTES AT PRESENTATION
  - 91% SENSITIVITY AND 88% SPECIFICITY FOR PREDICTING DEATH
- CHEMISTRY
  - BUN
  - CREATININE- PEAKS WITHIN 24-48 HOURS
  - GLUCOSE
  - LACTATE
  - NA/K ABNORMALITIES
  - CREATININE KINASE ELEVATIONS

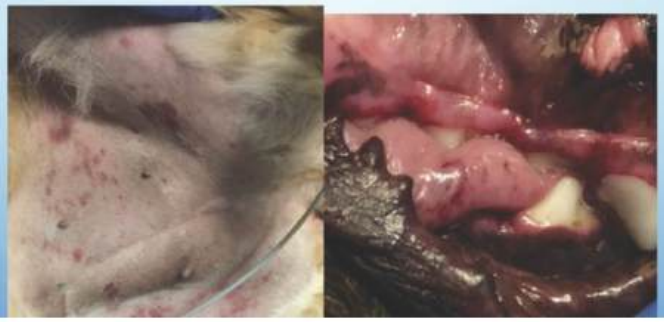


URINALYSIS

- NO CYSTOCENTESIS UNTIL COAGULOPATHY RULED OUT
- URINE SPECIFIC GRAVITY
  - INTERPRET CAUTIOUSLY BECAUSE OF PATIENT STATUS
- PROTEIN
- HEMOGLOBIN
- MYOGLOBINURIA
- GLUCOSURIA



UPDATE ON FRANKIE..



COMPLICATIONS

- RHABDOMYOLYSIS
- NEUROLOGIC DAMAGE
- ACUTE KIDNEY INJURY
- ACUTE RESPIRATORY DISTRESS SYNDROME
- HEPATOPATHY
- SEPSIS
- ACUTE PANCREATITIS
- DISSEMINATED INTRAVASCULAR COAGULOPATHY (DIC)

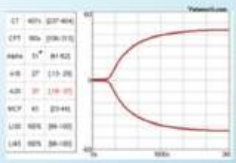
NEUROLOGIC DYSFUNCTION

- SUSPECTED TO OCCUR DUE TO SHOCK AND MULTI ORGAN DYSFUNCTION
- CEREBRAL HYPOPERFUSION DUE TO RESPIRATORY ALKALOSIS AND SHOCK
- DIRECT THERMAL DAMAGE ALREADY CAUSES:
  - VASCULAR DAMAGE
  - CEREBRAL EDEMA
  - HEMORRHAGE
  - VASCULAR THROMBOSIS AND INFARCTION

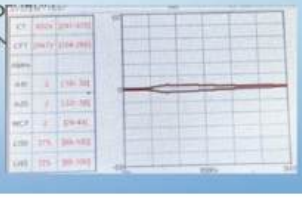
ACUTE KIDNEY INJURY

- PATHOGENESIS LIKELY MULTIFACTORIAL
  - DIRECT THERMAL INJURY
  - DECREASED RENAL PERFUSION SECONDARY TO SHOCK
  - ENDOTOXEMIA
  - MYOGLOBINEMIA SECONDARY TO RHABDOMYOLYSIS
  - RELEASE OF CYTOKINES, VASOACTIVE MEDIATORS AND MICROTHROMBI
  - ASSOCIATED WITH DIC
- HUMAN STUDIES SHOW PROGRESSION TO CHRONIC KIDNEY INJURY
- CHEN 2015- EARLY CRRT REDUCED PERCENTAGES OF NEUTROPHILS AND APACHE II SCORES

COAGULATION VALUES



- PT/APTT AND VISCOELASTIC MONITORING
- COAGULATION CASCADE ELEVATION:
  - THERMAL INJURY TO THE TISSUES AND ENDO
  - RESULTS IN CONSUMPTION OF PLATELETS AN
- RECHECK PLATELET COUNTS
- RECHECK COAGULATION PARAMETERS



CARDIAC ABNORMALITIES

- TACHYARRHYTHMIAS AND VENTRICULAR ARRHYTHMIAS
- MYOCARDIAL NECROSIS & SUBENDOCARDIAL HEMORRHAGES COMMON ON NECROPSY
- TREATMENTS:
  - LIDOCAINE
  - MAGNESIUM SULFATE
  - SOTALOL
  - PROCAINAMIDE

Clinical Service:	SA Critical Care	Fasting Sample:	Yes
Senior Clinician:	Rutter, Christine	Zoonotic Concern:	None
Attending Clinician:	Osgood, Ann-Mari	Email Results:	Yes/No
		Sample Container:	

Pertinent History:
Heat stroke (Temp of 108 on presentation), coagulopathy, tachyarrhythmias
Tests Requested: Ultra-sensitive Troponin

Test Name	Result	Flag	Reference	Unit
Ultra-sensitive Troponin	> 50	H	0 - 0.09	ng/ml

INITIAL TREATMENTS

- GOAL: TAKE ADVANTAGE OF HEAT DISSIPATING MECHANISMS
  - EVAPORATIVE!
- EXTERNAL COOLING
- NO TECHNIQUE HAS BEEN PROVEN EFFECTIVE OVER OTHERS
- DISCONTINUE COOLING WHEN BODY TEMPERATURE HITS 103F
  - GOAL TO PREVENT REBOUND HYPOTHERMIA
- ROOM TEMPERATURE INTRAVENOUS FLUIDS

Would you initiate cooling for Frankie?

TREATMENTS WHILE HOSPITALIZED

- GASTROPROTECTANTS
- BROAD SPECTRUM ANTIBIOTICS
- ANTIDIARRHEALS
- FRESH FROZEN PLASMA
  - EVIDENCE OF ACTIVE BLEEDING
  - COAGULOPATHY ON VCM ON SEVERELY PROLONGED PT/APTT
  - DIC

TREATMENTS TO AVOID

- ALCOHOL TO THE ENTIRE DOG
  - PAW PADS OK…BUT HAS NOT BEEN EVALUATED FOR EFFICACY
  - RECONSIDER APPLICATION IF ANY CHANCE OF NEEDING A DEFIBRILLATOR
- ICE BATH
  - PERIPHERAL VASOCONSTRICTION DECREASING HEAT DISSIPATION
- INTERNAL COOLING ?
  - GASTRIC LAVAGE, ICED PERITONEAL LAVAGE, COLD WATER ENEMAS
  - HIGH RISK FOR SERIOUS COMPLICATIONS
- STEROIDS?
  - EXCEPTION: BRACHYCEPHALICS WITH AIRWAY CRISIS

MONITORING

- EVERY 12 HOURS
  - PT/APTT OR VCM
  - CREATININE
  - ELECTROLYTES
- CONTINUOUS
  - EKG
  - URINE OUTPUT

Frankie's plan:
Hospitalization for 24-48 hours
Continuous EKG
Blood pressure q4hr
VCM/Full bloods q12hr
Supportive therapies

UPDATE ON FRANKIE…

- DIC ON HIS VCM
- RECEIVED 480 MLS OF FFP
- APPEARED TO IMPROVE
- RECHECK BW @ 12 HOURS
  - NO PLATELETS
  - ACUTE KIDNEY INJURY
  - LIVER VALUES INCREASING
- DEVELOPED UNCONTROLLABLE VENTRICULAR ARRHYTHMIAS OVERNIGHT

MORTALITY RATES

- BRUCHIM ET AL. 2017- 50%
- SEGEV ET AL. 2015- 43%
- HALL ET AL. 2020- 56.76%

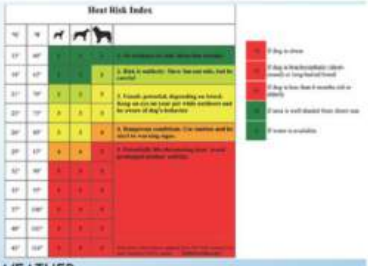
RISK FACTORS FOR DEATH

- OBESITY
- PROLONGED TIME TO PRESENTATION
- HYPOGLYCEMIA ON PRESENTATION
- PATHOLOGIC METARUBRICYTOSIS
  - INCREASED NUCLEATED RED BLOOD CELL COUNT
- DEVELOPMENT OF ANY:
  - DISSEMINATED INTRAVASCULAR COAGULOPATHY
  - VENTRICULAR ARRHYTHMIAS
  - SEIZURES
  - ALTERED MENTATION

SIGNIFICANT ASSOCIATIONS

- SIGNIFICANTLY ASSOCIATED WITH DEATH:
  - PROLONGED PT & APTT AT 12-24 HOURS POST PRESENTATION
  - LOWER TOTAL PROTEIN C ACTIVITY AT 12 HOURS POST PRESENTATION
  - HYPERFIBRINOGENEMIA AT 24 HOURS POST PRESENTATION
- INDEPENDENT RISK FACTORS:
  - ACUTE KIDNEY INJURY AT ANY TIME POINT
  - SERUM CREATININE >1.5 MG/DL AT 12 & 24 HOURS POST PRESENTATION

PREVENTION



- CLIENT EDUCATION
- WEIGHT MANAGEMENT
- PRECONDITIONING
  - PHYSICAL FITNESS
  - GRADUAL INTRODUCTIONS TO HOT WEATHER
- AVOID EXERCISING IN HOT WEATHER
  - ESPECIALLY IF COMPROMISED AIRWAY OR HEALTH
- ACCLIMATIZATION

TAKEAWAYS

- DOES IT HAVE TO BE HOT FOR A HEATSTROKE EVENT? NO.
- COOL WITH ROOM TEMPERATURE WATER TO 103F
- MORTALITY ~50%
- JUST BECAUSE THEY'RE "FINE" ON PRESENTATION.. DOESN'T MEAN THEY'LL STAY THAT WAY
- TREATMENT CAN BE CHALLENGING AND COMPLEX

QUESTIONS

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PawsitiveRelief: Integrative Strategies for Managing Osteoarthritis
Barrie Sands DVM, CVA, HMCT

Objective:
Thislecture will cover the topic of Osteoarthritis and the introduction and implementation of integrative strategies for treatment and management. It will cover physiology, the pathophysiology, current conventional western modalities and introduce and highlight various integrative modalities in use.

Osteoarthritis OA– A Brief Overview

OA is one of the most prevalent diseases in both dogs and cats.The pathophysiology of osteoarthritis is a complex progressive process involving mechanical, biochemical, and inflammatory factors that ultimately lead to joint degeneration.
Up to ~80% of dogs may show signs by around 8 years of age (especially large breeds).
It frequently starts earlier in life due to conformational abnormalities, and high mechanical stress on joints.

Prevalence increases sharply with:

- Age
- Body weight
- Developmental joint disease
- Environmental toxins/stress
- Inflammatory diets
- Subclinical dehydration

In dogs, it's commonly diagnosed clinically. In cats, it's equally or more prevalent, but underdiagnosed.
In cats:
Only about 15–30% show obvious clinical signs
22–34% of cats overall show OA on imaging
~60% in cats ≥6 years
Up to 90% in cats older than ~12 years

Pathophysiology of Osteoarthritis -What Goes Awry?

Six stages of destruction:

1.Cartilage Breakdown

- Chondrocytes become dysfunctional.
- There's increased breakdown of matrix (collagen and proteoglycans).
- Enzymes like matrix metalloproteinases (MMPs) degrade cartilage faster than it can be repaired.

2.Low-Grade Inflammation

- Damaged cartilage releases signals that activate the synovium.
- Synovial cells produce inflammatory cytokines (e.g., IL-1, TNF-α), which further damage cartilage and inhibit repair mechanisms

3.Subchondral Bone Changes

- The bone beneath the cartilage responds to stress. It becomes thickened and sclerotic and develops microfractures.
- Bone remodeling becomes abnormal, contributing to pain and stiffness.

4.Osteophyte Formation

The body attempts to stabilize the joint These can limit movement and cause mechanical pain.

5.Joint Space Narrowing

Leads to increased friction and bone-on-bone contact in advanced disease.

6.Biomechanical Stress & Risk Factors

Repetitive use, injury, or misalignment increases joint stress.
Common contributors:

- Aging
- Obesity (increased load + inflammatory mediators)
- Prior joint injury
- Genetics and Epigenetic factors

Understanding the Role of the Chondrocytes

The dysfunction of chondrocytes starts the process. They reside within tiny spaces called lacunae, embedded within the cartilage matrix they create. These cells are found in various types of cartilage:

- Hyaline cartilage (covering bone ends in joints)
- Elastic cartilage (in the ear and epiglottis)
- Fibrocartilage (in intervertebral discs and the meniscus)

They are highly specialized and metabolically active, dedicating their energy to the development, maintenance, and repair of the extracellular matrix (ECM). The ECM is a complex mixture primarily composed of water, collagen, and proteoglycans. Chondrocytes synthesize type II collagen and proteoglycans, which give cartilage its strength, flexibility, and shock-absorbing properties. This continuous synthesis and degradation of matrix components by chondrocytes are crucial for maintaining the tissue's structural integrity and mechanical function. Cartilage is an avascular tissue and receives nutrients through diffusion from the surrounding synovial fluid and adjacent tissues, a process aided by compressive forces. This contributes to the slow turnover and limited repair capacity of cartilage.

Understanding the Pain Cycle

Chronic inflammation or trauma causes pain in the locally affected and areas of compensation. Pain is one of the major aspects of immobility and emotional stress for the animal and the owner. Pain causes muscle tension/spasm which decreases blood circulation, which causes tissue hypoxia, which lead to further pain in the affected muscles. This intensifies the spasm, leading to increases in hypoxia, pain and sustained spasm. This eventually leads to decreased mobility, muscle atrophy and weakness, decreased function and emotional and mental distress.

Nociceptors and Gate Control Theory

Pain is largely mediated via the dense array of free nerve endings called nociceptors. They respond to mechanical, chemical and thermal influences. Understanding the Gate Control Theory of pain is beneficial to understanding how to alleviate pain. As pain is used as a protective mechanism to prevent further injury of the affected area, ultimately it is the perception of the pain that is the driving factor of alleviation. This is called pain tolerance and varies between individuals.
Stimulation of A-Delta (Sharp) and C-fiber (dull) inputs open the gate and causes the pain to be perceived. Stimulation of A- beta and A – alpha fibers close the gate.
The synapse of the nociceptors is filled with immune cells, inflammatory mediators, cytokines, and various chemokines and neurotransmitters. These can be modified by applying mechanical pressure, acupuncture, and specific sound frequencies locally to the site of pain stimulating the A beta and A- alpha fibers and closing the gate.

Current Conventional Therapies

The most widely used therapies are pharmaceutically driven towards pain control and are not without concerning side effects. These include: NSAIDS, steroids, and drugs like Gabapentin, Tramadol, Codeine -with or without Tylenol, and the relatively new anti-Nerve Growth Factor monoclonal antibody (mAb) such as Librela and Solensia.
There is an outreach into more nutraceutical-based therapies such as Adequan and Dasuquin and an increased popularity of regenerative therapies such as PRP/Stemcell, sound and light therapies such as Shock wave and LLT LASER.

As pain control is important, the ultimate goals go beyond that and are to:

- Decrease inflammation
- Manage pain locally and globally
- Increase mobility and muscle mass
- Decrease oxidative stress
- Manage toxic cellular byproducts
- Support cellular regeneration and mitochondrial function
- Improve quality of life.

Functional Medicine aims to work at the foundation of disease while incorporation all the different systems. The foundation is cellular health, decreasing oxidative stress, and supporting redox reactions and mitochondrial vitality.

Integrative Therapies

Diet is the number one aspect of wellness that the majority of integrative practitioners focus on. As Hippocrates said, *"Let food be thy medicine and medicine be thy food."*
Nutrients that go into the body affects the diversity and functionality of the gut microbiome, leading to the health of the gastrointestinal tract, enhancing the ability to break down, absorb and utilize nutrients, modulate a healthy balanced immune system, while decreasing inflammation, and help supply the cellular functions with what they need. It all starts with gut health. We can control inflammation and the inflammatory mediators through the use of various phytonutrients,

found in plants and other food sources containing constituents such as bioflavonoids, polyphenols, anthocyanidins, alkaloids, terpenoids, enzymes, co-enzymes, vitamins, and minerals.
In the world of functional medicine, there is a long list of different therapies that can be instituted. Protocols are tailored to the individual patient and practitioners' level of expertise.

These therapies are considered safe and have very few if any, untoward side effects. These include.

- Acupuncture and Acupressure
- Chiropractic care and Rehabilitation therapy
- Functional Food therapy and Nutraceuticals
- HBOT- Hyperbaric Oxygen Therapy, and Ozone
- Medicinal Botany and Phytotherapy
- Essential oils, Aromatherapy, Zoopharmacognosy

Frequency Medicine:

- Photobiomodulation- LLLT, Infared
- Sound and Resonance therapy
- Quantum healing- Reiki, Therapeutic touch
- Homeopathy

Regenerative Medicine:

- Stem cell therapy
- Platelet-rich plasma (PRP)
- Peptides

Stem Cell Therapy
At the forefront of regenerative medicine is stem cell therapy.
Stem cells possess the ability of regenerating and developing into any cell, organ or tissue of specific function. It is one of the most practical and effective ways to repair cell damage and treat fatal injuries or cell degeneration in different body parts. It does so by reversing the symptoms, supporting anti-inflammatory mechanisms and boosting the formation of new healthy cells.

Very Small Embryonic-Like Stem Cells (vSELS) and Nano-Bioelectronic Photo-Acoustic Therapy (NPT) using Strachan-Ovokaitys Node Generator (SONG) Technology

VSELS are pluripotent and can form all types of cells in the body. They are non-tumorigenic and possess unique regenerative properties. It is generally agreed that hVSEL stem cells are a population of epiblast-derived cells created during embryonic gastrulation which further highlights their important role in normal physiology as well as their role in rejuvenation and longevity. These cells are autologous, meaning a perfect match for the person or animal and because of this, there are no risks of rejection or other adverse immunologic reactions such as the cells attacking the host. These cells are very small measuring at a diameter of 1-4 microns. This is vitally important, as they can travel through the small capillaries of the pulmonary system and cross the blood brain barrier. This is important as when cells are injected intravenously the first place they go is to the right side of the heart, then the pulmonary arteries, and then through the lungs. The diameter of the lung capillaries is about 6 microns.

The Quantum Science of the SONG Laser

The SONG is a modulated (5 mW,670 nm) red laser light designed to transform the red light transverse wave into an acoustic longitudinal wave with a destructive interference to create the helical phase locked conjugated standing wave form. This sets up a vibroacoustic resonance with the stem cells they are activating. The remaining upper and lower wavelength bands create a beat frequency pattern of sparse nodes of constructive interference which represents the physical visible light that remains. Modulation of this complex wave form pattern results in a rapid traverse of these nodes that can reach pulse repetition frequencies at intervals as rapid as sub-femtosecond. In essence, the SONG laser technology sends a three-dimensional helical spiral homing vibroacoustic signal which then sets up a cell detected resonance frequency which is then used through tissue to direct the stem cells where to go in tissue to concentrate and regenerate. Simply, it gives the command sequence of "go there, stay there, and repair there."

In Conclusion

Osteoarthritis is a highly prevalent condition that is the clinical manifestation of deeper physiological imbalances with the foundation of cellular deterioration, inflammation and maladapted immune systems. It not only impacts the individual animal but the family as well. With the aid of integrative therapies, it is possible to achieve a level of regeneration, rejuvenation and over all well-being.

Resources

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Cultivating Leaders: The Art of Empowering the Next Level

Building strong teams through empowerment, growth, and culture

Cassee Wdowiak, CVPM

Seaside Forum
San Diego, CA

- *Married 2017*
- *3 Beautiful step kids*
- *2 Dachshunds*
- *Love camping, fishing, anything outdoors*

Seaside Forum
San Diego, CA

The Core Foundations of Leadership

1. **Trust & Integrity**
2. **Self-Awareness & Authenticity**
3. **Consistency**
4. **Empathy & Respect**
5. **Vision & Influence**

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Trust and Integrity

- Trust is the foundation of effective leadership. Without it, people may respect your title, but they won't truly follow your lead.
- Integrity (doing what you say, being consistent, honest, and fair) reinforces that trust.

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Self-Awareness & Authenticity

- Leaders must understand their strengths, weaknesses, and values.
- Authentic leaders create credibility by being genuine, not pretending to be perfect.

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Consistency

- Teams thrive on predictability. Consistency in behavior, decision-making, and expectations makes people feel safe and able to focus on their work.

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Empathy & Respect

- Leadership is about people, not tasks.

- Respecting each individual, listening actively, and valuing contributions builds engagement and loyalty.

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Vision & Influence

- Even at the foundation, leaders need to communicate *why* the work matters.

- Influence comes from showing direction and inspiring others, not from controlling them.

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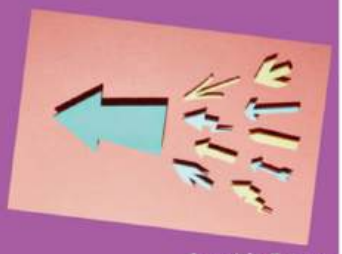
Why Leadership Matters

- Creates Clarity and Direction
  - Provides Vision
- Builds Trust and Culture
  - Sets the tone for how others interact
- Drives Performance and Results
  - Motivates people to give their best



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- Inspirates and Retains people
  - Reduces turnover
- Guides Through Challenges
  - Keeps people focused
- Multiplies Impact
  - They don't just manage tasks – they develop other leaders

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Leadership vs. Management

- Management = tasks, schedules
- Leadership = people, growth
- Both are needed

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The Growth Mindset of a Leader

- **Abundance mindset** – there's room for more leaders
- **Humility** – legacy over ego
- **Patience** – growth takes time
- **Empowerment** – delegate with trust, not dumping

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Empowerment in Action

- Delegate with trust, not abdication
- Set clear expectations + give autonomy
- Provide resources & coaching
- Follow up with support, not control

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Do not edit
How to change this session

What is the biggest barrier you face to empowering someone on your team?

The Slido app must be installed on every computer you're presenting from slido

Barriers to Empowerment

- Fear of losing control or quality
- "It's faster if I do it myself"
- Low trust or unclear expectations
- Culture that punishes mistakes

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Overcoming Barriers – The Cycle

- **Name it** – acknowledge the barrier
- **Reframe it** – see it as a growth opportunity
- **Release it** – take a small step toward letting go

Name It
Reframe It
Release It

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Tools for Empowerment

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Turning Feedback into a Growth Engine

- **Shift from correction → coaching.**
  Focus on *how to improve*, not *what went wrong.*
- **Feed forward, not backward.**
  Emphasize future actions and opportunities.
- **Make feedback a conversation.**
  Two-way, specific, and supportive.
- **Recognize effort as much as outcomes.**
  Growth often happens before results show.

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Leading Leaders: Building Trust That Multiplies Impact

- **Trust your leaders to lead.**
  Empower them to make decisions — even if they do it differently than you would.
- **Be clear, not controlling.**
  Set expectations, provide support, then step back.
- **Coach through mistakes.**
  Use errors as opportunities for growth, not grounds for doubt.
- **Model consistency and integrity.**
  When we hold ourselves accountable, our leaders follow suit.

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A strong culture doesn't just support growth — it creates it

- **Culture sets the tone for leadership behavior**
  - People lead based on what's modeled and rewarded
- **Reinforce values through daily actions**
  - **What we** *tolerate* defines culture just as much as what we *celebrate.*
- **Create belonging before expecting performance**
  - Leaders thrive when they feel seen, supported, and safe.
- **Culture is everyone's responsibility — but leadership drives it.**

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The 70-20-10 Rule of Leadership Growth

- **70% – Learning by Doing**
  Real leadership growth comes from hands-on challenges, projects, and decision-making opportunities
- **20% – Learning Through Others**
  Coaching, mentorship, and feedback turn experiences into growth
- **10% – Learning Through Training**
  Courses, CE, and leadership programs reinforce what's practiced in real life

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Do not edit
How to change this session

What do you think contributes most to leadership growth?

The Slido app must be installed on every computer you're presenting from slido

Our Commitment to Leadership Growth

- Mentorship & peer learning opportunities
- Leadership check-ins and development plans
- Safe space for learning through mistakes

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Your Leadership Legacy

Leadership is less about title — more about influence

The impact you make is in the people you grow

Every day is a chance to lead by example

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Leadership Is a Choice — Every Day

Great leaders don't wait for opportunities — they create them."
— *Simon Sinek*

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Questions?

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Broken Systems, Preventable Mistakes: A Root Cause Approach to Veterinary Practice

Melissa Hulgreen, MS, RVTg, VTS (ECC)

Introduction

In the fast paced, high stakes environment of a veterinary hospital, mistakes aren't just a possibility, they are an inevitability. Many are small and insignificant or even near misses that are caught in time. But some medical errors can lead to devastating outcomes for both our patients and our teams. In order to foster a culture that is progressive and psychologically safe, we must move away from systems designed to punish and blame and move towards ones that help us get to the root of *why* errors happen in the first place.

Culture of Safety

A culture of safety describes the core values and behaviors that come about when there is collective and continuous commitment by organizational leadership, managers, and healthcare workers to emphasize safety over competing goals (ANA, 2016).

Attributes include:

- Emphasis on quality
- Teamwork
- Leadership support
- Communication
- Non-punitive response to errors
- Perception of organizational commitment
- Work design
- Staffing and workload

Resources (Gershon et al., 2004; Stone et al., 2005).

Safety Culture vs. Safety Climate

- *Safety culture* is a broad term encompassing overall organizational culture, values, and actions.
- *Safety climate* is a narrower term focusing on staff's current perceptions about supervision, resources, and policies that support how safety practices are monitored and managed through trust and transparency (TJC, 2021).

Benefits

- Decrease in medical errors/adverse events
- Improved patient outcomes
- Improved job satisfaction/retention; reduced burnout

The Stats

March 2025 Study on Psychologically Safe Culture

  - Most participants reported experiencing at least one patient safety event within the last 12 months. The percentage was highest for veterinarians (79%), followed by managers/directors (74%), and veterinary technicians (67%).
  - The majority of those involved in a patient safety event reported they talked to their supervisor about the incident (79% of veterinarians, 83% of veterinary technicians, and 83% of veterinary assistants).

- Veterinary team members surveyed expressed the greatest desire for the following support after a patient safety event:
  - Access to a respected peer to discuss the details of what happened (71%);
  - A specified peaceful location available to recover and recompose (64%); and
  - An employee assistance program that includes free counseling (61%)

Medical Errors

The Stats

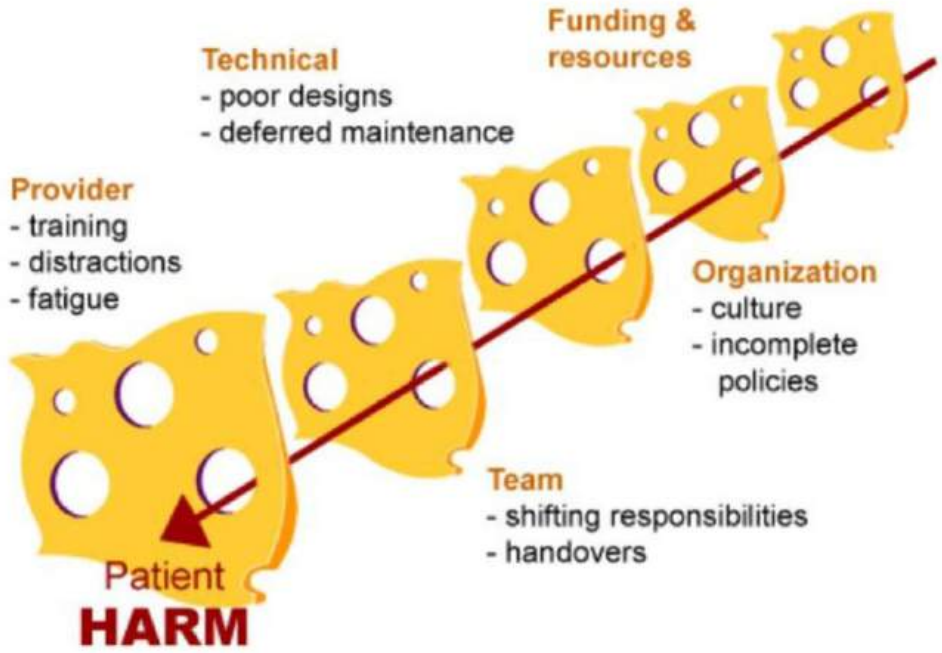
- A 2-year study (Jan 2021-Dec 2022) that analyzed PSE data across 5 veterinary multisite networks reported 64,404 PSEs- 73% no harm/"near misses" and 6.1% major harm or patient death.

Consequences of Medical Errors

- Patient injury/death
- Loss of client trust or loss of client
- Negative reviews
- Costs associated with medical errors (financial and emotional)
  - Increased burnout
  - Loss of confidence
  - Mental well-being

Contributing Factors

Medical errors can rarely *only* be attributed to the individuals that made them. Upon closer investigation, you typically uncover broken systems, unsafe or outdated processes. A 2019 study done at Cornell showed that the most common types of medical error in veterinary hospitals were involving drugs, 40% of which were wrong dose. Simple protocols like strict double check policies and thoughtful pharmacy organization can help to set otherwise busy and distracted team members up for success. Additional environmental factors such as noise levels, staffing and patient acuity also increase the likelihood that mistakes and near misses will occur.



<u>The 5 Whys</u>

- A simple exercise you can do as a leader when investigating medical mistakes is "The 5 Whys"- it challenges you to move beyond "Who's to blame" to "What's to blame?"
- Ideal when human error is involved
- Start with a specific problem/error- keep asking "why" until you get to the root cause

Error	Patient went home with IVC in
Why?	CSR grabbed the dog because the client had been waiting a long time
Why?	The technician caring for that patient went to lunch and didn't round anyone that they clients were picking up that hour
Why?	This is the technician's first week on the job and she didn't know she had to round her patients when she went on break
Why?	The team doesn't consistently round or hold huddles so this wasn't trained/modeled for the new hire as an expectation

Root Cause(s) to consider:

- Poor team communication, rounding/hand offs are not part of the culture
- Onboarding?
- TGH checklist for hospitalized patients

Root Cause Analysis

A Root Cause Analysis (RCA) is a process through which your team can use to review medical errors is a structured, objective way. Some hospitals may have a standing Patient Safety Committee that meets on a regular basis, others may convene a group to review specific cases as they arise. Either way, it is a good idea incorporate RCA/case review into your regular meetings as a way to strengthen your hospital's Culture of Safety.

Goals:

1. Figure out what happened and why
2. Identify corrective actions to prevent a similar situation in the future

Medical errors should rarely result in individual disciplinary action. This leads to a break down of trust and results in a team that is less likely to report errors when they happen. Exceptions are made when there was blatant disregard for a well established policy/SOP, repeated pattern of behavior despite coaching, or proof of intentional harm being done to patients.

Organizing a Safety Committee and Leading an RCA

- Selecting members, planning the meeting
- Fishbone Model-exploring the 5 factors

        - People
        - Patient
        - Procedure/task
        - Environment
        - Equipment
    - Creating a Plan for follow through
        - SMART goals
    - Communicating the committee's findings and recommendations (leadership, team, client)

Conclusion

It will never be possible to eliminate all risk of errors so long as humans are involved in processes. We can, however, recognize each incident as both an opportunity to learn and to reinforce the Culture of Safety in our hospitals. Committing to approaching errors with a solution-oriented mindset will help to promote better outcomes for your patients and improve job satisfaction for your team.

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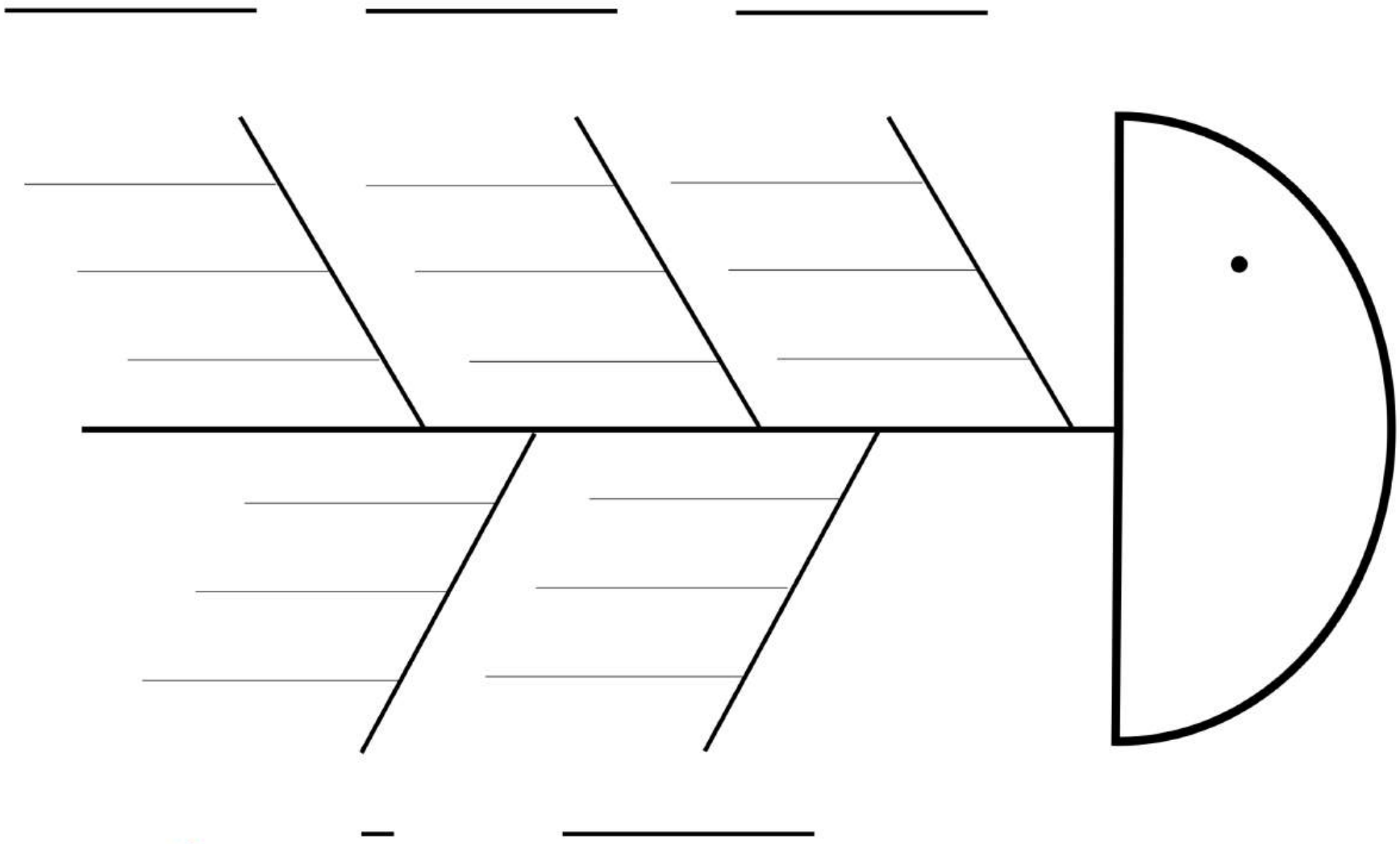


vca animal hospitals SPECIALTY CARE

Fishbone Diagram

Program Title: You've Got This in the Bag-Tips for a Successful Blood Donation

Speaker name and degree/s: Sylvia Gottfried, RVT, VTS (ECC)

Program Description: This lab course will cover the different steps leading to the actual collection of blood from a donor. Course participants will be given a demonstration of how to perform blood typing and cross-match using commercial kits. It will review the supplies necessary for the collection and delivery of the blood products. The course will include a section on proper storage and shelf life of stored blood products.

Program Outline:

- Review the criteria for the selection of canine and feline blood donors
- Demonstrate how to perform blood typing in dogs and cats
    - The difference between agglutination cards and immunochromatographic kits
    - Discuss pros and cons
- Learn how to perform a cross-match using a commercial kit
- Review screening process for commercially purchased units
- Review the supplies needed to do a blood donation in a dog or cat
- Showcase the different approaches to the donation process
    - Discuss the different systems used to collect the blood
    - Tools and tips that can improve outcome
- Understand storage requirements and shelf life of blood products
- Know the different kinds of blood administration sets and infusion pumps

Program Title: Blood Transfusions Made Easy: Are You My Type? Are We a Match? Set It Up and Find Out.

Speaker name and degree/s: Sylvia Gottfried, RVT, VTS (ECC)

Program Description: This course will cover topics important for those working in general practice and emergency/ specialty that need to administer life-saving blood products or are pre-screening a patient at high risk for blood loss. It will cover the different blood types in canines and felines as well as how to test for them. We will discuss the reason for transfusions, the types of transfusions, risks involved, and monitoring required during the transfusion. It will include a brief overview of cross-matching and indications for it.

Program Outline:

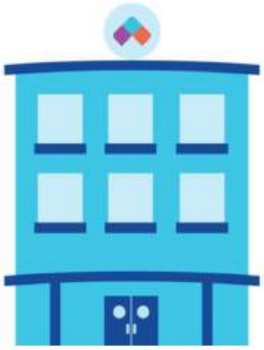
- Discuss the reasons for transfusions
    - When there is a need to replenish blood components due to sudden loss or inefficient production.
    - Prophylactic administration
    - Bleeding disorders
- Discuss the types of transfusions
    - Autologous
    - Banked blood using in-clinic donors or commercial blood banks
- Review of the different types of blood products available for canines and felines
    - Fresh whole blood
    - Packed red blood cells
    - Plasma-fresh or frozen
    - Other available products
- Review the different blood types in canines and felines
    - DEA blood types in canines and the importance
    - Alloantibodies and breed predisposition in felines
- Discuss in-house kits available to determine blood types in canines and felines
    - Agglutination vs. immunochromatography
- Discuss the need for cross-matching
    - Manual vs. commercially available kits
- Review the criteria for selecting the right canine or feline donor
- Review the importance of monitoring during the transfusion process
    - Examples of monitoring sheets
    - Indications of reactions
- Discuss potential risks involved with blood transfusions
    - How to minimize risks that may be caused by incorrect storage, handling, or administration of blood products

Managing Infectious Risks in Small Animal Neurology

Jessica Bautista, RVT, VTS – Neurology
VCA Animal Specialty Group San Diego

Leaner Objectives

- Define infectious, zoonotic, transmission, etc.
- Review and gain understanding of toxoplasmosis, distemper, brucellosis, and cryptococcus infections
- Understand methods of transmission and infectious risks of these diseases, as well as how to mitigate risk and transmission



Important Terms

- **Infectious** diseases – caused by a pathogen entering the body (e.g., bacterial, viral, fungal, protozoal, etc)
- **Contagious** diseases – infectious diseases that are spread easily from across host species (e.g., canine distemper virus)
- **Zoonotic** diseases – infectious diseases that spread from animals to humans (e.g., brucellosis, rabies)

Important Terms

- **Resevoir** – any person, animal, plant, soil, substance, or combo thereof, in which and infectious agent normally lives/grows/multiplies
- **Vector** – living organism that transmits an infectious agent from an infected host to a susceptible host
- **Host** – organism that harbors a disease-causing agent and provides nourishment and shelter
- **Transmission** – mode/pathway in which an infectious agent moves from a reservoir or infected host to a susceptible host
- **Incubation** – time interval between exposure to infectious agent and the appearance of the first sign/symptom of the disease

Cleaning – removal of gross debris through the use of manual of mechanical process

Important Terms

- **Cleaning** – removal of gross debris through the use of manual of mechanical process
- **Disinfection** – elimination of many or most microbes from an inanimate surface
- **Sterilization** – complete elimination of a all microbes, including bacterial spores. Accomplished by the use of ethylene oxide gas, pressurized steam, dry heat, liquid chemicals
  - generally reserved for items that enter tissues, the vascular system, or for devices through which blood flows

Disinfection Agents

- Accelerated hydrogen peroxide (AHP)
  - Standard H_2O_2 easily inactivates
  - AHP contains surfactants that allow for broad spectrum disinfection with activity against bacterial spores, non-enveloped viruses, dermatophytes, etc.
  - Low toxicity, environmentally friendly, compatible with most materials
- Sodium hypochlorite (bleach)
  - Potent oxidizer, broad spectrum activity
  - Needs to be diluted correctly, needs to have correct contact time (usually 10 min)
  - Highly corrosive to a wide range of materials, can release toxic gas when in the presence of other materials, light sensitive, inactivated by organic materials

Disinfection Agents

- Iodophors
  - Iodine based solutions
  - Primarily used as skin antiseptics (non-toxic and non-irritating)
  - Must be diluted correctly (more effective when diluted)
  - Have to be reapplied frequently, staining
- Chlorhexidine
  - Used widely for skin antisepsis but poo environmental disinfection
  - Use as environmental disinfectant can lead to chlorhexidine resistance

Disinfection Agents

- Quaternary ammonium compounds
  - Usually fungicidal, bactericidal, virucidal when used at manufacturer's correct concentration and contact time
  - Highly stable products with low toxicity
- Alcohol – optimum bactericidal concentration is 60-90%.
  - Does not destroy bacterial spores
  - Easily inactivated by organic debris
  - Readily evaporates/dries quickly (~1min) so cannot achieve adequate contact times
  - Not recommended for routine environment disinfection
  - OK for low level contact items (thermometers, stethoscopes)

Toxoplasmosis

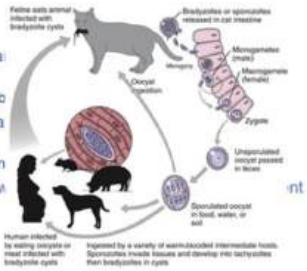
Toxoplasmosis

- Causative Agent: Toxoplasma gondii (protozoa)
- Affected Hosts:
  - Definitive hosts: cats
  - Intermediate hosts: most vertebrate species
  - Mechanical hosts: invertebrates (e.g., cockroaches)
- Geographic distribution: worldwide
  - where there are cats, there is toxo

Toxoplasmosis

Transmission

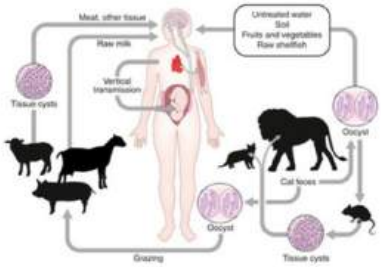
- Definitive hosts (cats): ingests infected a consumables
  - Organism can reproduce in this host and b
- Intermediate hosts: ingests infected mea consumables
  - Organism cannot reproduce in this host an
- Mechanical hosts: come into contacted w and spread to consumables by contact



Toxoplasmosis

Clinical signs of intestinal infection in cats

- Usually nothing
- Majority of cats with infection show no clinical signs
- Maybe self limiting small bowel diarrhea for 1-2 weeks



Toxoplasmosis

- Clinical signs of fatal extraintestinal toxoplasmosis (cats, dogs)
- Occurs when organism overcomes intestinal load and migrates to other tissues
  - Fever, lethargy
  - Ocular inflammation (uveitis, chorioretinitis)
  - CNS signs (seizures, ataxia)
  - muscle pain
  - respiratory distress

Toxoplasmosis

- Diagnosis
  - Definitive diagnosis can only be made by identification of the organism in infected tissues (rare)
  - Presumptive antemortem diagnosis can be made by:
    - clinical signs consistent with infection
    - Antibodies present in serum that suggest exposure
      - IgM titers higher than 1:64 and a fourfold or great rise in IgG titer is highly suggestive of recent or active infection
      - False low positive titers are common and re-testing should be performed in 2-3 weeks to prove/disprove
    - Exclusion of other diseases with similar clinical syndromes
    - Positive response to appropriate targeted treatment

Toxoplasmosis

- Safety Considerations
  - Immuno-incompetent persons are at a higher risk of infection
  - Avoid consumption of undercooked meats, eliminate feeding of raw/undercooked meats to pets
  - Pregnant women should avoid cleaning of the litterbox
  - Daily cleaning of the litterbox may lessen the risk of accidental ingestion of sporulated oocysts from infected cats in the household to non-infected animals/persons in the house
- Wear gloves to handle pets and when cleaning litterbox
- Wear gloves when handling raw/undercooked meat
- Strong consideration for face mask use when cleaning litterboxes
- Consistent, frequent hand washing
- Cleaning agents: ammonia based, iodine based, ethanol of 70% or greater, bleach (1%). Boiling water

Toxoplasmosis

Infectious ✓

Contagious ✗

Zoonotic ✓

Canine Distemper Virus

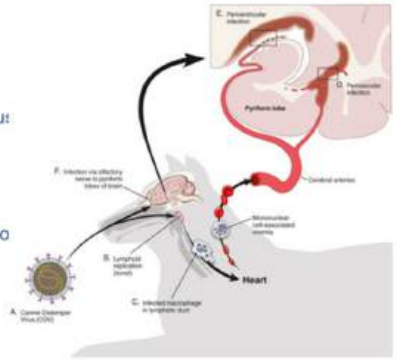
Canine Distemper Virus

- Causative Agent: canine distemper virus (paramyxovirus)
- Affected Hosts:
  - Dogs and other canines (coyotes, foxes, wolves)
  - Raccoons, pandas
  - Mustelids (ferrets, minks, skunks, otters)
  - Large, wild felines
  - Non-human primates
- Geographic distribution: worldwide

Canine Distemper Virus

Transmission:

- oronasal contact with the virus animals
- Aerosolized particles
- Droplet nuclei (respiratory dro



Canine Distemper Virus

Clinical signs

- Vary dramatically in both signs and degree, **Incubation**: 3 -6 days
- Fever, lethargy
- Respiratory (oculonasal discharge, coughing, bronchopneumonia, etc)
- Gastrointestinal (vomiting, diarrhea, inappetence)
- Hyperkeratosis of the paw pads, nasal planum
- Disorders of dentition – enamel hypoplasia, partial eruption, impaction, oligodontia
- Neurologic
  - Usually manifests 1-3 weeks after recovery from the above
  - Seizures
  - Cerebellovestibular signs
  - Constant, repetitive myoclonus that is present during sleep (**pathognomic**)

Canine Distemper Virus

Canine Distemper Virus

Diagnosis

- Strong presumptive diagnosis can be made based upon combination of clinical signs alone
  - Enamel hypoplasia and constant repetitive myoclonus are pathognomonic signs
- Recent vaccination can lead to false positives
- More limited clinical signs (i.e. only respiratory signs) make diagnosis more difficult as these signs overlap with a multitude of other diseases
- Veterinary medicine generally leans towards using PCR
  - Swab affected tissues to reduce potential for false negatives

Canine Distemper Virus

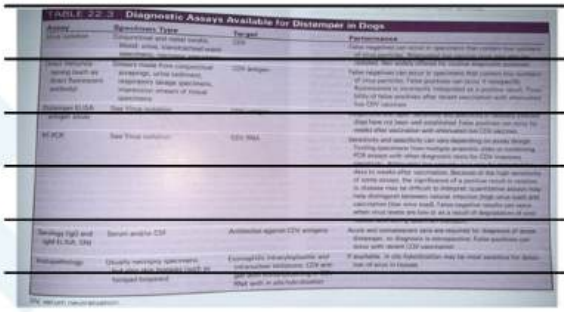


TABLE 22.3 Diagnostic Assays Available for Distemper in Dogs

Assay	Specimen Type	Target	Performance
Direct fluorescent antibody test	Conjunctival and nasal swabs; blood, urine, transtracheal wash specimens, necropsy tissues	CDV	False-negative test occur in specimens that contain low numbers of virus particles. False-positives can occur if nonspecific fluorescence is incorrectly interpreted as a positive result. Titers of false positives after recent vaccination with attenuated live CDV vaccines
Direct fluorescent staining (such as direct fluorescent antibody)	Smears made from conjunctival scrapings, urine sediment, respiratory lavage specimens, impression smears of nasal specimens	CDV antigen	False-negatives can occur in specimens that contain low numbers of virus particles. False-positives can occur if nonspecific fluorescence is incorrectly interpreted as a positive result. Titers of false positives after recent vaccination with attenuated live CDV vaccines
Polyclonal ELISA antigen assay	See Virus isolation	CDV	Assay has not been well established. False positives can occur for months after vaccination with attenuated live CDV vaccines
RT-PCR	See Virus isolation	CDV RNA	Sensitivity and specificity can vary depending on assay design. Testing specimens from multiple anatomic sites or combining PCR assays with other diagnostic tests for CDV improves
Serology (IgG and IgM ELISA, CIA)	Serum and/or CSF	Antibodies against CDV antigens	Also in weeks after vaccination. Because of the high prevalence of some viruses, the significance of a positive result is variable. In disease may be difficult to interpret quantitative assays may have disrupted between natural infection (high virus load) and vaccination (low virus load). False-negative results can occur when virus levels are low or as a result of degradation of viral
Histopathology	Usually necropsy specimens but also can biopsy (such as tonsil biopsy)	Eosinophilic intracytoplasmic and intranuclear inclusions; CDV antigen demonstrable by IHC	Acute and convalescent sera are required for diagnosis of acute distemper, so diagnosis is retrospective. False-positives can occur with recent CDV vaccination. If available, in situ hybridization may be most sensitive for detection of virus in tissues

CDV, canine distemper virus; IHC, immunohistochemistry.

Canine Distemper Virus

Safety considerations

- Complete personal protective equipment
  - Gloves, mask, hairnets, booties, gowns, goggles
  - Transmission risks to other pets is high
- Consider designating 1-2 team members per shift as the primary caretaker for the infected pet
- Shoe baths
- Isolation wards
- 6-8 weeks of isolation from other pets after resolution of clinical signs
  - Or 6-8 weeks after development of the last clinical sign
- Routine and frequent cleaning of contaminated surfaces

Canine Distemper Virus

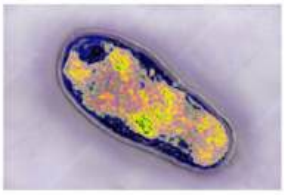
Infectious ✓

Contagious ✓

~~Zoonotic~~ ✗ (?)

Brucellosis

Brucellosis



Causative agent: gram negative (-), aerobic, facultatively intracellular coccobacillus

- 12 species based upon host preference

Affected hosts:

- *Dogs primarily get brucella canis*
  - Farm dogs, hunting dogs, dogs fed raw meat rarely get *B. abortus, B. suis, B melitensis*
  - Cats, rabbits, nonhuman primates can be infected experimentally → transient bacteremia

Geographic distribution: Increased incidence in south USA, Mexico, Central/South America, China, Japan

Brucellosis

Transmission:

Direct exposure of mucus membranes to bodily fluids; transplacental route

Sources: **semen, lochia, aborted fetuses/placentas, urine**; lesser extent milk

- Aborted tissues tend to have highest numbers of organisms

Aerosol route (via urine) important in crowded kennels

- Has been described in male dogs housed together for weeks - months

Brucellosis

Clinical signs

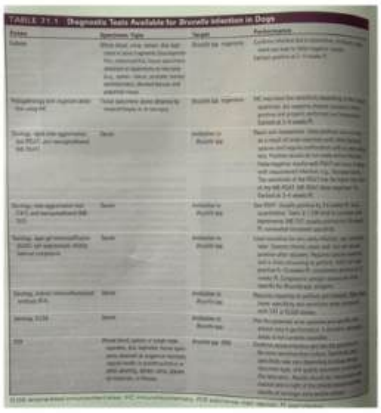
- Often systemically healthy
- Lymphadenomegaly, splenomegaly
- Intact adults
  - Pregnancy loss:
    - 45 – 60 d of gestation
    - partially autolyzed, edematous, hemorrhagic fetuses
    - followed by greenish-gray vaginal d/c x 1 – 6 weeks
  - Live puppies
    - often die within few days
    - If survive: generalized lymphandeomegaly +/- hyperglobulinemia, fever, leukocytosis, seizures
  - Infertility
  - Moist scrotal dermatitis 2' to licking, scrotal enlargement → testicular atrophy/asymmetry

Ocular abnormalities: often unilateral; uveitis, multifocal granulomatous chorioretinitis

± Discospondylitis: typically episodic spinal pain; often chronic

Uncommonly reported: Meningoencephalitis, osteomyelitis, polyarthritis

Brucellosis



Brucellosis

Staff Safety considerations

- All PPE, all the time
- Consider staff's safety over all else
  - Chill protocols/sedation
  - Muzzles/e-collars
  - Minimize appointments/exposure

Canine Safety considerations

- Intact dogs >> neuter/spay to reduce shedding
- Infected breeding dogs must be removed from the program
- Avoid: feeding of raw meat, hunting programs, consumption of livestock birthing tissues

Brucellosis

Brucellosis

Infectious ✓

Contagious ✓

Zoonotic ✓

Cryptococcosis

Cryptococcosis

- Causative Agent: cryptococcus gattii, cryptococcus neoformans (fungal)
- Affected Hosts:
  - Cats
  - Dogs
  - Humans
  - Wide variety of other domestic and wild animal species
- Geographic distribution: worldwide
  - North America – particularly on the US West Coast and British Columbia, CAN
  - Pigeon feces = known reservoir

Cryptococcosis

Transmission:

- Inhalation of spores from the environment
- Spores are ubiquitous in the soil

- immuno-incompetency is a known risk factor in humans (E.g., HIV)
- Suspect this model can similarly be applied to other mammals
  - E.g., concurrent infection of FeLV, FIV in cats
- Unclear why only certain animals become infected despite its ubiquity in the environment

Cryptococcosis

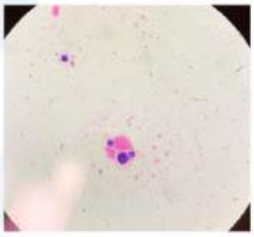
Clinical signs:

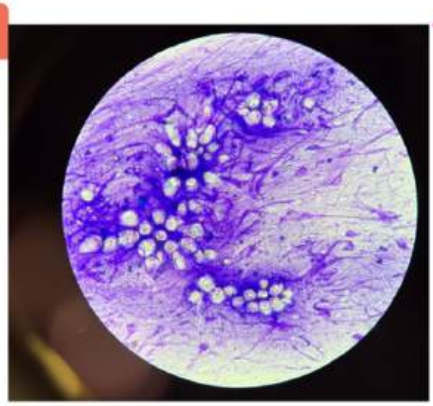
- Granulomatous formation
- Nodular or ulcerative cutaneous lesions
- Chorioretinitis
  - fungal lesions can be seen in up to 30% of infected cats on fundic exam
- Upper respiratory tract signs
- Infectious meningoencephalitis
  - Seizures, cerebellovestibular signs, paresis, spinal pain, etc
- Gastrointestinal signs (dogs)

Cryptococcosis

Cryptococcosis

Cryptococcosis





Cryptococcosis

Diagnosis:

- Cryptococcal latex agglutination test
  - High sensitivity and specificity of >90% each
  - Serum (red top tube only!) or CSF
- Cytology or histopathology
  - Occasionally organisms are not visualized but otherwise high sensitivity
- Fungal culture

Cryptococcosis

Safety considerations:

- We're all exposed to the same environment – what is your risk?
- Gloves at minimum!
- Face masks for immunocompromised health care professionals
- Avoid inadvertent needle sticks
  - Human health setting – accidental needle sticks while aspirating skin lesions has lead to localized cutaneous infection of the healthcare professional
- Other, more contagious fungal infections can have similar signs

Cryptococcosis

Infectious ✓

Contagious ✗

Zoonotic ✗

Questions?

Care and Considerations for the "Down" Patient

Jessica Bautista, RVT, VTS-Neurology

VCA Animal Specialty Group, San Diego

Learner Objectives

- Degrees and definitions of ambulation in various neurologic patients
- Various neurologic disorders that can lead to loss of mobility
- Techniques and knowledge to improve the patient's outcome, comfort, and care

What is a "down" dog?

Definitions

What does "down" mean?

- layman's description of an animal that can't walk or can't get up
- usually used with some degree of assumption that there is neurologic cause

Definitions

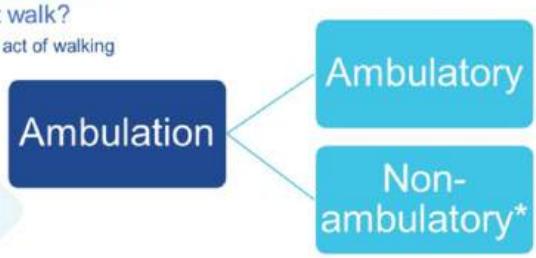
Need to form an accurate medical description of these pets!

- Decide: ambulatory vs non-ambulatory
  - if non-ambulatory, is there any motor at all?
- Decide: which limbs
- Decide: how to describe the gait
- Decide: if pain perception needs to be assessed

Definitions

Can the patient walk?

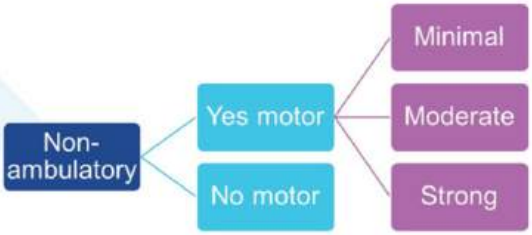
- Ambulation = act of walking



*unable to take more than 7-10 steps without falling

Non-ambulatory

If they are non-ambulatory, does the pet have any motor at all?



Definitions

Which legs are we talking about?

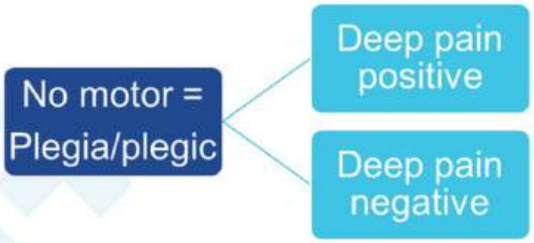
- Hemi – refers to right or left side group of limbs
- Tetra – all four limbs
- Mono – singular limb
- Para – refers to fore or hind group of limbs

Definitions

How would we describe the gait?

- Paresis/paretic – weakness
- Ataxia/ataxic – incoordination
  - Vestibular
  - Cerebellar
  - proprioceptive

Non-ambulatory, no motor

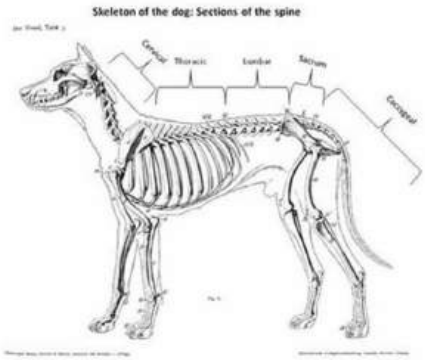


Abnormal Gaits

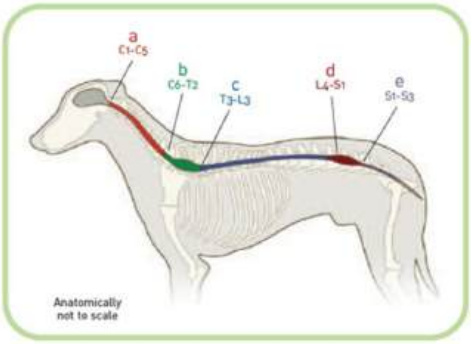
Functional Neuroanatomy

(briefly)

Anatomical divisions of the spinal column



Functional divisions of the spinal cord



Neurologic disorders that can lead to loss of mobility

Category	Diseases/disorders
Degenerative	**Degenerative Disc Diseases, Degenerative myelopathy**, other inherited degenerative disorders
Anomalous	Congenital malformations, AA luxation
Metabolic	
Neoplastic	Primary spinal tumors, metastatic spinal tumors
Nutritional	Thiamine deficiency
Infectious/Inflammatory	Primary immune mediated inflammatory disorders of the CNS (MUE/MUO), infections of the CNS (bacterial, fungal, etc.)
Idiopathic	
Toxic	
Traumatic	Accidents (HBC, BBD, falling from significant height, etc)
Vascular	Strokes, **fibrocartilaginous embolism (FCE)**

Intervertebral Disc Disease ("IVDD")

Type 1

- Acute
- Extrusion of nucleus pulposus
- Chondrodystrophic breeds

Type 2

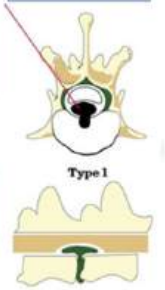
- Chronic
- Protrusion of annulus fibrosis
- Non-chondrodystrophic, large breed dogs

Type 3

- Acute, non-compressive, nucleus pulposus extrusion (ANNPE)
- Low volume, high velocity extrusion of material that "punches" the spinal cord and causes contusion injury

Intervertebral Disc Disease ("IVDD")

Type 1



Type 2

Care and Considerations

Patient Handling

- Assess the situation first – stressed, painful, or both?
- Ask for help!!
- Picking up/putting down
- Use assistance devices – slings, harnesses

Recumbency Care

- Recumbency = state of lying down or reclining
- Complications of recumbency:
  - Pulmonary atelectasis (of the "down" lung)
  - Poor circulation of compressed tissues
  - Aspiration risks
  - Decubital ulcer risk
  - Depression ☹

Recumbency Care

- Minimizing recumbency sequelae
  - Aim for sternal recumbency (rather than lateral)
  - Rotate the patient q2-4 hours (realistically, q4-6hr)
  - Passive range of motion exercises, massage q6hr
  - Feeding only upright or in sternal recumbency
  - Soft, dry padding (especially under joints)
  - Clean, dry bedding (change as frequently as needed)
  - Family interaction, mental stimulation

Bedding

- Layers of soft, thick bedding
- Orthopedic mattresses
- Potty pads
- Bolsters, props

Bedding

Bedding

Feeding

- Feed upright or in sternal recumbency
- Hand feed or raise bowls
- Caution with leaving food and water unattended
- Maintain resting energy requirements (RER)
  - RER = 70 x (body weight in kg)$^{0.75}$
  - remember this is not the same as Maintenance Energy Requirement (MER) and should only be used as a guideline in hospital

Physical Therapy

- Passive Range of Motion in resting/recovery period
  - Formal physical therapy is not always indicated but if so, referral to certified professional
  - Not for open wounds, trauma, or systemically ill pets
  - Motions should be passive – no force needed!
    - Bicycle rotations
    - Flexion/extension
    - Massage
    - Standing exercises (bouncing, leaning)

Pain Control

- Adequate pain control must be achieved
  - Consider using pain score scales
- Pain management will vary from clinician to clinician
- Many therapies available, consider multimodal therapy
  - Gabapentin, pregabalin
  - Opioids (fentanyl, methadone, codeine)
  - Acetominophen
  - NMDA Antagonists (Amantadine, ketamine)
  - NSAIDs (carprofen, meloxicam, etc)
    - very controversial for neurologic patients but not wrong >> will steroids be needed?

Anxiety Control

Many of these pets will need crate rest!

- Transient issues with anxiety is almost always a sequelae
- Consider if the pet is anxious vs painful?

- Trazodone
- Acepromazine
- Alprazolam
- In hospital considerations can be given to dexmedetomidine
- Consider behavior modifications and consultation for long term therapeutics in patients that need long term treatment

Bladder Care

- Spinal cord injury/disease that is severe enough to make patient non-ambulatory = will have some degree of bladder dysfunction
  - Control of bladder starts to return with return of motor function
  - Need to have bladder expressed periodically (q8hrs, 12hrs max)
  - Needs to return to hospital if bladder cannot be expressed at 16hrs
    - Permanent dysfunction can occur (detrusor atony)
  - Consider medications to aid in bladder expression
    - Pain medications in patients with painful conditions (i.e., IVDD, post operative pets)
    - Pain medication does not directly help with bladder expression but rather allows for comfortable palpation of the bladder
    - Sphincter tone medications
    - Bladder tone medications

Bladder Care, cont.

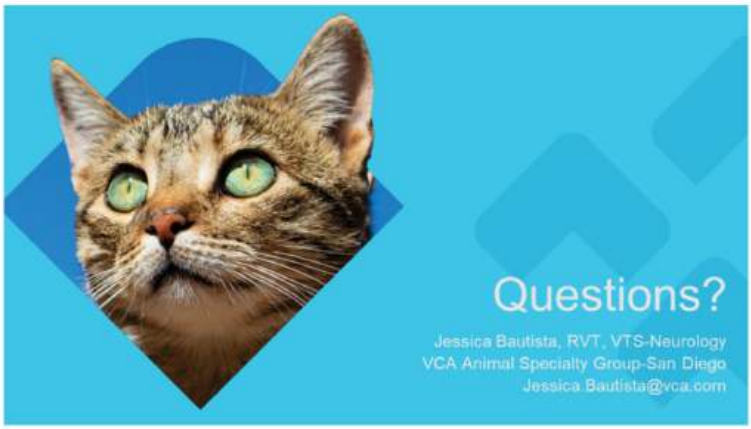
- Medications to reduce sphincter tone
  - Diazepam >> reduces external urethral sphincter tone
  - Tamsulosin vs Prazosin >> reduces internal urethral sphincter tone
    - Tamsulosin specific to receptors on the urethral sphincter so less global effect on smooth muscles. Can be q24hr dosing which is nice for client compliance
  - Phenoxybenzamine >> reduces internal urethral sphincter tone
- Medications to increase bladder tone
  - Bethanechol >> improves bladder muscle contractility in cases of bladder atony

Bladder Care, cont.

- In hospital management techniques
  - Carry outside, try different areas (grass vs gravel vs potty pads)
  - Use known "potty commands" – ask the clients!!
  - Overflow incontinence can mimic bladder control
  - Use your tools – ultrasound that bladder!

- Considerations for urinary catheterizations
  - Indwelling catheters (i.e., foley)
  - Intermittent red rubber catheterizations
  - If the pet is a candidate for discharge, what is client's ability to manage the bladder?

Sunshine time



2026 Seaside Veterinary Forum

Thank You for Joining Us

On behalf of our hosting VCA Specialty Hospitals of San Diego—Animal Specialty Group, California Veterinary Specialists- Carlsbad, Emergency Animal Hospital and Referral Center, and Eye Clinic for Animals—we thank you for being part of the 2026 Seaside Veterinary Forum.

Your participation, engagement, and commitment to advancing veterinary medicine made this event truly meaningful.

We are grateful to our speakers for sharing their expertise, to our sponsors and partners for their support, and to each attendee for contributing to a collaborative and inspiring environment.

We are also proud to share that 100% of raffle sales and remaining proceeds will be donated to the Street Dog Coalition – San Diego, thank you for contributing support for their important work.

We hope you leave feeling informed, connected, and energized in your work.

Safe travels, and thank you for being part of our veterinary community.

Please follow our social media channels for future continuing education opportunities.

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