



GULF COAST
VETERINARY
SPECIALISTS

2024 SYMPOSIUM DVM PROSPECTUS





On behalf of the entire team at Gulf Coast Veterinary Specialists, I want to extend our deepest gratitude for attending our 19th Annual Symposium. As we continually strive to be one of the nation's leading veterinary hospitals, the success of our Symposium underscores our commitment and passion for our incredible veterinary community.

Your dedication to advancing veterinary medicine is what drives the success of events like this, and I want to thank you for your unwavering dedication to the field. Throughout this weekend, we will be offering more than 20 hours of RACE-approved continuing education, and we hope you find the experience both enriching and inspiring.

It is our honor to host you this weekend, and we look forward to welcoming you back in the years to come as we continue this shared journey of learning, growth, and excellence.

Warmest regards,

Carley Giovanella, DVM, DACVIM
Medical Director
Gulf Coast Veterinary Specialists



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SATURDAY, 8/24 DVM SCHEDULE



GULF COAST
VETERINARY
SPECIALISTS



8:00 AM -
8:10 AM

OPENING REMARKS

CARLEY GIOVANELLA, DVM, DACVIM
MEDICAL DIRECTOR



8:10 AM -
9:00 AM

IT STARTED OUT WITH AN ITCH, HOW DID IT END UP LIKE THIS? AN UPDATE ON ATOPY

PETER CANNING, DVM, DACVD
DERMATOLOGIST



9:05 AM -
10:00 AM

OPIOID ABUSE AND CONTROLLED SUBSTANCE DIVERSION (OPIOID PART I)

MELISSA CLARK, DVM, PH D, DACVCP, DACVIM
INTERNIST

10:05 AM -
10:25 AM

BREAK



10:25 AM -
11:20 AM

OPIOID ABUSE AND CONTROLLED SUBSTANCE DIVERSION (OPIOID PART II)

REBECCA SALAZAR, DVM, DACVAA
ANESTHESIOLOGY DEPARTMENT LEAD



11:20 AM -
12:15 PM

EXOTICS: SMALL MAMMAL DENTISTRY

SUE CHEN, DVM, DABVP
AVIAN & EXOTICS DEPARTMENT LEAD

12:15 PM -
1:20 PM

LUNCH



1:20 PM -
2:15 PM

NEW MONOCLONAL ANTIBODY TREATMENT ADVANCES AND WHERE WE CAN GO NEXT

AMANDA HANZEL, DVM
EMERGENCY MEDICINE



2:15 PM -
3:10 PM

ARRHYTHMIAS AND ANESTHESIA

REBECCA SALAZAR, DVM, DACVAA
ANESTHESIOLOGY DEPARTMENT LEAD

3:15 PM -
3:35 PM

SNACK BREAK



3:35 PM -
4:30 PM

FELINE INFECTIOUS PETITONITIS (FIP)

AMY DAVENPORT, DVM, DACVIM
INTERNIST



4:30 PM -
5:25 PM

CURRENT UPDATES IN DIAGNOSTIC IMAGING

LAURA HAMMOND, DVM, DACVR
RADIOLOGIST

ALL PRESENTATIONS ARE RACE APPROVED AND WORTH 1 HOUR OF CONTINUING EDUCATION



TABLE OF CONTENTS

CONFERENCE SCHEDULE - SATURDAY	5
CONFERENCE SCHEDULE - SUNDAY	6
SPONSOR DIRECTORY	7
PETER CANNING, DVM, DACVD	10
MELISSA CLARK, DVM, PH D, DACVCP, DACVIM	19
SUE CHEN, DVM, DABVP	38
AMANDA HANZEL, DVM	66
COLLEEN WILLMS, DVM, DACVECC	71
GRAYSON COLE, DVM, DACVP, CCRP	86
OLIVIA MURRAY, DVM, DACVIM	99
NICHOLAS MOCKUS, DVM	106
AUDREY HUDSON, DVM, DACVO	121
SHELBY SCANLIN, DVM	142

SUNDAY, 8/25 DVM SCHEDULE



GULF COAST
VETERINARY
SPECIALISTS



8:00 AM -
8:10 AM

OPENING REMARKS

CARLEY GIOVANELLA, DVM, DACVIM
MEDICAL DIRECTOR



8:10 AM -
9:00 AM

GI: SURGICAL TECHNIQUES AND COMMON MISTAKES TO AVOID

HEIDI HOTTINGER, DVM, DACVS
SURGEON



9:05 AM -
10:00 AM

"EN FUEGO" ANTICIPATION IS WHAT SAVES THESE PATIENTS

COLLEEN WILLMS, DVM, DACVECC
CRITICAL CARE DEPARTMENT LEAD

10:05 AM -
10:25 AM

BREAK



10:25 AM -
11:20 AM

LOWER URINARY TRACT SURGERY

GRAYSON COLE, DVM, DACVS, CCRP
SURGERY DEPARTMENT LEAD



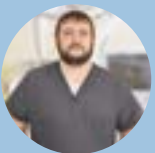
11:20 AM -
12:15 PM

ADDISON'S DISEASE

OLIVIA MURRAY, DVM, DACVIM
INTERNIST

12:15 PM -
1:20 PM

LUNCH



1:20 PM -
2:15 PM

POCUS WITH MOCKUS: BASICS OF POINT OF CARE ULTRASOUND

NICHOLAS MOCKUS, DVM
RADIOLOGIST



2:15 PM -
3:10 PM

OPHTHALMIC EXAM FOR THE GENERAL PRACTITIONER

AUDREY HUDSON, DVM, DACVO
OPHTHALMOLOGY DEPARTMENT LEAD

3:15 PM -
3:35 PM

SNACK BREAK



3:35 PM -
4:30 PM

IT'S A JOINT EFFORT - "LEGS" WORK TOGETHER ON ORTHOPEDIC EXAMS

ALLA KERR, DVM, DACVS
SURGEON



4:30 PM -
5:25 PM

AN UPDATE ON THE DOWN DOG

SHELBY SCANLIN, DVM
NEUROLOGIST

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Nicole Dragich
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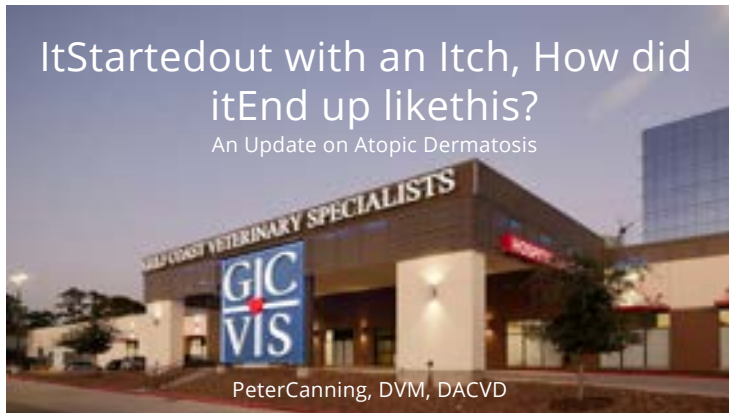
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VETERINARY BOOKS BY SUCCESS CONCEPTS

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It was only an itch...

- q An Overview of Atopy
- q Diagnosing Atopy
- q Treating Atopy
- q Allergen-specific immunotherapy



Canine Atopy Dermatitis

An Overview

Canine Atopic Dermatitis

- Canine Atopic Dermatitis (AD) has been defined as a genetically predisposed

inflammatory and pruritic allergic skin disease with characteristic clinical features. It is associated most commonly with IgE antibodies to environmental allergens

- A diverse spectrum of clinical signs
- Clinical signs have overlap with many other dermatologic conditions



Canine Atopic Dermatitis

- Generally believed to be due to an interplay of both intrinsic and extrinsic

factors

- There is clearly a genetic basis but no consistent mutations are recognized
- Skin barrier most thought to be affected
- There is a clear predisposition for pathogenic Staph. and Malassezia
- Environmental factors play a role



Canine Atopy Dermatitis Diagnosis

Diagnosing Atopy

- The diagnosis of canine atopic dermatitis is a diagnosis of exclusion
- The presence or absence of seasonality or seasonal exacerbation of clinical signs is helpful but not solely indicative of allergies
- Consider and rule out all of major sources of skin infection and pruritus



Diagnosing Atopy

- For non-seasonal patients, food trials are still highly recommended due to the overlap in food allergies and atopy
- Food allergies can happen at any age and can occur regardless of the diet(s) a patient has been on
- Prescription diets are highly preferred over over-the-counter options
 - Ingredients still matter



Diagnosing Atopy

- Stereotypical clinical signs or patient history:

- Clinical signs started before <3 years of age
- Patient lives mostly indoors
- Corticosteroid responsive pruritus
- Chronic or recurrent yeast infections
- Affected front feet
- Affected ear pinnae
- Not affected ear margins
- Non-affected dorsolumbar area
-
-

Fulfilling 5 or 6 of these criteria carries very high sensitivity and specificity for an atopic diagnosis



Canine Atopy Dermatitis

Treatment

Atopic Treatment – Setting Expectations

- Atopic dermatitis, above all else, is a lifelong incurable disease
- Treatment is costly, frustrating, and ideally hands-on
 - A multimodal approach is best, but we don't always pick the right combination from the get-go



Atopic Treatment – A Multimodal Approach

- The best treatment approach will come from a combination of infection control and prevention, itch management, and allergy avoidance, wherever possible
- There is no one size fits all approach to address these tenets for a patient and its owners
 - Therapies need to be balanced against owner burden and compliance



Atopic Treatment –Infection Control

●Both ear and skin infections need to be considered

- Active infections must be resolved first
 - § Cytology, cytology, cytology
 - § When in doubt, culture skin infections

●Routine bathing and/or ear cleaning is highly recommended

- Recommended up to once or twice weekly when a patient is affected, either year round or seasonally



Atopic Treatment –Bathing

●Bathing is helpful to remove allergens from a patient's skin and coat, to remove infectious organisms from the same areas, and to re-affirm the skin barrier in the process

- Bathing is not too drying because of ceramides and phytosphingosines in the products
- Chlorhexidine is the preferred ingredient, can be synergistic with an added antifungal
- Sodium hypochlorite is a good alternative for chlorhexidine-sensitive patients



Atopic Treatment –Ear Cleaning

●Ear cleaning is a "bath for the ears"

- Cleaning is meant to remove debris that can harbor infection and to remove infection itself
- Neutral pH, non-irritating cleansers preferred



Atopic Treatment –Alternatives for Infections

- Spot-on moisturizers and spot-on anti-pyoderma products
- Staphage Lysate injections
- Probiotics
- Omega3 Fatty Acids



Atopic Treatment –PruritusControl

- There are several anti-pruritics available and each have a role
 - Not every dog will respond to each option
 - Not every option is appropriate for every dog or every itch/dermatitis

1. Corticosteroids
2. Cyclosporine
3. Oclacitinib
4. Cytopoint

Most to least anti-inflammatory



Atopic Treatment –Corticosteroids

- Steroids provide the most broad coverage anti-inflammatory option and are very rapid in their action

- Best suited for severe dermatitis or concurrent infection
- A new option can be found when things are better managed



Atopic Treatment –Cyclosporine

- Cyclosporine (Atopica, Cyclavance, Sporimune) has potent anti-inflammatory

function, albeit with a delayed onset of activity

- Best suited for patients where other drugs have failed
 - § Not controlling itch well enough, not preventing infections, not controlling inflammation to the right extent, etc.



Atopic Treatment –Apoquel

- Apoquel is most suited for mild to moderate inflammation

- Less potent for otitis externa
- Less capable during concurrent infection



Atopic Treatment –Cytopoint

- Cytopoint is best suited for dogs with very mild inflammation

- Perfect for use in patients with other comorbidities
- Can be used safely in conjunction with other medications
- Proactive use is better than reactive administration



Atopic Treatment –Allergy Avoidance

- Not a very practical or possible strategy

- Pollens are too ubiquitous to avoid, no matter the setting
- Dust and storage mites can be mitigated but are still omnipresent

What can we do if we can't avoid the allergens? We can try to desensitize patients with allergen specific immunotherapy.



Canine Atopy Dermatitis

Allergen Specific Immunotherapy (ASIT)

Atopic Treatment –ASIT

- Immunotherapy stands alone as the only option that can address the underlying

syndrome

- Highly recommended in any confirmed atopic dog affected ≥ 6 months each year
- § The younger the patient the greater the reason to consider immunotherapy



Atopic Treatment –ASIT

- Allergen-specific immunotherapy is considered effective 70% effective
 - 70% of patients will be ≥50% improved after 6-12+ months
 - Lifelong use is nearly always required
- Some patients need less medications and others can get off drugs altogether



Atopic Treatment –AllergenTesting

- Both intradermal and serologic allergen testing methods are valid
 - Vaccines made from either test have statistically similar success rates
 - What matters most atopy is confirmed, and that the test used generates positive results that make sense for the patient
- Sometimes both tests are necessary in the case of incomplete or illogical results



Atopic Treatment –CCDs

- Be mindful for the influence of cross-reactive carbohydrate determinants (CCDs)
 - CCDs are unique, highly antigenic carbohydrate structures found on plant and insect allergens
 - These are a source of cross-reactivity and polysensitization in serologic testing



Atopic Treatment –VaccineAdministration

- Allergy vaccine is typically done one of two ways: subcutaneous vs. oral
 - The choice is owner dependent but SQ is most common
 - If one does not work, the other can be tried



Atopic Treatment –Vaccine Expectations

- We recommend patients be continued on all their same medications and topical regimen for at least 6 months
- Immunotherapy is a long-term process and results are not expected for months
 - Trying therapy for those 6-12+ months is the only way to determine if it can be effective



Questions?



Raising the Standards in Pet Cremations

**On average, we save clinics
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and aftercare services.**

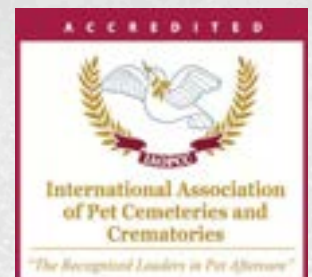
- 100% true private cremation
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**For more information, please contact
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2024 Texas Veterinarian Symposium

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Opioid Abuse and Controlled Substance Diversion: Veterinary Implications

Melissa Clark, DVM, PhD, DACVP, DACVIM



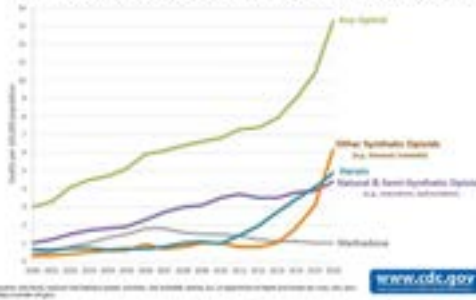
Why Are We Here?

Causes of Death



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Overdose Deaths Involving Opioids, by Type of Opioid, United States, 2000-2016



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Opium Poppy



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Opium



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Opium Prescription



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Opium Prescription



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Other Opioids?



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“A Non-Addictive Morphine Substitute”



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Heroin Addiction



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Regulation of Opioids



OPIUM EXCLUSION
ACT 1909



HARRISON NARCOTICS
TAX ACT 1914



HEROIN ACT OF 1924

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Controlled Substances Act

- Practitioner registration with DEA
- Prescription specifications
- Recordkeeping and inventory
- Security

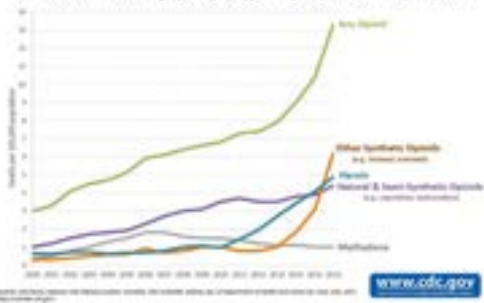


	Abuse/addictive potential	Examples	Restrictions
I	High; no medical use	Heroin, ecstasy, psychedelics (LSD, Quaaludes, peyote, psilocybin, MJ)	No RX
II	High	Amphetamines, cocaine, most opioids (including hydrocodone and codeine >90 mg), pentobarbital, PCP	Written RX unless emergency, no refills
III	Medium (severe mental, moderate physical)	Ketamine, codeine <90 mg, buprenorphine, anabolic steroids	RX expires after 6 mo, no > 5 refills
IV	Moderate	Benzodiazepines, phenobarbital, tramadol, carisoprodol	RX expires after 6 mo, no > 5 refills
V	Low	Codeine (<2 mg/mL) for cough, diphenoxylate, pregabalin	

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Overdose Deaths Involving Opioids, by Type of Opioid, United States, 2000-2016

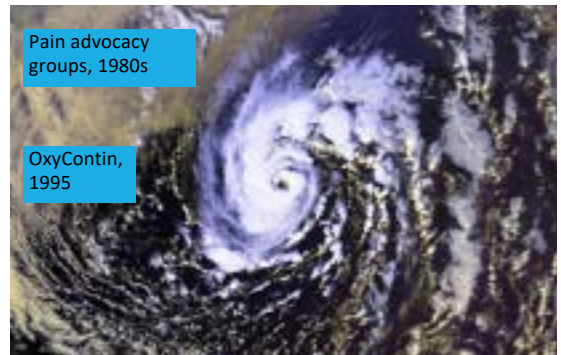


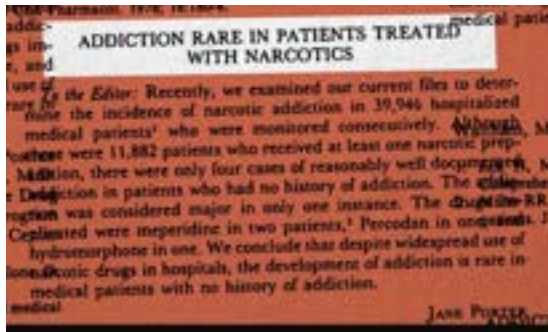
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How Did This Happen?

Pain advocacy groups, 1980s

OxyContin, 1995





How Did This Happen?

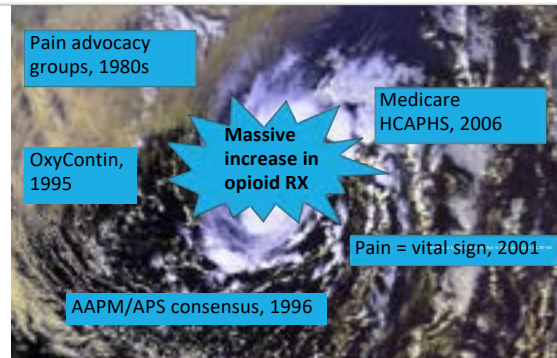
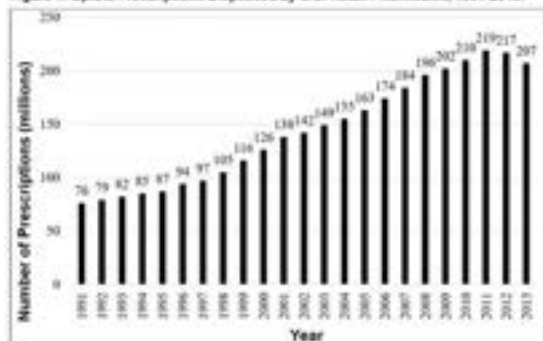


Figure 1. Opioid Prescriptions Dispensed by U.S. Retail Pharmacies, 1991-2013.

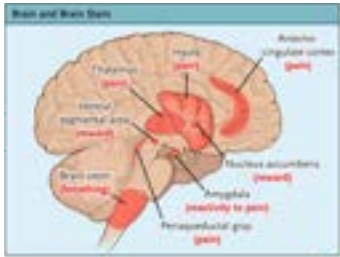


Why Are Opioids Addictive?

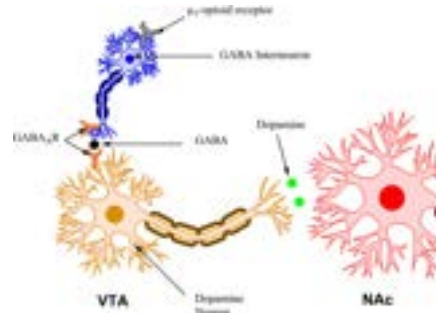


Soergel et al., Pain 2014

Why Are Opioids Addictive?

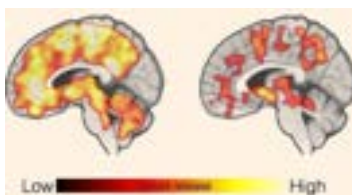


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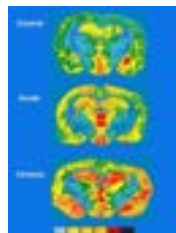
Horsfall et al. CVBS.CO.PMT 2016

Endogenous Opioid Release

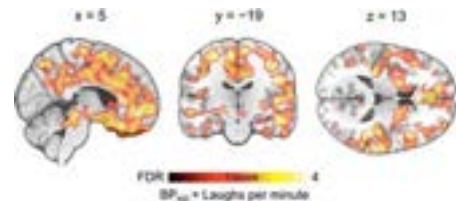


From Tuulari et al., 2017 and Arido et al., 2014

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Endogenous Opioid Release



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Receptor	Subtypes	Location	Function
Delta (δ)	δ ₁ , δ ₂	Brain <ul style="list-style-type: none"> • Prefrontal cortex • Amygdala • Olfactory bulb • Deep cortex 	Analgesia Anxiogenetic effects Physical dependence
Kappa (κ)	κ ₁ , κ ₂ , κ ₃	Brain <ul style="list-style-type: none"> • Hypothalamus • Periaqueductal gray matter • Cerebellum • Spinal Cord • Substantia gelatinosa 	Spinal analgesia Anesthesia Motor Inhibition of ACh release
Mu (μ)	μ ₁ , μ ₂ , μ ₃	Brain <ul style="list-style-type: none"> • Cerebrum • Nucleus III and IV • Thalamus • Periaqueductal gray matter • Spinal Cord • Substantia gelatinosa 	μ ₁ <ul style="list-style-type: none"> • Supraspinal analgesia • Physical dependence μ ₂ <ul style="list-style-type: none"> • Respiratory depression • Miosis • Euphoria • Reduced GI motility • Physical dependence

Exogenous vs. Endogenous Opioids

Pain attenuation ->> Pain blockade

Calming ->> Euphoria

Miosis, respiratory depression, bradycardia, GI stasis



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Exogenous Opioids - Chronic Administration

-Tolerance

• Downregulation of DA system

-Withdrawal

• Excess cAMP and NE, locus ceruleus



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Exogenous Opioids - Chronic Administration

-Psychological dependence

• Motivation ->> cravings

-Addiction

• Changes to frontostriatal loop and PFC



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Veterinary Drugs Subject to Diversion

PRESCRIBED/DISPENSED

Tramadol
Hydrocodone
Benzodiazepines
Barbiturates
Fentanyl

IN-HOSPITAL USE

Opioid analgesics
Ketamine
Barbiturates

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Prescription Opioid Epidemic: Do Veterinarians Have a Dog in the Fight?

- Survey of 189 Colorado veterinarians
- 44% aware of opioid abuse or misuse by client or staff
- 12% veterinary staff opioid abuse and/or diversion
- 13% aware of deception or pet abuse by client to procure opioid

Mason et al., Am J Public Health 2018

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Controlled Substances Act

- Practitioner registration with DEA
- Prescription specifications
- Recordkeeping and inventory
- Security

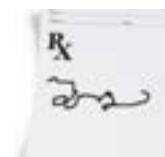


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Prescriptions for Controlled Substances

- Official form, dated
- Patient's full name and address
- Practitioner's full name, address, DEA number
- Drug name, strength, dosage form
- Quantity prescribed
- Directions for use
- Number of refills (if any) authorized



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Security

"Veterinarians shall adhere to the following to ensure security of controlled substances:

- (1,2) Establish adequate security to prevent unauthorized access to [and diversion of] controlled substances.
- 3) During the course of business activities, **do not allow any individual access to controlled substances storage areas except those authorized agents** required for efficient operations.
- (4) Controlled substances listed in Schedules I, II, III, IV, and V shall be stored in a **securely locked, substantially constructed cabinet** or security cabinet."

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Security

(5) The term "substantially constructed cabinet" means the following:

- (A) A **structure of wood or metal so constructed as to resist any entry by simple tools** of attack such as screw drivers, crow bars, tire tools, pry bars, etc. **Hinges should not be mounted with bolts or screws on outside of door and the locking devices should be installed internally** as in a dead bolt type or the device should be of a type that has protected mounting screws or bolts to inhibit removal.

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Security

The cabinet should **be permanently constructed or attached** to the building structure or fixtures so as to **prevent the cabinet from being physically removed from the premises**. If the cabinet is a metal file cabinet type, it should be permanently attached to prevent easy removal and have an external locking bar that secures the drawer or drawers.

- (B) A security cabinet or safe equivalent in construction to a Class 6 Mosler Government Sales Security Filing Cabinet or a Class 5 Mosler Government Safe.

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Security

(C) A cabinet less substantially constructed may meet security requirements provided the cabinet is located in a **room or area entrance to which has been so constructed that hinge mountings inhibit removal and a limited number of employees have keys or combinations to locking device**. If combination locks are utilized, the combination can be changed upon termination of employees having knowledge of the combination. A veterinarian must maintain a **written list of all persons that have access to the controlled substances storage areas**, including the dates on which individuals are added or deleted from the list.

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Controlled Substance Storage



- ✗ Not securely locked, substantially constructed cabinet

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- ✗ Susceptible to entry
- ✗ Hinges on outside

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- ✗ Not permanently attached to prevent removal

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- ✗ Large number of persons have keys or combinations to locking device



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Appropriate Storage



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Veterinary Drug Diversion

Client Kept Getting Refills For Controlled Drugs After Dog Was Euthanized At Different Clinic

Client's Child Is Taking Dog's Medication And Now Dog Needs Refill

Staff Member Called In Alprazolam Refills To Pharmacy For Own Use

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Preventing Diversion by Employees

- Screen employees
- Limit access to controlled substances
- Protect RX pad
- Have written protocols/SOPs
- Do your own reconciliation
- Monitor invoices
- Check PDMP for your DEA



TRUST, BUT VERIFY

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Employee screening

"It is, therefore, assumed that the following questions will become a part of an employer's comprehensive employee screening program:

Question. Within the past five years, have you been convicted of a felony, or within the past two years, of any misdemeanor or are you presently formally charged with committing a criminal offense? (Do not include any traffic violations, juvenile offenses or military convictions, except by general court-martial.) If the answer is yes, furnish details of conviction, offense, location, date and sentence.

Question. In the past three years, have you ever knowingly used any narcotics, amphetamines or barbiturates, other than those prescribed to you by a physician? If the answer is yes, furnish details."

CFR Title 21 Volume 9

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Prescription Drug Monitoring Programs



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Texas' PDMP



- Opioids
- Benzodiazepines
- Barbiturates
- Carisoprodol

<https://www.veterinary.texas.gov/PMP.php>

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Recognizing Possible CS Abuse by Employees

Mood swings, anxiety, or depression
Mental confusion and an inability to concentrate
Making frequent mistakes at work
Not showing up for work
Consistently volunteering for solo cleanup/disposal



<https://www.fda.gov/animal-veterinary/resources-you/opioid-epidemic-what-veterinarians-need-know>

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What to Do if You Suspect Diversion

Employee

- Report to local police department
- Call field office of the DEA for guidance

Client

- Call state veterinary board
- TX Pharmacy Board can also run deeper searches

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Reporting Loss/Theft of Controlled Substances

Email [hdo \(or sado\).theftorloss@dea.gov](mailto:hdo(or sado).theftorloss@dea.gov)

Within 1 business day



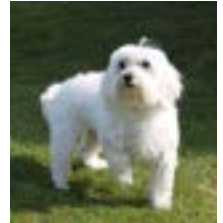
Recognizing Diversion Attempts by Clients

New client bringing in seriously injured animal with vague history

Old or incomplete records of veterinary care

History and exam inconsistent

Recurring or atypical injuries



https://www.avma.org/sites/default/files/2019-11/Opioids_Vet-Shopping-Drug-Diversion_Guide-for-Veterinarians_flyer.pdf

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Recognizing Diversion Attempts by Clients

Inordinate focus on specific drugs (requests, or refusal by name)

Pet owner aggressive/insistent

Early refills or lost medications

Requests for refills but missed appointments



What to Do if You Suspect Diversion

Employee

- Report to local police department
- Call field office of the DEA for guidance

Client

- Call state veterinary board
- TX Pharmacy Board can also run deeper searches



https://www.avma.org/sites/default/files/2019-11/Opioids_Vet-Shopping-Drug-Diversion_Guide-for-Veterinarians_flyer.pdf

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CS Prescriptions for In-Hospital Use

Plan A: use hospital stock

Plan B:

- Do not accept entire bottle
- Count and take picture
- Have client sign off
- Store in lock box
- Maintain controlled drug log

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Controlled Substance Disposal

Veterinarian

- Reverse distributor

Client

- <https://www.fda.gov/drugs/safe-disposal-medicines/disposal-unused-medicines-what-you-should-know>
- <https://medlineplus.gov/>

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<https://pubmed.ncbi.nlm.nih.gov/28787777/>



Medline Plus



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Treatment of Opioid Overdose

<https://www.avma.org/resources-tools/opioid-abuse-and-drug-shortages>

Reversing opioid overdoses in working dogs – Do you have a veterinarian-client relationship with a canine handler? This training video provides critical information for veterinarians who may need to provide advice by phone, especially in emergencies with a dog suffering an overdose in the field. The video was produced by the University of Illinois with contributions from the AVMA

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Monitoring by Regulatory Agencies

Texas Veterinary Licensing Act, Sec 801.511

MONITORING HARMFUL PRESCRIBING AND DISPENSING PATTERNS. (a) The board shall periodically check the prescribing and dispensing information submitted to the Texas State Board of Pharmacy as authorized by Section 481.076(a)(1), Health and Safety Code, to determine whether a veterinarian is engaging in potentially harmful prescribing or dispensing patterns or practices. (b) The board, in coordination with the Texas State Board of Pharmacy, shall determine the conduct that constitutes a potentially harmful prescribing or dispensing pattern or practice for purposes of Subsection (a).

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Monitoring by Regulatory Agencies

In determining the conduct that constitutes a potentially harmful prescribing or dispensing pattern or practice, the board, at a minimum, shall consider: (1) the number of times a veterinarian prescribes or dispenses: (A) opioids; (B) benzodiazepines; (C) barbiturates; or (D) carisoprodol; and (2) for prescriptions and dispensations described by Subdivision (1), patterns of prescribing or dispensing combinations of those drugs and other dangerous combinations of drugs identified by the board....(d) The board may initiate a complaint against a veterinarian based on information obtained under this section.

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References

Rummans et al., 2018. How good intentions contributed to bad outcomes: the opioid crisis. *Mayo Clin Proc.* 93(3):344-350.
Kosten, TR, and George, TP. 2002. The neurobiology of opioid dependence: implications for treatment. *Sci Pract Perspect Jul*; 1(1): 13–20.
Code of Federal Regulations Title 21, Ch II, Part 1300-1304
Texas Administrative Code Title 22, Part 24, Ch 573

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THANK YOU

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PRESCRIPTION DIET

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Exotic Companion Mammal Dentistry



Sue Chen, DVM, Diplomate ABVP (Avian)

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GOAL OF PRESENTATION



- Dental Anatomy
- Clinical signs of Dental Disease
- The Dental Examination
 - Dental equipment
 - Diagnostics
- General supportive measures
- Case presentations

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3

Dental Anatomy



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Dental Anatomy



• *Herbivores*

- Rabbits
- Guinea Pigs
- Chinchillas
- Prairie Dogs



• *Omnivores*

- Rats/Mice
- Hedgehogs
- Sugar Gliders



• *Carnivores*

- Ferrets



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Dental Terminology



Types of Teeth



- Incisors
- Canines
- Premolars
- Molars
- Cheek Teeth



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Dental Terminology



Types of Teeth

• Anelodont vs. Elodont

• Brachydont

vs.

• Hypsodont

- Radicular (close-rooted)
- Aradicular (open-rooted)
- aka Elodont



<https://veteriankey.com/exotic-animals-oral-and-dental-diseases/>

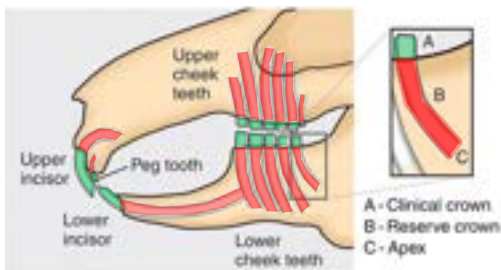
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Dental Terminology



Dental Anatomy

- Clinical Crown
- Reserve Crown
- Apex



Quesenberry, K., Mans, C., & Orcutt, C. (2020). Ferrets, Rabbits, and Rodents (4th ed.). Elsevier.

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Dental Terminology

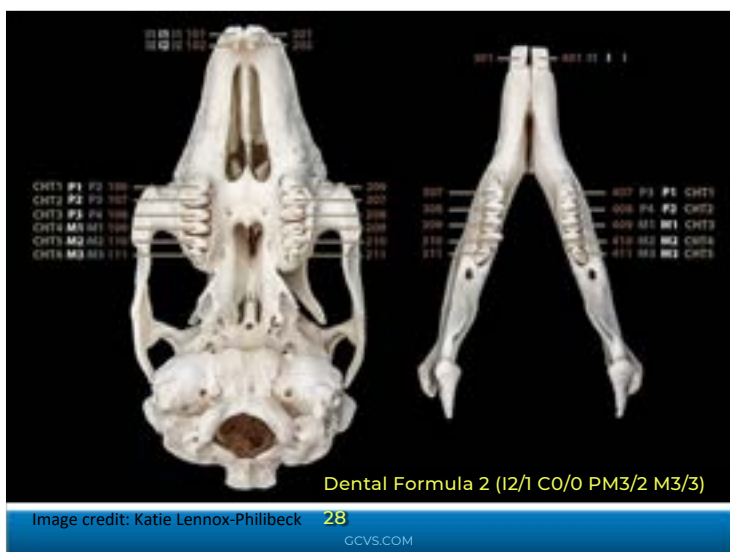
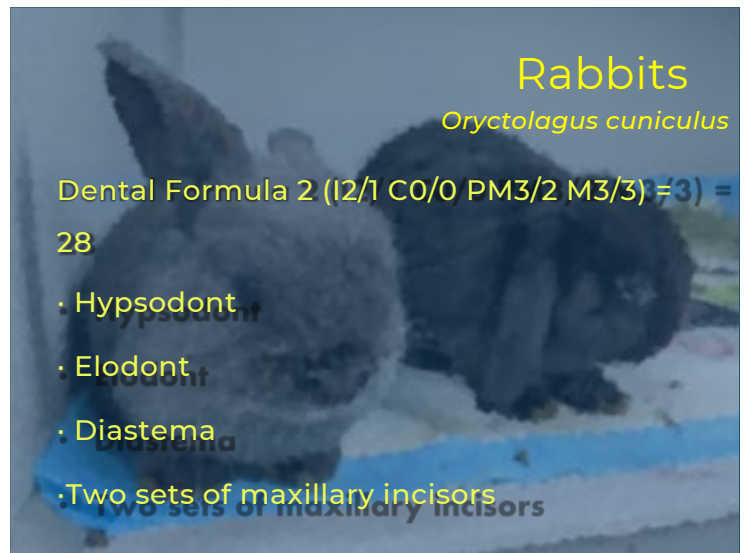


Dental Anatomy

- Clinical Crown
- Reserve Crown
- Apex
- Lingual
- Buccal
- Occlusal surface

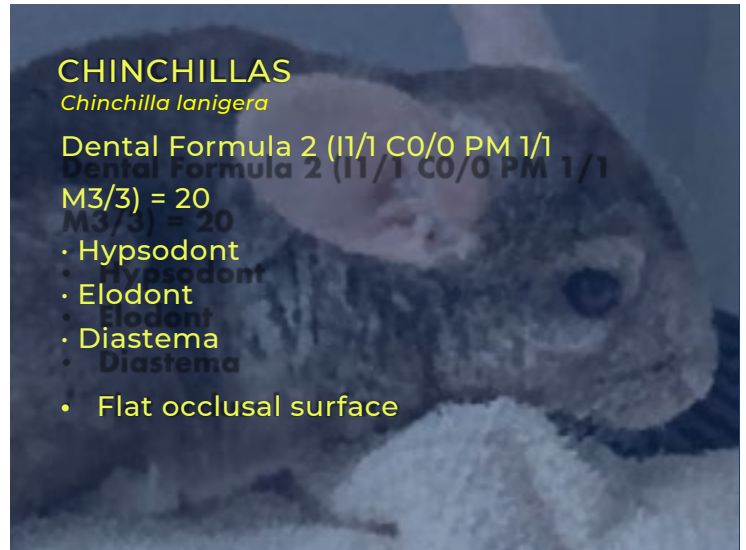


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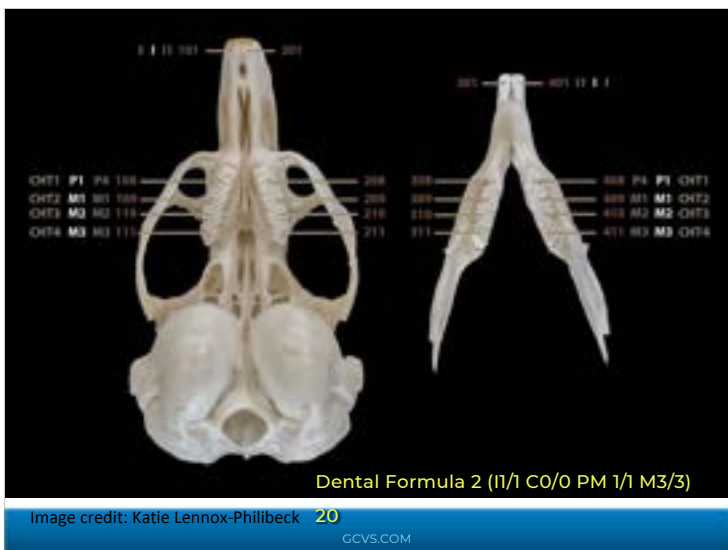


CHINCHILLAS
Chinchilla lanigera



CHINCHILLAS
Chinchilla lanigera

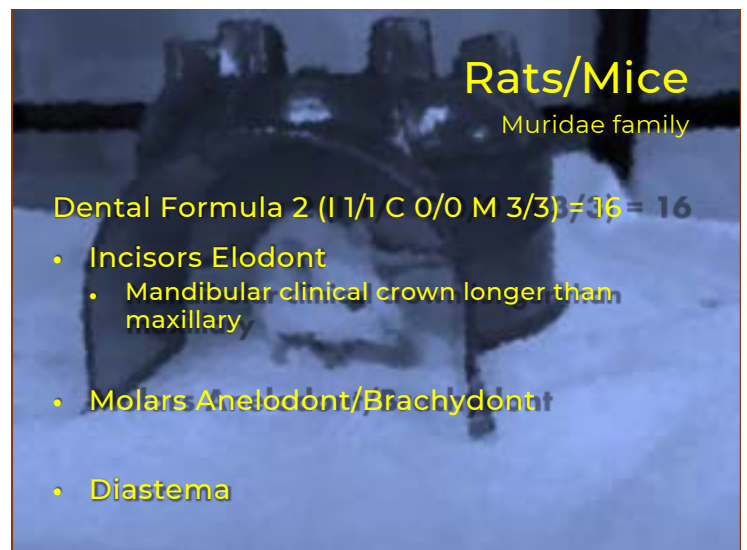
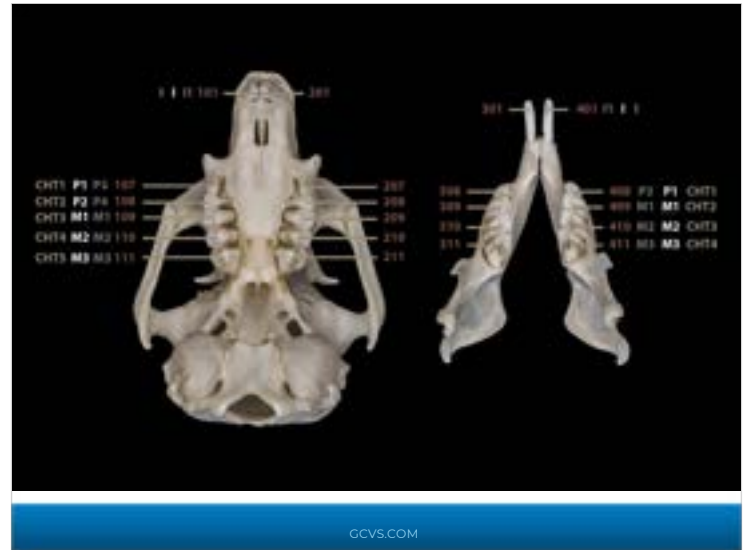
- Dental Formula 2 (I1/1 C0/0 PM 1/1
M3/3) = 20
M3/3) = 20
- Hypsodont
 - Elodont
 - Diastema
 - Flat occlusal surface

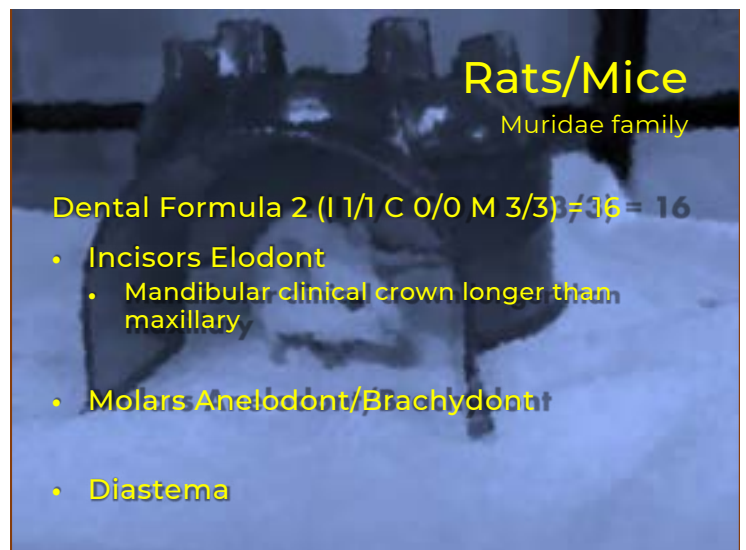
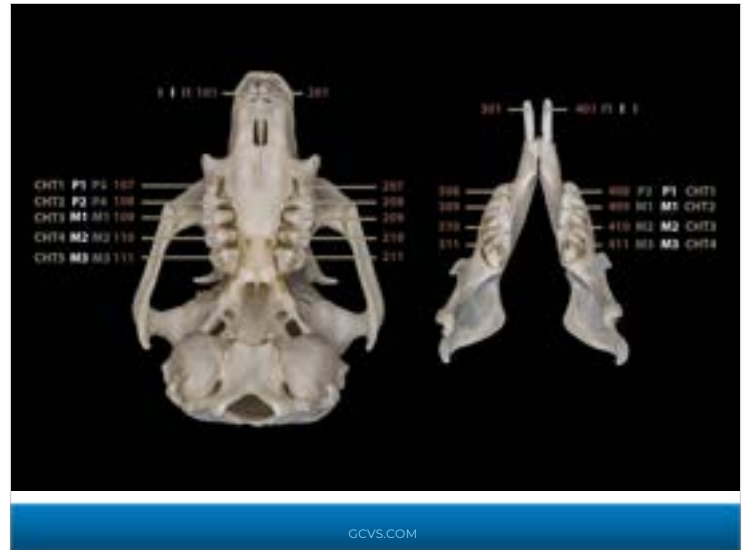


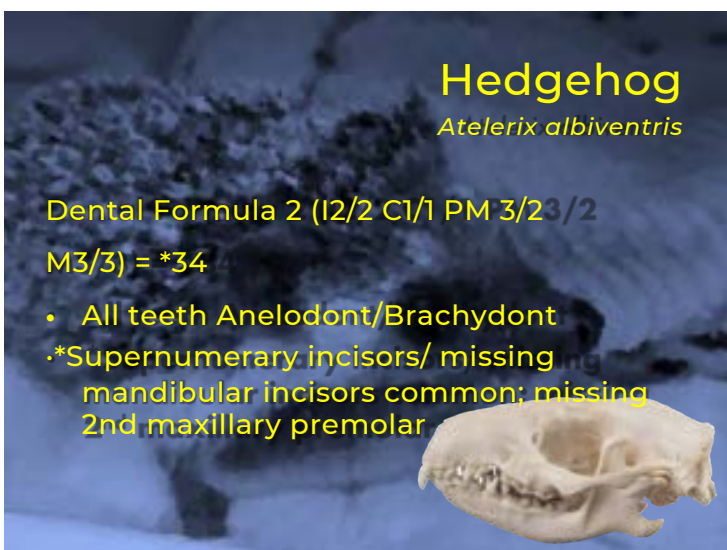
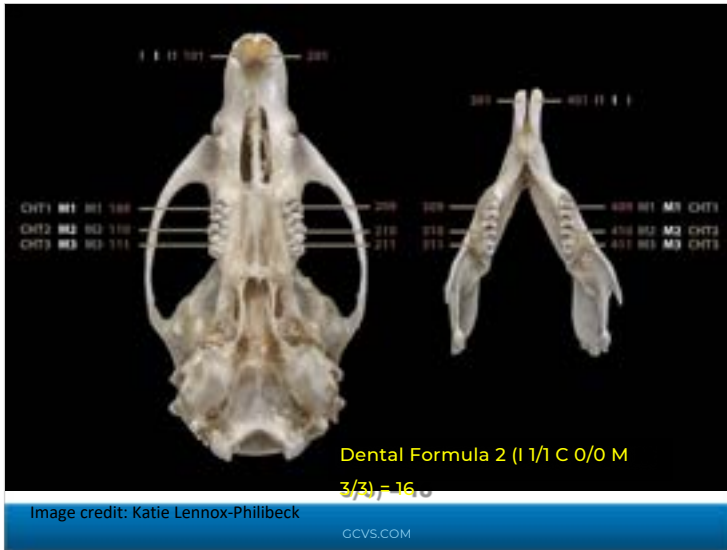
Dental Formula 2 (I1/1 C0/0 PM 1/1 M3/3)

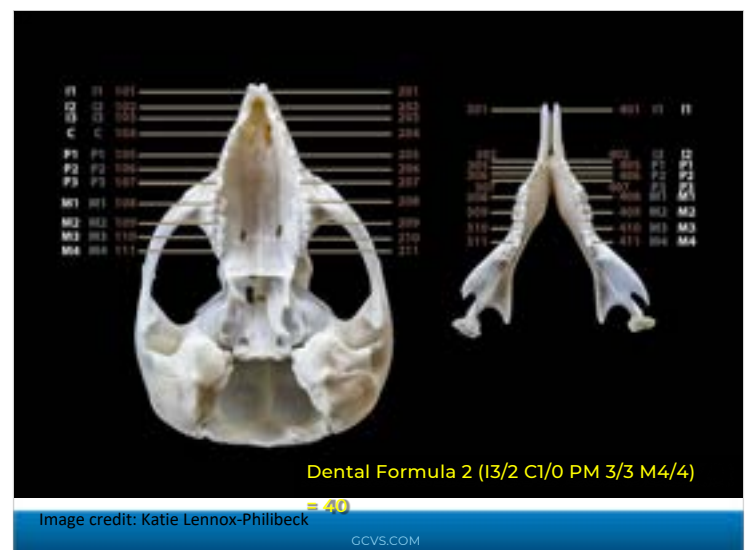
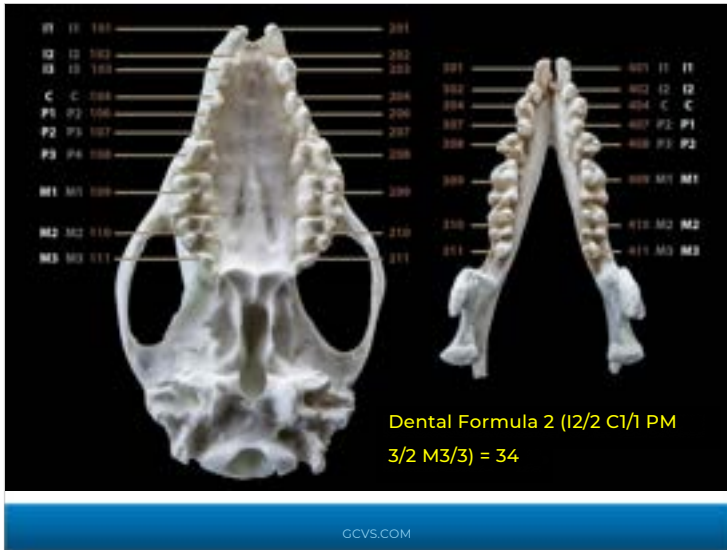


PRAIRIE DOGS
Cynomys ludovicianus











Dental Formula 2 (I3/3 C1/1 PM 3/3 3/3 M1/2) = 34

- Brachyodont
- Anelodont
- Supernumerary incisors common
- Carnassial teeth – 4th maxillary premolar and 1st mandibular molar most developed

FERRETS
Mustelidae putorius furo

Dental Formula 2 (I3/3 C1/1 PM 3/3 M1/2) = 34

Image credit: Katie Lennox-Philibeck
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Clinical signs of Dental Disease

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Clinical signs of Dental Disease



- **Decreased appetite**
 - Favoring certain food items
 - Interest in food, but not eating
- Malodorous breath
- Bruxism
- Ptyalism
- Epiphora
- Facial Swelling
- Nasal discharge
- Unkempt haircoat



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Clinical signs of Dental Disease



- **Decreased appetite**
 - Favoring certain food items
 - Interest in food, but not eating
- Malodorous breath
- Bruxism
- **Ptyalism**
- Epiphora
- Facial Swelling
- Nasal discharge
- Unkempt haircoat



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Clinical signs of Dental Disease



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 - Favoring certain food items
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- Nasal discharge
- Unkempt haircoat



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Clinical signs of Dental Disease



- **Decreased appetite**
 - Favoring certain food items
 - Interest in food, but not eating
- Malodorous breath
- Bruxism
- Ptyalism
- Epiphora
- **Facial Swelling**
- Nasal discharge
- Unkempt haircoat



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The Dental Examination

How to evaluate the teeth

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Performing an oral exam



Equipment

- Dental speculum
- Otoscope
- Endoscopic otoscope
- Sedation greatly aids in visualization



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Sedation/Anesthesia

For exam or treatment



- Gabapentin
- Buprenorphine/Hydromorphone
- Midazolam
- +/- Dexdomitor/ZenAlpha
- +/- Alfaxalone
- +/- Inhalant

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Performing an oral exam

Use Oral Speculum

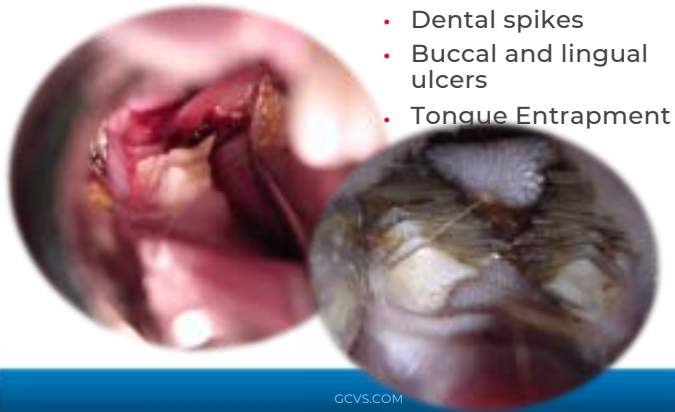


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Performing an oral exam



Evaluating oral cavity



Performing an oral exam



Evaluating oral cavity



- Dental spikes
 - Buccal and lingual ulcers
 - Tongue Entrapment
 - Abnormal occlusal surfaces
 - Cavities
 - Entrapped foreign material
 - Purulent debris
 - Missing teeth
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Diagnostic imaging

Endoscopy

- Better evaluation of oral cavity
- Magnifies dental lesions

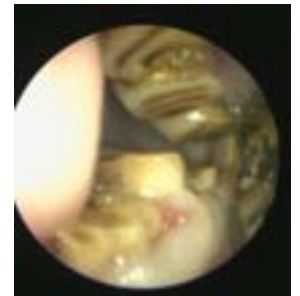


Diagnostic imaging



Endoscopy

- Better evaluation of oral cavity
- Magnifies dental lesions
- Documentation of lesions
 - Pre- and post-procedure



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Diagnostic imaging



Endoscopy

- Better evaluation of oral cavity
- Magnifies dental lesions
- Documentation of lesions
 - Pre- and post-procedure
 - To share annotated images with owners



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Diganostic Imaging



Radiographs



A - Clinical crown
B - Reserve crown
C - Apex

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Diagnostic imaging

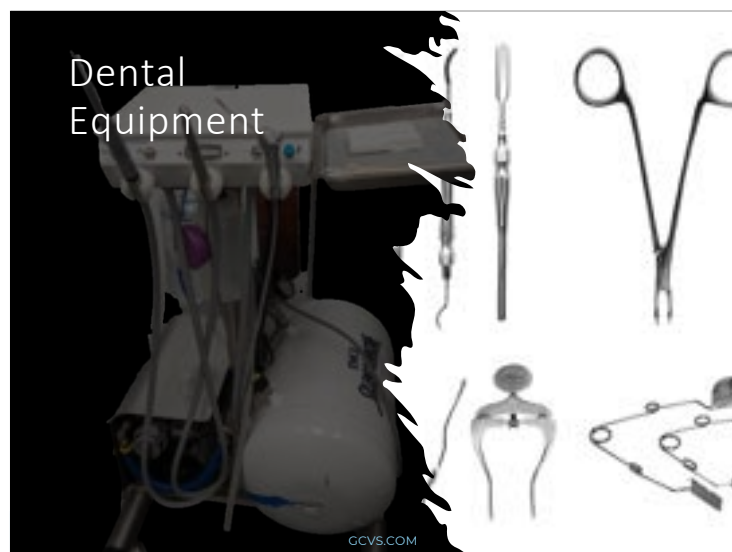


Computed Tomography



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Dental Equipment



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Dental Equipment



Increasing visualization



- Mouth gags
 - Dental table
- Cheek dilator
- Spatula



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Dental Equipment



Treatment



- Rongeurs
- Variable Speed Dental Unit
 - Low speed handpiece

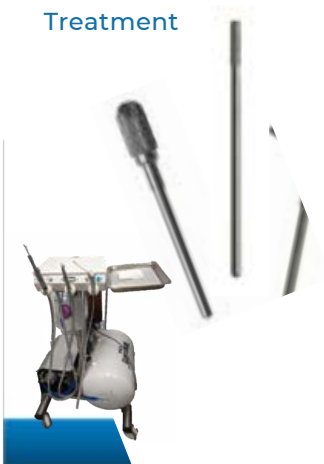


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Dental Equipment



Treatment



- Variable Speed Dental Unit
 - Low speed handpiece
- Different bits
 - Lg Tubular HP Carbide Bur
 - X-long 60 mm Diamond HP Bur
 - Diamond Disc

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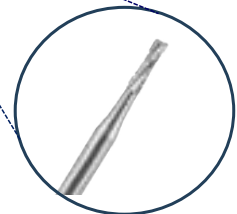
Dental Equipment



Treatment



- Variable Speed Dental Unit
 - High-Speed handpiece
 - X cut Bur



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Dental Equipment

Treatment



- Probes
- Luxators
- Cotton Tipped Applicators
- Tongue Depressor

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Post-op care

- **Offer food**
- **Pain medications & Anti-inflammatories**
 - Meloxicam
 - Gabapentin
 - Maropitant
 - +/- Opioids



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Post-op care

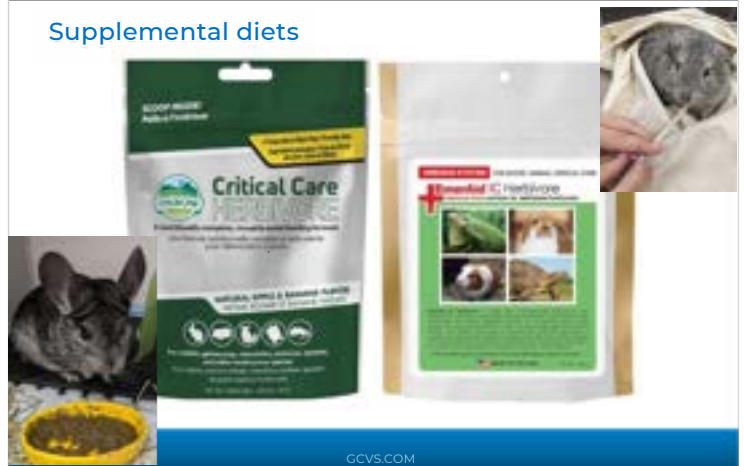
- Assist feed if not eating



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Post-op care

Supplemental diets



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Post-op care



Supplemental diets

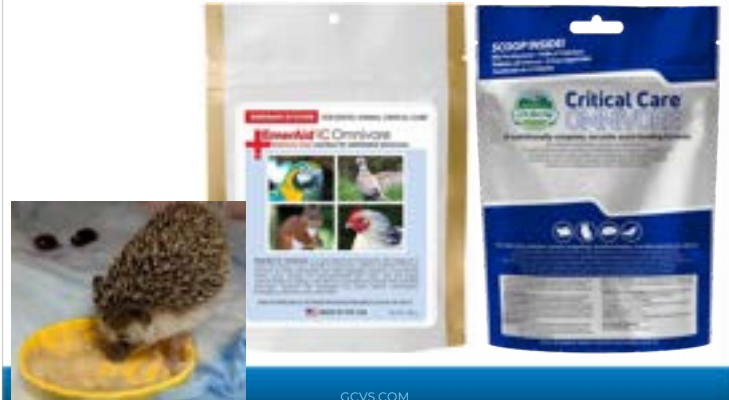


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Post-op care



Supplemental diets



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Case presentations



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"Gus"



- 1.5 year old rat
- Decreased appetite
- Rough haircoat

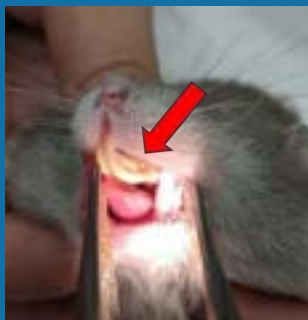


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"Gus"



- Overgrown maxillary incisors on physical exam



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Elongation of Elodont teeth



Etiology

- Malocclusion
 - Congenital
 - Brachycephalic breeds
 - Acquired
 - Trauma
 - Inappropriate diet
 - Metabolic bone disease



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Elongation of Elodont teeth



Etiology



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Elongation of Elodont teeth



Etiology

- All teeth
 - Rabbits
 - Guinea pigs
 - Chinchillas
- Only Incisors
 - Rats
 - Mice
 - Prairie dogs



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Elongation of Elodont teeth



All teeth

- Rabbits
- Guinea pigs
- Chinchillas

• Only Incisors

- Rats
- Mice
- Prairie dogs



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Elongation of Elodont teeth



If incisors are overgrown/abnormal in species with elodont teeth, look at the cheek teeth!



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Elongation of Elodont teeth



Evaluating cheek teeth



- Dental spikes
- Buccal and lingual ulcers
- Foreign material
 - Food
 - Hair
- Tongue Entrapment
- Uneven occlusal surface (aka "Wave Mouth" or "Step Mouth")

Elongation of Elodont teeth



Occlusal Adjustment of Cheek Teeth



- Rongeurs
 - Only for dental spikes & tongue entrapment



Elongation of Elodont teeth



Occlusal Adjustment of Cheek Teeth

- Rongeurs
 - Only for dental spikes & tongue entrapment



Elongation of Elodont teeth



Occlusal Adjustment of Cheek Teeth

- Low-speed dental drill for occlusal adjustment
 - Large carbide bur to reduce length
 - Diamond bur to smooth surface

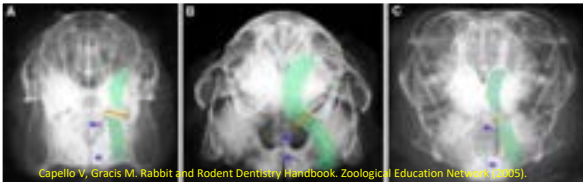


Elongation of Elodont teeth



Occlusal Adjustment of Cheek Teeth

- Low-speed dental drill for occlusal
 - Large carbide bur to reduce length
 - Diamond bur to smooth surface
- Obtain proper angle



Capello V, Gracis M. Rabbit and Rodent Dentistry Handbook. Zoological Education Network (2005).

Elongation of Elodont teeth

Occlusal Adjustment of Cheek Teeth

- Low-speed dental drill for occlusal adjustment
 - Large carbide bur to reduce length
 - Diamond bur to smooth surface
- Obtain proper angle
- Check jaw range of motion

Elongation of Elodont teeth



Occlusal Adjustment of Cheek Teeth



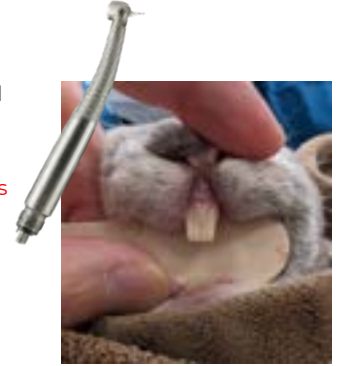
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Elongation of Elodont teeth



Trimming incisors

- Trim under sedation
 - High-speed dental drill with cutting bit
 - Tongue depressor to protect soft-tissues
 - **Do not use nail clippers**
- Trim incisors **AFTER** cheek teeth have been addressed



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Elongation of Elodont teeth



Extraction of incisors

- Severe malocclusion
 - Requiring frequent incisor trims
- Risk of fracturing teeth
- Risk of regrowth
 - All incisors usually need to be extracted



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"Gus"

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- 1.5 year old rat
- Decreased appetite
- Rough haircoat
- Overgrown incisors



- Extraction recommended
- Incisor trim every 6-8 weeks under light sedation

• **What about his cheek teeth?**



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"Figgy"



- 5-year old male rabbit
- Stopped eating hay
- Mild swelling of mandible



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"Figgy"



- Mild swelling of mandible
- Uneven incisors
- Purulent debris from right mandibular incisor



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"Figgy"



- Mild swelling of mandible
- Uneven incisors
- Purulent debris from right mandibular incisor
- Scab under chin



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Odontogenic Abscesses



- Most common type of abscess in rabbits
 - Sugar gliders
 - Guinea pigs
 - Hedgehogs
- Swelling of jaw or face
- Malalignment of teeth
- Elongation of teeth
- Loose teeth
- Purulent debris emanating from gums

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Dental Abscessation



Evaluation



- Diagnostic imaging
 - Radiographs
 - Lateral
 - VD
 - Obliques

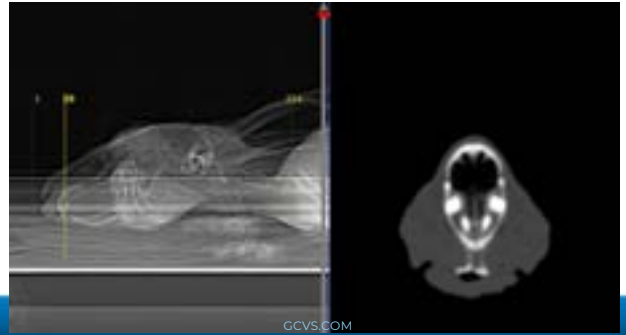
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Dental Abscessation



Evaluation

- Diagnostic imaging
 - CT scan



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Dental Abscessation



Evaluation



- Diagnostic imaging
 - Radiographs
 - CT scan
- Identify pathogen
 - Culture
 - Next generation DNA sequencing
 - Aerobic and anaerobic bacteria
 - Fungal organisms

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Dental Abscessation



Treatment

- Surgical debridement
 - En bloc Resection
 - Marsupialization
 - Staged Wound packing



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Dental Abscessation



Treatment

- Surgical debridement
 - En bloc Resection
 - Marsupialization
 - Staged Wound packing
- Drains are not recommended
- Hyperbaric Oxygen Therapy (HBOT)
- +/- Extraction of teeth
 - Fistulas
 - Malalignment of jaw in elodont species

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Dental Abscessation



Treatment – Supportive measures



- Supplemental fluids
- Assist Feed
- Pain/Anti-inflammatory Medications
- Antibiotics based on culture or DNA sequencing

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"Figgy"



- 5-year old male rabbit with mandibular abscess
- Marsupialization
- HBOT
- Long-term antibiotics
 - CCFA SQ
- Oral fistula
- Chronic management



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"Stella"



Increased respiratory effort

Decreased appetite

Short uneven incisors

Nasal discharge



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Odontomas



- Seen most commonly in prairie dogs and squirrels
- Increased respiratory effort
 - +/- nasal discharge
- Difficulty eating



- Abnormal incisors
 - Shortened
 - Ridged
 - Overgrowth of opposing incisors

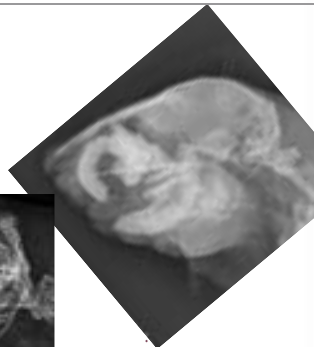
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Odontomas



Evaluation

- Diagnostic Imaging
 - Radiographs



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Odontomas



Evaluation

- Diagnostic Imaging
 - Radiographs
 - CT



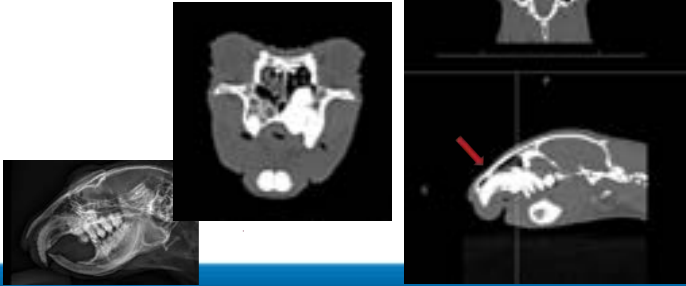
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Odontomas



Evaluation

- Diagnostic Imaging
 - Radiographs
 - CT



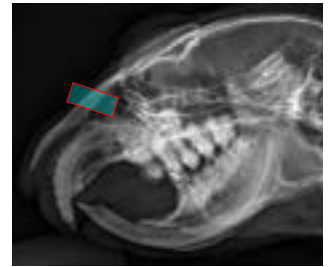
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Odontomas



Treatment

- Increase Airway Patency
- Anti-inflammatories
 - Meloxicam
- +/- Antibiotics
 - Maropitant
- Surgical options
 - Rhinostomy
 - Tracheostomy
 - Incisor Extraction



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"Stella"

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Increased respiratory effort
Decreased appetite
Short uneven incisors
Nasal discharge

- Recommended rhinostomy or incisor extraction
- Owners elected medical management
- Trimmed teeth as needed



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"Slinky"

Click to edit Master subtitle style



• 2-year old male ferret

- Not eating kibble
- Malodorous breath
- Dental calculi on several teeth



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Ferret dental diseases



Fractured Canines
Plaque & calculi
Gingivitis
Periodontal disease
Furcation
Osteomyelitis
Periapical abscesses



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"Slinky"

Click to edit Master subtitle style



- 2-year old male ferret
- Not eating kibble
- Malodorous breath
- Dental calculi
- Furcation
- Extraction
- Improved oral hygiene
- Routine dental cleaning



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Take home points

- Always check the teeth if there is a decrease in appetite
 - Check both incisors AND cheek teeth!
- Use sedation to aid in identifying lesions
- Use pain medications
- Use appropriate antibiotics based on sensitivities
- **Do not trim sugar glider incisors!**

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References



References



<https://www.exoticvetclinic.com/dentition-poster>



References



<https://www.exoticvetclinic.com/dentition-poster>



Any
Questions?

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Parvo is



Test. Treat. Defeat.



Canine Parvovirus
Monoclonal Antibody

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Innovation. In practice.



IDEXX

NEW MONOCLONAL ANTIBODY TREATMENT ADVANCES AND WHERE WE CAN GO NEXT



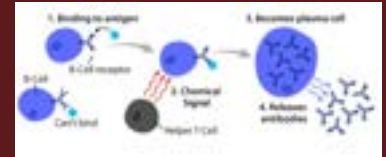
WHAT ARE MONOCLONAL ANTIBODIES?

Complex, large molecular weight
biological protein macromolecules

Designed to mimic the natural immune
response by the body

Unlike a natural immune response, as per the
name, these are made when a single antibody
recognizes a single region (epitope) on the
target antigen

These are antibodies that we administer to a
patient and not a drug to induce the patient's
own immune response



MECHANISMS OF ACTION



Attack circulating targets (such as
cytokines)



Bind and block target receptors



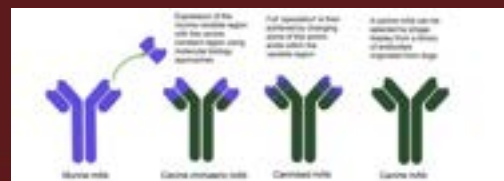
Attach and attack viruses or cancer
cells with direct cytotoxicity

SINGLE MOST IMPORTANT STEP



Immunogenicity: the ability of a molecule to
induce a specific humoral or cellular immune
response

Higher immunogenicity with xenogeneic
antibodies; least with fully species specific
antibodies



PROS AND CONS

- Pros
 - Extremely target specificity
 - Long half-life
 - Precise mode of action
- Cons
 - Inactivated by digestion, therefore must be injected
 - Cannot act intracellularly
 - Immunogenicity (still one of the largest cons)
 - Difficulty penetrating tumors



<https://www.ancmempth.com/ukvet/blog/temphs/2022/09/02/facial-swelling-in-dogs>



Liccardi DR, Chapter 2: The Abdominal (GI/GI) Exam. In: Farnsworth (Ed): Small Animal Practitioner, Editor, Liccardi DR, Wiley Blackwell, Ames IA, 2014

USE IN HUMAN MEDICINE



HUNDREDS OF USES IN HUMAN MEDICINE



MABs dominate the biologics market in human cancer therapy

Cancer

Inflammatory and autoimmune disorders inclusive of IBD and allergies

Organ transplant rejection

Infections, including COVID-19

Osteoporosis

Eye conditions

Migraines

High Cholesterol

Nervous system disorders

USE IN VETERINARY MEDICINE



CURRENT/PAST MABS FOR COMPANION ANIMAL USE

- MA b 231 (canine lymphoma) (7), used in conjunction with chemotherapy (VCAA), 80% remission form a group of 215 dogs, very promising but discontinued due to apparent lack of demand at the time
- B-cell lymphoma (AT-004, anti-CD20) and T-Cell Lymphoma (AT-005, anti-CD52) (7), USDA licensing trials show not encouraging results
- Librela (bedinvetmab) - NGF (Nerve Growth Factor)
- Solensia (furnevetmab) - NGF (Nerve Growth Factor)
- CPV monoclonal antibody
- Cytopoint (lokivetmab) - IL 31
- Glivetmab - (treats Melanoma and Mast Cell Tumors) (9) conditionally approved

LIBRELA - NERVE GROWTH FACTOR



SOLENSIA - NERVE GROWTH FACTOR



<https://www.janssen.com/products/fur/malevela>

CPV MONOCLONAL ANTIBODY - PARVOVIRUS



<https://my.janssen.com/us/parvovirus>

CYTOPOINT – 31



<https://www.purina.com/products/dogs/cytopoint>

WHERE DO WE GO FROM HERE?



Essentially anything an antibody can target



Cancer



Autoimmune diseases

ALTERNATIVES TO CURRENT TREATMENTS

Immunosuppressants
additions to better regulate disease

OTHER SPECIES

Not just for canine and feline treatments



SOURCES

Rosenbaum, Michele. *The Science of Monoclonal Antibody Therapy: Introducing Canine Atopic Dermatitis Immunotherapy*.
Beirão, Breno C. B., et al. "Challenges and Opportunities for Monoclonal Antibody Therapy in Veterinary Oncology." *The Veterinary Journal*, vol. 218, Dec. 2016, pp. 40–50. <https://doi.org/10.1016/j.tvjl.2016.11.005>.
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Arvin, A. M., and S. F. Chen. "Vaccines, Viral." *Elsevier eBooks*, 2009, pp. 796–804. <https://doi.org/10.1016/b978-012373944-5.00321-7>.
Mhyjack. "Merck Animal Health Announces Availability of Novel Canine Oncology Therapy to Veterinary Specialists Practicing Oncology Nationwide." *Merck Animal Health*, 27 Nov. 2023, www.merck-animal-health.com/blog/2023/10/13/merck-animal-health-announces-availability-of-novel-canine-oncology-therapy-to-board-certified-veterinary-oncologists-nationwide.
Professional, Cleveland Clinic Medical. "Monoclonal Antibodies." *Cleveland Clinic*, my.clevelandclinic.org/health/treatments/22246-mono-clonal-antibodies.

THANK YOU



Amanda Hanzel

972-358-4426

Amanda.Hanzel@nva.com

"En Fuego-" Anticipation is what saves these patients

Colleen Willms, DVM, DACVECC



"En Fuego..."



Summary



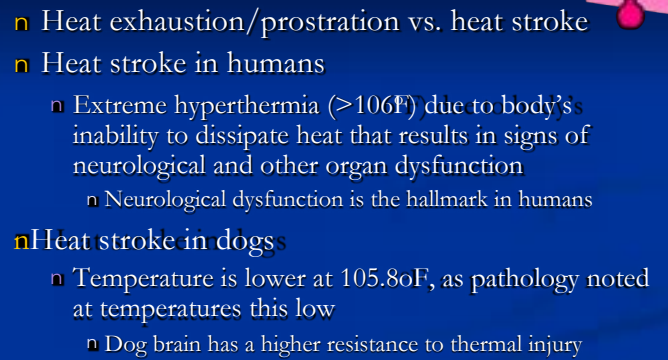
- Definitions
- Pathophysiology
- Types of heat stroke
- Mechanisms of heat dissipation
- Predisposing risk factors
- Initial assessment and stabilization
- Secondary survey and intensive supportive care
- Clinical research and prognosis

Definition

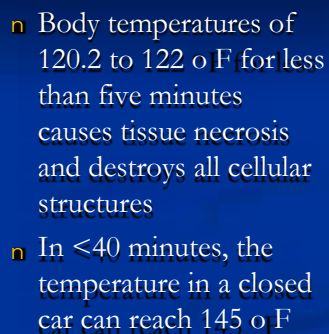
- Hyperthermia: elevated body temperature due to various causes
- Fever is a type of **hyperthermia**
 - Thermoregulatory center in the hypothalamus...
 - is not functional
 - "resets" the temperature to a higher "set point" in response to endogenous or exogenous pyrogens



Body temperature is regulated by the hypothalamic thermostat, which has a specific set point under normal conditions. Fever can result from a resetting of this set point or from an abnormality in the thermoregulatory system itself, as shown in this flowchart.

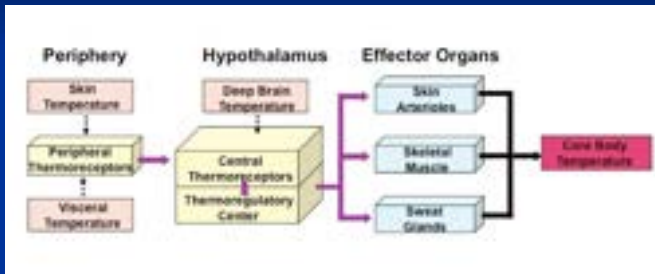


Pathophysiology



- Core temperature is maintained in a narrow set range to allow all systems to function properly and prevent tissue injury
 - Hypothalamus ensures that this happens
 - Increase in body temperature $<1^{\circ}\text{C}$ (1.8°F) activates hypothalamus to...
 - Decrease blood delivery to periphery via vasodilation
 - Increase cardiac output
 - Increase minute ventilation via panting

Thermoregulation



Fever vs. heat stroke

Fever

- Normal acute phase response (APR) to infection or inflammation
- Balance between pro-inflammatory and anti-inflammatory mediators so destructive AND protective
- Well balanced so rarely puts patient at risk for heat related complications

Heat stroke

- Set-point is NOT re-programmed → APR activated to prevent tissue injury/promote repair → APR runs "amuck" with pro-inflammatory mediators prevailing → tissue damage

Types of heat stroke

Non-exertional

Exposure to a hot and humid environment
The body can adapt to these conditions, given enough time=acclimatization

- Partially at 10-20 days and fully at 60 days

Adaptive mechanisms:

- Conserve salt and water to increase intravascular volume
- Increase glomerular filtration rate (GFR)
- Improve cardiovascular performance
- Increase muscles' resistance to rhabdomyolysis

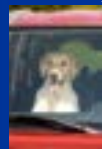
Types of heat stroke

Exertional

- Associated with intense physical exercise
- Seen at the start of the warm season (late spring or early summer) before acclimatized

- Working dogs that have recently moved to a warmer climate

Dog frantically trying to escape from being trapped in a locked car in the sun



Mechanisms of heat dissipation

Conduction: body is in contact with a cool surface
i.e. limited by fur insulation

Convection: heat transferred to the air passing over the body
i.e. wind or fan

Radiation: natural release of heat from body into environment

Evaporation: fluid changing to vapor
i.e. panting in dogs; perspiration in people



How do dogs deal with heat?



- Vasodilation (radiant)
- Panting (evaporative)
- Increased skin circulation
(radiant, conduction)
- Seeking cool shelter
- Drinking water

Intrinsic predisposing factors

Limits convection/radiation

- Thick hair coat
- Obesity
- Cardiovascular disease



Limits evaporation/conduction

- Compromised airway
i.e. laryngeal paralysis or
brachycephalic breeds
 - Also adds to heat production



Intrinsic predisposing factors

■ Limits evaporation, radiation and convection

- Dehydration +/- water deprivation
 - Also impairs thermoregulation



■ Increased intrinsic heat production

- Increased work of breathing
- Rise in metabolic activity i.e. exercise, eclampsia, tremorgenic toxins, seizures



Extrinsic predisposing factors

■ Decreased conduction, radiation, convection

- High environmental temperatures



■ Decreased evaporation

- High humidity
 - Evaporation is the most important process for heat dissipation when environmental temperature is >90°F



Prior to arrival at clinic:

■ Recognition

- Well-educated dog owner or handler is the "first responder" in this chain of survival



■ Signs?

- Panting ■ non-stop Staggering Collapsing
- Altered level of consciousness in hot/humid environment
- Altered level of consciousness in hot/humid environment

- Obtain rectal temperature STAT!!



Cooling measures at home:



- Get pet OUT of heat and in the shade
- Soak fur with tepid water
- Fan on high, AC in car if humid or windows open if not humid

Cooling measures at home:

DO NOT immerse

DO NOT immerse in cold or ice water

- Promotes peripheral vasoconstriction and shivering and can raise core body temperature

Massage

Massage muscles-improved circulation and can ease pain

STOP

STOP cooling measures when reach rectal temperature of 103°F

- Avoid hypothermic overshoot and shivering

Why cool at home or en route?



Retrospective study on heat stroke showed:

49% mortality in cases where owners did not start cooling process

VS

14% mortality when owners initiated appropriate cooling measures prior to and during transport!

Initial assessment and stabilization

- Rectal temperature may NOT be high!
- Low temperature may need re-warming
 - Overzealous cooling
 - Poor perfusion
- Take a thorough history:
 - Timeline of heat exposure?
 - Home cooling measures done?
 - Clinical signs that support diagnosis in the absence of hyperthermia?
- Continue safe cooling with wet towels and fan
- Triage and treat most life-threatening issues via CABs



Airway and Breathing

Adequate airway?

Laryngeal paralysis/collapse
Tracheal collapse
Oropharyngeal/laryngeal edema
Upper airway obstruction

■ Minimize work of breathing

Sedatives-choose reversible ones

■ ALWAYS provide oxygen

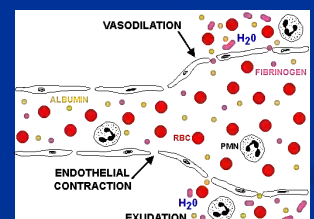
■ Radiographs are not therapeutic!

■ Anticipate... intubate... ventilate in some cases



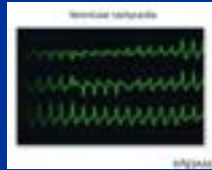
Circulation

Distributive shock due to massive vasodilation



Circulation

- n Hyperemic mucous membranes
- n Short CRTT
- n Sinus tachycardia
- n ++ ventricular tachyarrhythmia
- n Weak pulses
- n Massive hypovolemia
 - n GI third spacing/losses and respiratory losses



Circulation

- n Place two large bore IV catheters
- n Start isotonic crystalloids STAT
 - n Incremental boluses of 20-30 mL/kg IV to effect with desired end-points of resuscitation for HR, BP +/- CVP
- n Minimum Data Base from IV catheter hub
 - n PCV/TSS
 - n Blood glucose
 - n Azostick



Circulation

- n Obtain full bloodwork: CBC, chemistry, lytes, glucose, lactate, coagulation tests and urinalysis, as starting IV fluids
- n Consider vasopressors if large volumes do not improve blood pressure and tissue perfusion
 - n i.e. norepinephrine and/or vasopressin as constant rate infusions (CRIs)



Neurologic assessment

- n Level of consciousness: normal to comatose
- n Dogs inherently are more resistant to direct thermal brain injury, but...
 - n Neurological signs are seen in heat stroke with:
 - n Hypoglycemia
 - n IV dextrose supplementation
 - n Increased intracranial pressure
 - n IV mannitol +/- hypertonic saline
 - n Hyperbaric oxygen therapy (HBOT)
 - n Seizures (correlated with increased death risk)
 - n IV diazepam
- n Cortical blindness: Intact PLRs; no menace
 - n Typically resolves over several hours, but can be permanent
 - n HBOT



Secondary Survey and Intensive Supportive Care



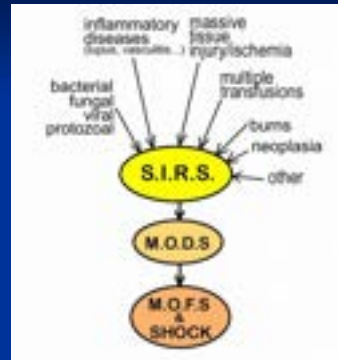
n Patient is no longer emergent after initial triage and stabilization → shift focus to prevent SIRS and stabilization → shift focus to prevent SIRS

n SIRS = systemic inflammatory response syndrome

n DIC = disseminated intravascular coagulopathy

By monitoring/treating for SIRS, we can prevent progression into DIC, MODS and decrease mortality!

SIRS >> MODS >> MOFS



Systemic Inflammatory Response

Normal endothelium

n Tight junctions, selective permeability

n Coagulation- heparins/thrombomodulin; subendothelial collagen; vWF

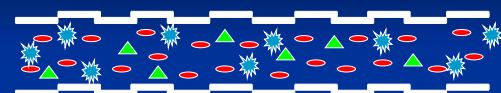
n Nitric oxide – vasodilator

n Endothelin – vasoconstrictor



Systemic inflammatory response

Normal endothelium



- Red blood cells
- Albumin
- Platelets
- Subendothelial collagen

Systemic inflammatory response

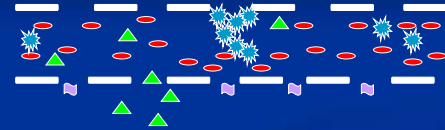
Damage to endothelium



- Damage to endothelium
 - Excessive heat or cold *
 - Hypoperfusion and anaerobic metabolism *
 - Sepsis/infection
 - Red blood cell destruction

Systemic inflammatory response

Damaged endothelium



- Tight junctions lost, protein loss
- Platelets try to plug the “holes”
- Exposure of subendothelial collagen

Systemic inflammatory response

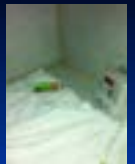
Early markers for systemic inflammation

- Low platelets
- Low albumin
- Rapid clotting times
- Prolongation of clotting times
- Increased D-dimer or FDPs



How to handle SIRS?

- Early recognition prior to clinical signs!
- Maintain hydration and perfusion
 - Combination of crystalloid/colloid
 - Monitor HR and BP
- Consider natural colloids (i.e. Human or canine albumin) in these patients...
 - Limit loss through the “leaky” vessels
 - Improved rheology and blood flow
 - Can actually “plug” some of the leaks in the endothelium
 - Provides oncotic pull to prevent edema
- Plasma transfusions
 - To treat coagulopathies NOT to replace albumin



Intensive care

- Apply critical thinking in an effort to anticipate and identify further complications:

- Coagulopathies
- Acute renal failure
- Lung failure
- GI compromise
- Hepatic dysfunction
- CNS dysfunction



- Constantly re-examine and re-evaluate

Watch these patients carefully, as they can progress from SIRS to MODS to death!

Bloodwork and prognostication

- Commonly see::

- Severe hemoconcentration+- dehydration
- Azotemia
- Hypoglycemia

- Poor prognostic indicators/risks for death:

- Hypoglycemia on presentation-refractory to IV dextrose
- Increased creatinine after 24 hours of therapy
- Thrombocytopenia and prolonged PT and aPTT

Prognostication?



- Nucleated red blood cells (nRBCs) are a common finding on admission

- Study conducted and published in JYIM 2009

Their presence and number are correlated to outcome

Findings?

- More than 18 nRBCs/100 WBCs corresponded to a 91% sensitivity and 88% specificity for death
- Non-survivors had a higher number of nRBCs at presentation compared to survivors AND were more likely to develop acute renal failure and DIC, too

Coagulation concerns

- Monitor for petechiae, ecchymotic hemorrhages, bleeding from any orifice



- Anticipate albumin and platelet count to fall= vasculopathy

- Daily blood smears
- Cheap, easy and valuable!

- Plasma transfusions to halt clinical bleeding
- Blood products to maintain hemodynamic stability



Renal concerns

- Renal insult is common
 - Must get baseline bloodwork and urinalysis to assess renal insult AND recovery
- Urinalysis
 - Casts indicate early tubular injury
 - Myoglobinuria= muscle damage
 - RBCs/hemoglobin may support DIC
- Avoid NSAIDs, steroids, nephrotoxic drugs



Renal concerns

- Urine output monitoring with collection system
 - Monitoring fluid balance measuring “ins and outs”
 - Early identification of oliguric or anuric ARF
 - Be proactive with dextrose, mannitol +/- furosemide and diltiazem
 - Hemodialysis may be necessary
- Monitor serial BUN/creatinine/lytes to determine renal recovery



Gastrointestinal concerns

- Anticipate massive third spacing into GI tract
Vomiting and hemorrhagic diarrhea=common
- Direct thermal damage to GI mucosa
 - Poor perfusion during hypovolemic shock
- Mucosal sloughing, ulcerations, ileus → gut translocation from increased permeability
- Broad spectrum IV antibiotics



Gastrointestinal concerns

- Anti-nausea therapy
 - 5-HT3 receptor antagonists i.e. ondansetron, dolasetron
 - Avoid maropitant with any hepatic dysfunction
 - CRI of metoclopramide in patients with regurgitation
 - Combat silent aspiration/promote motility
- Be pro-active and place...
 - Naso-gastric tubes for gastric decompression and microenteral nutrition to maintain mucosal integrity
 - prior to DIC/coagulopathy development
- Treat GI ulcers with H2-blockers or proton pump inhibitors
- Use sucralfate or therapeutic barium if no vomiting and appropriate mentation



Hepatic concerns



- n Monitor liver enzymes and liver function tests
 - ALT, SAP, t bili, glucose, PT/aPTT, albumin, bile acids profile, serum ammonia
 - Serial monitoring for on-going dysfunction or recovery
- n Maintain perfusion to provide oxygen delivery to hepatocytes for repair
- n No evidence that antioxidant nutraceuticals are beneficial, but likely will do no harm if tolerated

CNS concerns

Decrease in blood flow to brain → hypoxia → edema → aggravation of hypoxia → secondary brain damage

- n HBOT supplies brain with adequate O₂ and interrupts this process
 - n Relief of hypoxia
 - n Improvement of microcirculation
 - n Constricts the brain's blood vessels, yet delivers more oxygen via the plasma component of the blood
 - n 10-15-fold increase in PaO₂, thus 1500-2000mmHg vs 100mmHg
 - n This effect lasts for at least FOUR hours after a single HBOT treatment
- n Reduces cerebral edema
- n Preserves the partially damaged tissue and prevents progression of secondary lesions
- n Improves cerebral metabolism

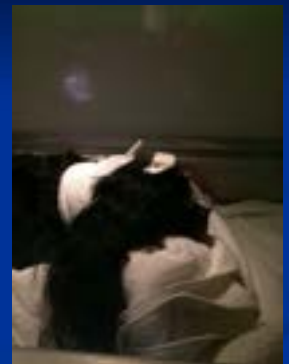


Hyperbaric oxygen therapy (HBOT)



HBOT use

- n Safe and cannot hurt
- n Contraindications:
 - n Pneumothorax or pulmonary bullae
 - n Must take chest radiographs prior
- n Hemodynamically not stable and needs to be on IV fluids



HBOT monitoring

- TPR and BP prior AND immediately after
- Treatment time is typically 60-90 min.
 - Takes 10-15 min. to reach 1.5-2ATA pressure and 10-15 min. to decompress
 - Technician observes patient the entire time, recording observations every 10 minutes



Clinical research and prognosis

Retrospective study: 54 dogs with heat stroke

- Retrospective study: 54 dogs with heat stroke
 - (1999-2004) and published in JVIM
 - Overall mortality rate was 50%

Risk factors for death:

- Delayed admission to the hospital of > 90minutes
- Hypoglycemia at admission
- High total bilirubin, low albumin
- DIC
- Acute renal failure
- High creatinine at 24 hours of treatment
- Seizures
- Ventricular arrhythmias
- Obesity



Mortality and prognosis

Mortality in people ranges from 10-80% and is 50% in small animals



It is essential to give a realistic and guarded prognosis to all heat stroke patients, however...

Clinical experience shows that more than 1/2 of the fatalities seem to occur within the 1st 24 hours of hospitalization

One study found that death is unlikely if the animal survives the first 48 hours and gets on-going aggressive care

Prognosis in summary

- Most pathological lesions from heat stroke can recover if the patient is provided with on-going aggressive supportive care, as long as their owners are prepared and capable of handling the subsequent emotional and financial commitment.



Questions?



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COMPASS



Lower urinary and vulvar surgery

Grayson Cole, DVM, CCRP
Diplomate, American College of Veterinary Surgeons

August 20, 2024

GCVS.COM

Outline

- Anatomy
- Physiology
- Selected surgical techniques



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2

Anatomy

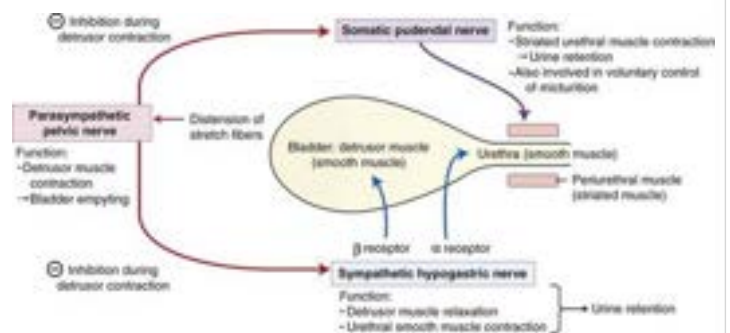
- Bladder
 - Ventral median ligament
 - Urachus
 - Lateral ligaments
 - Detrusor muscle
 - Ureters enter trigone
 - Mucosa, submucosa, detrusor muscle, serosa



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Tobias and Johnston 2nd edition

Physiology

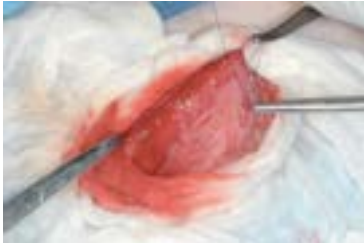


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Bladder wound healing



- Mucosal defects heal in 5 days
- Full thickness defects reach 100% strength in 21 days
- Monofilament absorbable suture recommended
- 3-0 or 4-0 Monocryl commonly used



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Cystotomy technique

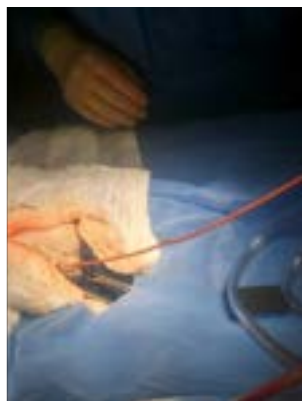


- Caudal ventral abdominal approach
- Stay sutures!
 - One at apex
 - Lateral or caudal
- Lap pad isolation
- +/- Abdominal retractor
- Stab incision and extend with Metzenbaums



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Urinary catheter techniques



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Tips for cystotomy



- Sterile prep prepuce or vulva for normo and retrograde catheterization
- Make sure stones aren't trapped in stay sutures
- Ventral approach to bladder
- Appositional simple continuous



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Hydropropulsion of stones



- Decompress bladder first
- Manually compress urethra proximal to obstruction
- Can place Foley normograde past obstruction
- Hold connection of catheter to syringe



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Tricky!



Bladder wall mineralization

- Tips for identifying:
1. Not gravity dependent
 2. More likely if previous cystotomy
 3. Palpate wall of bladder during surgery if uncertain



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Cystoscopic assisted cystotomy



- | | |
|---|---|
| <ul style="list-style-type: none"> • Pros <ul style="list-style-type: none"> • Faster than laser lit hotr ipsy • Enhanced visualization | <ul style="list-style-type: none"> • Cons <ul style="list-style-type: none"> • Slower than traditional cystotomy |
|---|---|

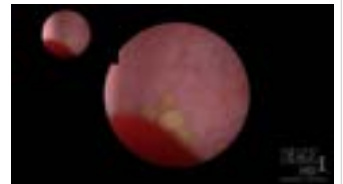


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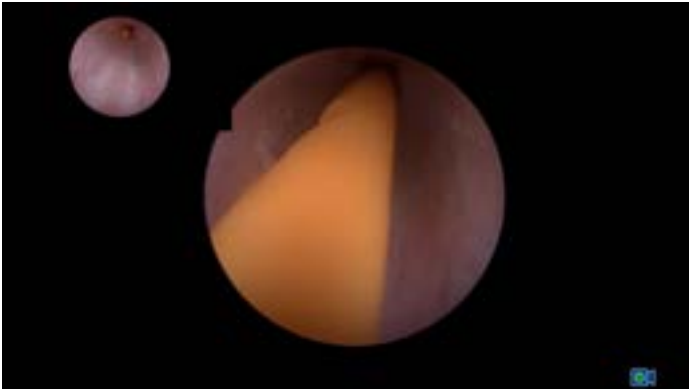
How it works



- Small incision ventral abdominal wall
 - (1-2cm)
- Incision in apex of bladder
- 2.7mm cystoscope or 5mm laparoscope
- Stone retrieval



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Bladder rupture

- Likely apex
- Positive contrast cystogram
- Simple interrupted appositional
- Closed suction drain



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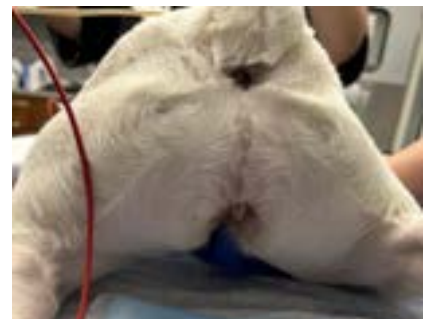
Questions about the bladder?



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Recessed vulva

- Juvenile vulva
- Hypoplastic vulva
- Hooded vulva



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Recessed vulva



- History
 - Multiple/recurrent UTI
 - No historical problems
- Clinical signs
 - Pollakiuria
 - Licking at vulva
 - Stranguria
 - None

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Recessed vulva



- PE:
 - Recessed vulva
 - Ulceration
 - Salivary staining

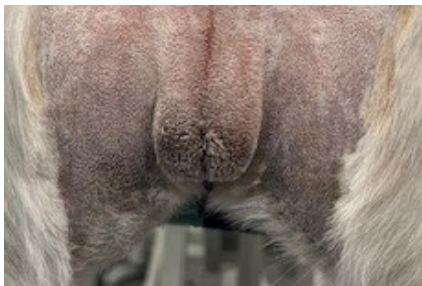


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When to operate?



- Age
- Under GA
- # of UTIs
- Struvite history
- Owner decision
- Perivulvar ulcers



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Vulvoplasty



- Inverted U incision adjacent to the vulva



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Vulvoplasty



- Another inverted U distant from vulva
- Connect "U"s on the inner thigh



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Vulvoplasty



- Retraction helps to complete incision in floppy skin



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Vulvoplasty



- Checking the anatomy before suturing in place



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Vulvoplasty



- Finished product



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Vulvoplasty



Common mistakes

- Not removing enough tissue
- Not incising close enough to vulva



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Urethra



Anatomy

- Male dogs
 - Prostatic
 - Penile
- Male cats
 - Preprostatic
 - Prostatic
 - Postprostatic
- Female dogs
 - More collagen, less muscle
 - External orifice at tubercle
- Female cats
 - More smooth muscle than females

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Urethral wound healing



Critical factors

- Mucosal continuity
 - Urine extravasation
- Suture material
 - Monofilament absorbable
- Urinary diversion critical for tears



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Selected urethral procedures



- Perineal urethrostomy
- Scrotal urethrostomy



Manual of Soft Tissue Surgery, Tobias

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Perineal urethrostomy



Indications:

- FIC
- Neoplasia
- Any penile obstructive etiology

Baseball analogies?

Complications

- Stricture
- Urine scald
- UTI
- Dehiscence
- Reblocking



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Perineal urethrostomy



First step:

- Incision around the prepuce and scrotum
- Scrotal castration for intact males
- Urinary catheterization (may need to perform cystotomy)

Perineal urethrostomy photos courtesy of Janet Grimes



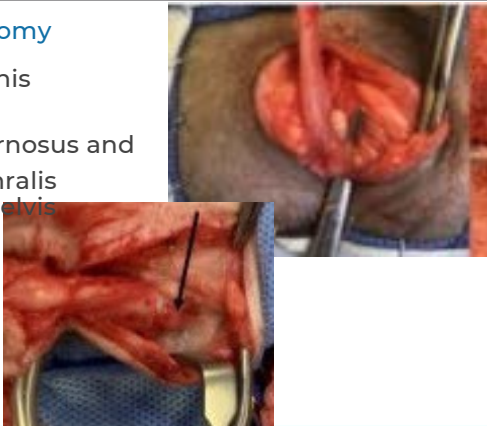
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Perineal urethrostomy



Identify anatomy

Retract penis caudally
Ischiocavernosus and ischiourethralis attach to pelvis



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Perineal urethrostomy



Critical step

- Transect ALL attachments to ischium
- Place finger from one tuberosity to the other
- BU glands



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Perineal urethrostomy



Getting there...

- Retract penis cranially
- Transect retractor penis
- Start incision in urethra



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Perineal urethrostomy



Urethral stoma

- Open urethra to widest point
 - Mosquitos to box lock
 - .8 French red rubber
- 3 sutures at caudal most aspect (skin to urethra)



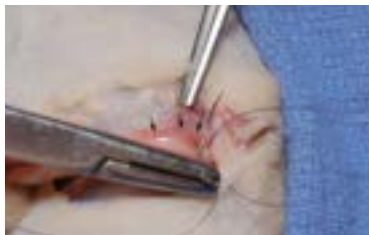
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Perineal urethrostomy



Almost there

- Finish urethrostomy and drain board suturing
 - Consider subq to periurethral sutures
- Transect remaining penile tissue
- Close remaining skin



- Manual of Soft Tissue Surgery, Tobias

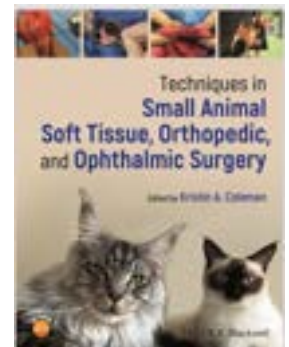
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Perineal urethrostomy



Post operative care

- E-collar!
 - 3 weeks
 - Soft outside of hard
- Non-clumping litter
- Analgesia
 - Buprenorphine
- Antibiotics
 - Culture based



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Perineal urethrostomy



Things to remember!

- Transect ischiourethralis and ischiocavernosus
- Does NOT eliminate clinical signs of FIC
- Monocryl acceptable suture (no need to remove) – Frem JAVMA 2017



Manual of soft tissue surgery, Tobias

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Perineal Urethrostomy



- Don't be an "unblocking hero"
- Cystos are OK!



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What if we can't perform PU?



Transischial urethrostomy
Tube cystotomy
Prepubic urethrostomy
Eutanasia



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Urethrostomy Alternatives



- Transpelvic(ischial)
 - Outcomes favorable
- Prepubic
 - Urine scald
 - Incontinence



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Transpelvic Urethrostomy



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Scrotal urethrostomy in dogs



- Indications:
 - Recurrent obstruction
 - from stones
 - Penile trauma/neoplasia
- Complications
 - Analogous to PU
 - + Hemorrhage
- Scrotal urethra
 - Wide, superficial
 - Decreased urine scald in dogs compared to PU



Manual of soft tissue surgery, Tobias

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Scrotal urethrostomy



Things to remember!

- Retract rather than transect retractor penis
- Bleed for several days!
- Sterile prep scrotal region if urethral stones
- Careful and gentle tissue apposition



Manual of soft tissue surgery, Tobias

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Conclusions



- Bladder fast healing organ
- Delicate tissue handling
- Appropriate dissection



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Questions?



Urethral hydraulic occluder

Urethral sphincter mechanism incompetence

- Indications:
 - Patients who have failed medical management!
- Procedure:
 - Inflatable silicon device connected to port in the subcutis



Urethral hydraulic occluder

- Advantages:
 - Longer term continence over other reported procedures
 - Adjustable after surgery
 - High success rate (92% continence rate in one study)
- Disadvantages
 - Implanted device can become infected
 - Puncture of device may render surgery ineffective
 - More invasive than collagen

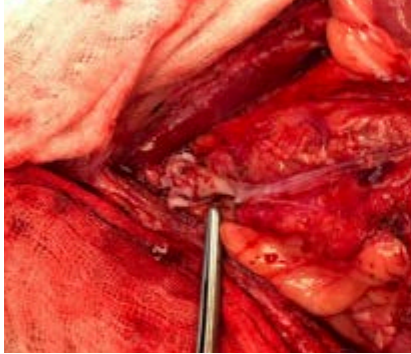
Urethral stricture

Causes:

1. Urethral trauma intraop
2. Overly aggressive adjustments
3. Too small of a device

Treatment:

1. Device removal
2. Balloon dilation



Urethral hydraulic occluder

What you need to know in general practice

- There is another option for refractory USMI
- Not appropriate for neurological causes of incontinence
- Can result in urethral obstruction
- No blind cystos ever again!!!!





About me

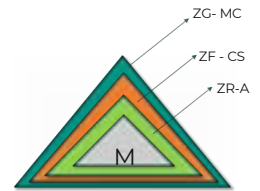
Objectives

- Recall the basic physiology of canine hypoadrenocortism (Addison's disease)
- Summarize acute intervention of the emergent Addisonian crisis
- Apply recent literature to long-term management strategies for typical Addison's
- Recognize indications for identification of atypical Addison's and management differences

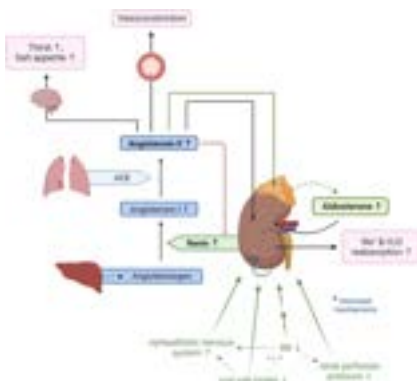




Physiology of Addison's disease



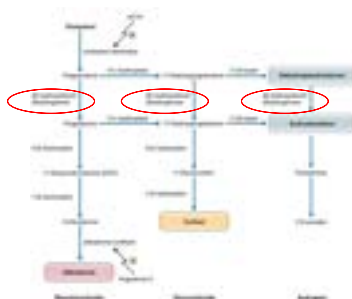
RAAS



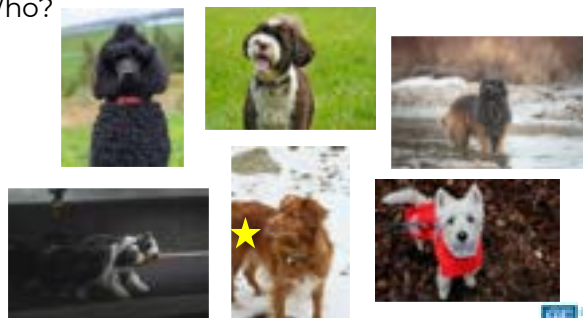
Why?

- Atrophy or destruction (immune) Uncommonly,
- infiltrative disease Autoimmune polyglandular
- syndromerare in dog

Iatrogenic HOC



Who?



Lab Findings + Why?

Finding (%)	Mechanism
Low Na, Elevated K (95% have Na < 27, 1)	Lack of aldosterone
Azotemia (BUN 90%, Cr 65%)	VR-AKI from hypovolemia +/- intrinsic AKI Likely component of GI blood loss
Hypercalcemia (30%)	Full mechanism unknown (hemoconcentration, decreased GFR, and decreased renal calcium excretion presumed)
Hypoglycemia (15%)	Loss of GIC (decreased glycogen storage and decreased gluconeogenesis)
Lymphocytosis, eosinophilia (10-20%)	Lack of corticosteroid
Mild N, NR anemia (21-25%)	Bone marrow suppression, GI bleeding
ALT, mild to moderate (20-30%)	Suspect due to poor cardiac output, poor tissue perfusion
Hypoalbuminemia (15%), hypocholesterolemia	GI loss (PLE), lack of intake, malabsorption, impaired synthesis



If not Addison's, it could be -



Some weird things...



Diagnosis of Addison's disease

• ACTH Stimulation

- Pre- and Post-ACTH < 2 mcg/dL
- 1 mcg/kg cosyntropin IV
 - Not same for HAC

• Interaction with cortisol assay

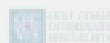
- Pred/Methylpred/HC - YES
- Dex/Triamcinolone - NO



Rule out - Baseline Cortisol

SNAP cortisol?

A baseline cortisol > 2 in dogs rules out Addison's with 99% certainty, however the specificity is low (20-78%).



Acute Crisis

- FLUIDS! Historically, 0.9 Saline%
- Correct < 0.5 mEq/kg/hr
- Potassium
 - If arrhythmias, calcium gluconate
 - Insulin and dextrose
- Dexamethasone - SP (1 mg/kg pred equivalent)

DOCP?



Discharge

- 0.5 mg/kg SIDpred, taper
- Lyte rechecks:
 - Day 10-14
 - Day 25-30



Long term management-steroid



Long term management-DOCP

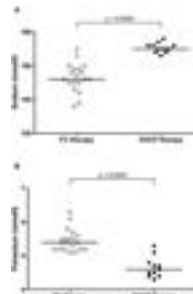
- Long acting (~28 d) synthetic

mineralocorticoid

- No GC activity
- Replace aldosterone
- Suppresses renin (PRA)
- Manufacturer dose 2.2 mg/kg IM or SC



DOCP vs fludrocortisone



- $FC = MC + GC$
- Monitoring in humans = PRA, blood pressure and electrolytes
- No commercial PRA for dogs
- $DOCP > FC$



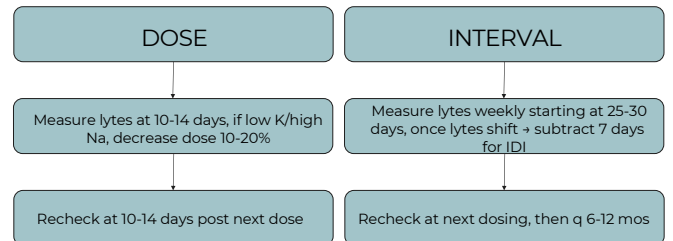
Long term management-DOCP



1.1 mg/kg dose was safe/effective; PRA over suppressed in 90% of control dogs (standard dose)



DOCP Adjustment



Atypical Addison's

- 10% of primary HOC
- Prevalence of 4% in dogs with chronic GI signs
- Usually slightly older 6-8
- No evidence of a "continuum" e.g. 2-6 mcg/mL
- Incidence of atypical → typical is low but documented (~10%)
- Recommendation monitor for lytes and signs of AC



J. Vet. Intern. Med. 2004;28:146-149

Evaluation of Aldosterone Concentrations in Dogs with Hypoadrenocorticism

M.E. Bannasch, N.S. Sieber-Buckholz, C. Müller, M. Wenger, F.S. Borotti, and C.E. Rensch

- Aldosterone Stim test at 60 min
- Aldosterone low in dogs with HOC regardless of serum electrolytes
- Should we be measuring aldosterone in ALL Addisonian dogs and supplementing DOCP?



Cats - just small dogs?

- Higher starting dosages

- Prednisolone 0.3 mg/kg
- DOCP 2.2 mg/kg q 28



A few takeaways for the disease that never changes

Only 1 mCg/kg
cosyntropin for Stim

Lower than label dose
for DOCP

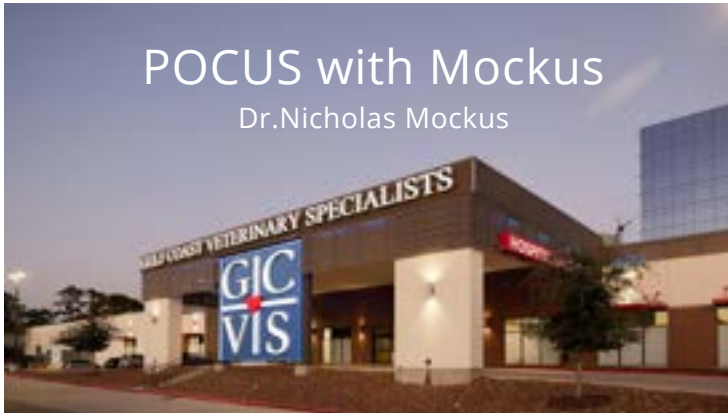
Longer DOCP intervals
may be reasonable

Atypical Addison's might
secretly be typical



POCUS with Mockus

Dr. Nicholas Mockus



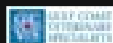
What is Point-of-Care Ultrasound(POCUS)/FAST scan?

- POCUS: the use of cage-side ultrasound to supplement your physical exam and non-invasively assess changes within the patient.
 - Abdomen
 - Thorax
 - Lungs
 - Musculoskeletal
 - Ocular
- Mid-90's: Focused Assessment with Sonography for Trauma (FAST)
- 2004: Dr. Boysen translated the ultrasound views used in humans to dogs to assess for changes secondary to blunt trauma



AFAST/TFAST/VetBLUE

- 2005: Dr. Lisciandro began modifying the FAST exam to include fluid scoring, serial monitoring guidelines, as well as a variety of other changes
- 2009: Labeled the new more complete examination, AFAST. Additionally he extended the examination to include the thorax (TFAST).
 - Progressed to using it in patients with other causes of pleural, pericardial, and peritoneal effusion instead of just hemorrhage.
 - The T in these exams now included Triage (non-trauma), and Tracking (monitoring), in addition to the previous trauma.
- 2014: Created a system called veterinary bedside lung ultrasound examination (VetBLUE).
- Eventually Lisciandro called this global approach to ultrasound examinations Global FAST



When should I use POCUS?

- POCUS is an extension of your physical exam
 - Perform as part of your triage process on every patient
 - Quantify fluid volumes and other pathology in trauma cases to help guide immediate intervention recommendations (transfusions, surgery)
- Resuscitate, rehydrate, re-evaluate
 - Track patients by repeating AFAST within 4 hours of admission, or sooner if they are unstable
 - Are new effusions now present?
 - Are effusion volumes progressive?
 - Can effusions now be sampled?
 - Hospitalized patients should be tracked with POCUS daily!
- Reminder: this is not a binary "flash approach"



Questions answered by AFAST

- Does the patient have fluid in the peritoneal/retroperitoneal space?
 - Detect as small as 2-3ml/kg free fluid
- Does the patient have any obvious AFAST target organ abnormalities?
 - Determining the integrity of the urinary bladder, estimating urinary bladder volume and urine output during resuscitation
 - Screen for anaphylaxis or other causes of gallbladder wall edema
 - Look for large splenic masses
- What is the central fluid volume status of the dog or cat?
 - Assess right-sided cardiac function/caudal vena cava size



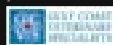
What can't AFAST do?

- Cannot tell you what fluid type the free fluid is without sampling.
 - Abdominocentesis can be performed in patients with adequate volumes of fluid
- Lacks sensitivity in penetrating trauma cases
- Cannot always accurately assess dehydrated or hypotensive patients. Can give false results on these patients.
- Is not a replacement for a good physical exam, nor can it replace the use of a full abdominal ultrasound exam by someone with adequate training.



Preparing the patient

- No need to shave, though it does improve transducer contact.
 - General image quality is adequate with newer machines
 - Cosmetic appearance is preserved leading to happier clients
 - However, placing the probe head on a wetted mat of hair full of trapped air will produce a poor image
- Apply 70% alcohol or water and "acoustic medium" (ultrasound gel/alcohol hand sanitizer).
 - Minimize air trapping and ensure good transducer-skin contact.
 - One should avoid 70% isopropyl alcohol if electrical defibrillation is anticipated or there are open wounds.
 - Alcohol can degrade the head of your probe, but does eliminate some of the oils/debris on the skin and dries quickly.
- Right lateral recumbency (over left lateral recumbency) is recommended because right lateral recumbency is the standard positioning for electrocardiographic and basic echocardiography evaluation.
 - Left lateral recumbency is also possible and the fluid scoring system has been validated for either recumbency
 - Not validated for standing patients, though can be performed if necessary for patient stability.



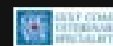
Utilize a grip that is comfortable for you





Where to place the probe for AFAST?

- 4 main regions in right lateral:
 - DH- Diaphragmatico-hepatic
 - SR- Spleno-renal
 - CC- Cystocolic
 - HRU/SIU- Hepato-renal-umbilicus/spleno-intestinal-umbilicus
- HR5th- Hepatorenal 5th view
 - Performed at the end of exam or after GlobalFAST, because you will temporarily place patient in opposite lateral
 - Does not contribute to fluid scoring
- If performing in left lateral the order is DH>HR>CC>SRU>SR5th



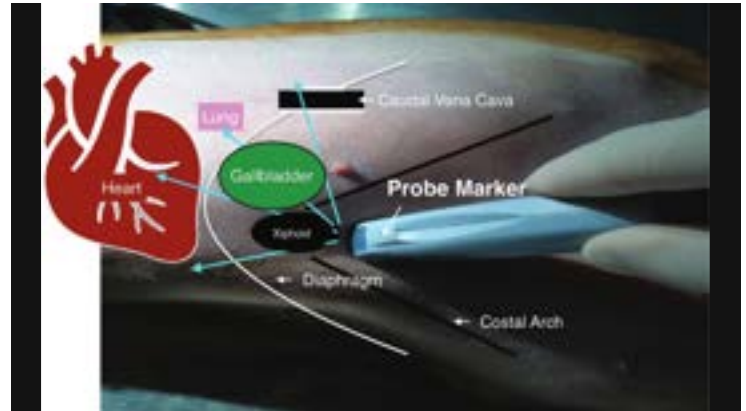
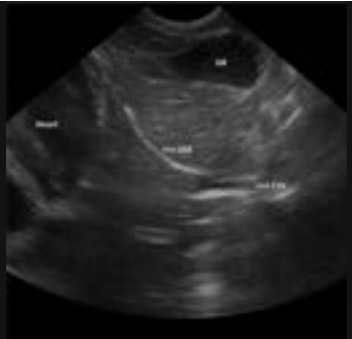
What are we looking for?



Diaphragmatico-hepatic view

Transducer placed immediately caudal to the xiphoid and angled cranially towards the patient's head
Fan through the gallbladder in both directions until the gallbladder disappears in both directions

2. rock cranially to image the "cardiac bump"
3. returning to your starting point for one final look within the abdominal cavity.



Diaphragmatico-hepatic view

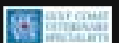
- Liver: masses, cysts, heterogeneous echogenicity
- Gallbladder: sediment/sludge, mucocoeles, wall abnormalities, common bile duct distension
- Caudal vena cava and hepatic veins: distension, microfilaria, thrombi, masses
- Lung: B-line, signs of consolidation

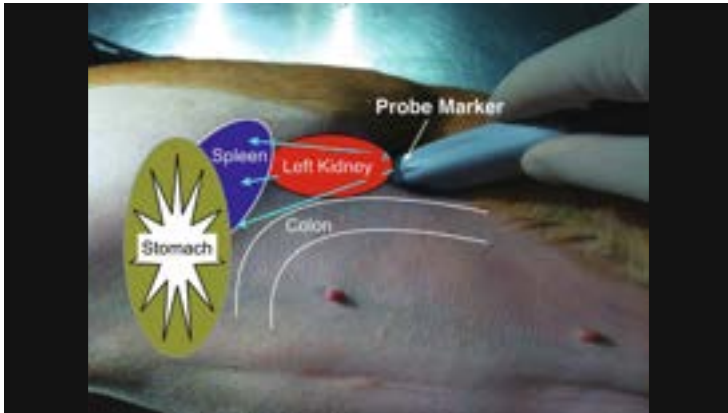


Spleno-renal view

The SR view is done by locating the junction of the left 13th rib and the hypaxial muscles

1. Fan through the left kidney in both directions until the left kidney disappears in both directions
2. Rock cranially to image the head of the spleen (fan on it too)
3. Return to your starting point of the left kidney for one final look. The kidney is retroperitoneal and the spleen peritoneal. The head of the spleen is reliably imaged in both dogs and cats.





Spleno-renal view

- Left Kidney: mineralization, calculi, pyelectasia, hydronephrosis, cortical cysts, perinephric cysts, ureteral distension, cortical infarction, masses
- Spleen: masses, heterogeneous echogenicity (lymphoma, torsion)
- Retroperitoneal Space: masses, thrombi, free air

Two ultrasound images showing the Spleno-renal view. The left image shows a dark, anechoic area representing the retroperitoneal space. The right image shows a cross-section of the abdominal cavity with the Spleen and Left Kidney visible.

Cystocolic view

The CC location is evaluated by placing the transducer lateral to midline when the patient is in lateral recumbency and directing the ultrasound beam toward the opposite side at a 45-degree angle

Fan through the urinary bladder in both directions until the bladder disappears in both directions

2. Rock cranially to image the "CC pouch" along its most gravity-dependent region

Return back to your starting point for one final look.

An ultrasound image showing the Cystocolic view. It displays a cross-section of the abdominal cavity with the Cysto-Colic Pouch and Urinary Bladder visible.



Cystocolic view

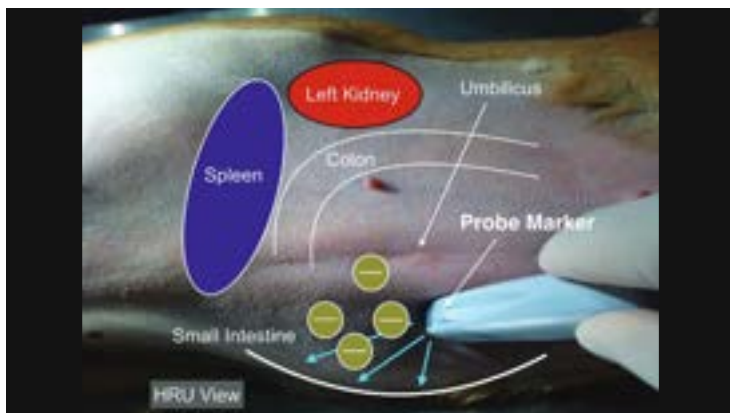
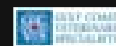
Urinary bladder: sediment, calculi, thrombi, masses
 Uterus: fluid-filled (pyo-, hydro-, mucometra), pregnancy
 Caudal abdominal masses



Hepato-renal-umbilicus/spleno-intestinal-umbilicus view

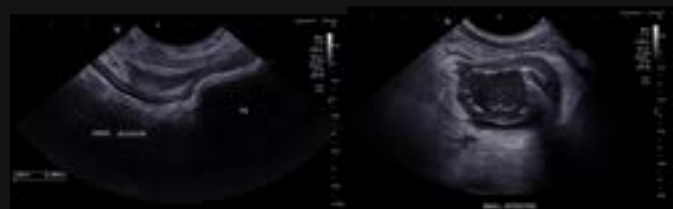
The transducer is placed ventral to the level of the umbilicus and directed into the gravity-dependent region (down side)

1. Fan through the small bowel and spleen in both directions
2. Rock cranially to image the cranial abdominal region
3. Return to the "HRU pouch" at its most gravity-dependent region, for one final look.



Hepato-renal-umbilicus/spleno-intestinal-umbilicus view

- Spleen: masses, heterogeneous echogenicity (lymphoma, torsion)
- Small Intestine: ileus and distension, wall abnormalities, masses, mid-abdominal masses, gastric distension, hepatomegaly
- Right Kidney: mineralization, calculi, pyelectasia, hydronephrosis, cortical cysts, perinephric cysts, ureteral distension, cortical infarction, masses
- Right Liver: masses, cysts, heterogeneous echogenicity



Alternative views

HR5th view- (right lateral recumbency)

1. Fan through the right kidney in both directions until the right kidney disappears in both directions
2. rock cranially to image the right liver lobes
3. returning to your starting point of the right kidney for one final look.

SR5th bonus view- (left lateral recumbency)

1. Fan through the left kidney in both directions until the left kidney disappears in both directions and then
2. rock cranially to image the spleen before
3. returning to your starting point of the left kidney for one final look.

SRU view- (left lateral recumbency)

1. Fan through the small bowel and spleen in both directions
2. rock cranially to image the cranial abdominal region
3. returning to the "SRU pouch", its most gravity dependent region, for one final look.

The right kidney may be viewed with increased depth through a single SR view, especially in cats and smaller dogs

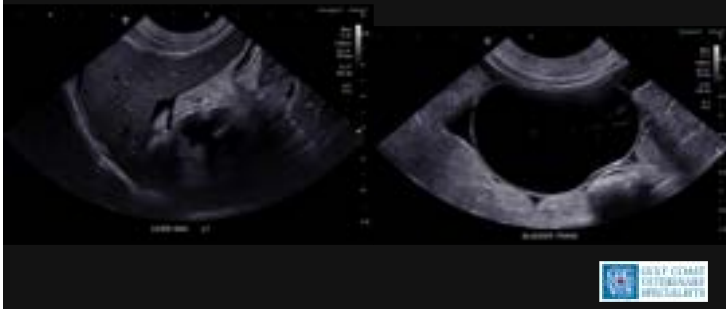


Abdominal fluid scoring system (AFS)

- Check for fluid at each of the 4 views (DH, SR, CC, HRU)
 - Assign each view a fluid score of 0 or ½ or 1
 - 0= no fluid
 - ½= <5mm in cats and <1cm in dogs
 - 1= >5mm in cats and >1cm in dogs
 - Sum the four scores for an AFS of 0-4
- Negative for effusion = 0 = rehydrate, re-evaluate
- Small volume = 1-2 = major injury, small bleeder
- Large volume = 3-4 = sufficient bleeding to cause anemia, large bleeder



Fluid-scoring system examples- ½



Fluid scoring system examples- 1



How do we utilize this information?

Serial examination(s) until patient is no longer at risk

Attempt to sample and characterize fluid

Treat per fluid type- uroabdomen, septic abdomen, bile peritonitis

Serial examination until patient is no longer at risk



In the context of hemoabdomen

Separate cases into 1 of 3 categories based on history:

- Blunt trauma
- Penetrating trauma
- Post-interventional trauma

Further categorize patient based on AFS:

- 1-2 = small bleeder
- 3-4 = large bleeder

Cavitary bleeds should resolve within 48 hours after bleeding stops or coagulopathy has been corrected.



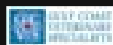
Blunt Trauma

Small volume bleeder- AFS 1-2

Anemia not expected
Should not need a blood transfusion if only bleeding intraabdominally
PCV: >30% in canines, >24% in cats
Static AFS, but developing anemia: rule out hemorrhage at another site.
Including retroperitoneal, pleural, fracture, external wounds
Unlikely to need exploratory surgery

Large volume bleeder- AFS 3-4

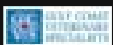
- Anemia expected in these patients
- Shock boluses can be attempted initially, but may need to begin blood transfusion
- Most intraabdominal bleeding in this subset will stop with 1 or 2 rounds of blood transfusion +/-replacement of clotting factors
- Uncommonly need exploratory surgery



Penetrating trauma

Small volume bleeder (AFS 1-2) or large volume bleeder (AFS 3-4)

- Exploratory surgery almost always necessary- communicating wound with the exterior +/- laceration/perforation of abdominal organs.
- Sample fluid when safely accessible to direct recommendations (septic abdomen, uroabdomen, etc)
- Clots will defibrinate and ruptured organs will begin to leak or effuse. Can lead to lack of/low volume of effusion on initial examination.
- Serial examination is key- 4, 8, 12, and 24 hours and approximately every 24 hours after
- Combine with radiographs and/or CT if available.



Postinterventional trauma

Small volume bleeder- AFS 1-2

- Serial examination: If patient remains AFS 1-2, generally non-surgical
- Effusion should resolve in 3-10 days
- Expect to see some amount of gas- up to 21 days postoperatively



Large volume bleeder- AFS 3-4

- Recommended to explore these patients even with or without anemia
- Patients with delayed treatment and AFS 3-4 have increased risk of decompensation and increased morbidity.
- Correct any coagulopathy and transfuse prior to emergent exploratory.
- Expect to see some amount of gas- up to 21 days postoperatively



Caudal vena cava

- A normal "bounce" to the CVC represents a "fluid responsive CVC." The "bounce" describes a dynamic CVC with obvious changes in its diameter (35% to 50% difference) between inspiration and expiration. "Fat" CVC- often with concurrent hepatic venous distention indirectly represents a high central venous volume and pressure.
 - A dog that has received no fluid resuscitation that has a fat CVC and distended hepatic veins likely has right-sided cardiac dysfunction, a pericardial effusion with cardiac tamponade, or a restrictive pericarditis.
- "Flat" CVC- severely volume depleted patient. Small CVC with minimal dynamic change in luminal diameter during the respiratory cycle (<10%).



Gallbladder wall edema

- Hypoechoic thickening of the wall - "gallbladder halo sign"
- Generally associated with anaphylaxis
- Multiple conditions:
 - Right-sided CHF
 - Cholecystitis
 - Pancreatitis
 - IMHA
- Assessment of CVC can help differentiate them
 - Anaphylaxis - normal CVC
 - Right-sided CHF- fat CVC +/- hepatic venous distention

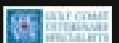


Pros of AFAST

- Safe
- Non-invasive
- Quick
- Can answer clinically important questions
- Can be performed in the patient's most comfortable position (standing, laterally recumbent, etc)
- Can be used in your trauma or emergency cases, as well as medical and post-surgical cases

Cons of AFAST

- Limited examination- AFAST does not assess the whole abdomen
- Cannot assess the type of free fluid
- May be less reliable for detecting free fluid in dehydrated, hypotensive dogs
- Might not be accurate at predicting degree of anemia in cats with blunt trauma where uroabdomen more common

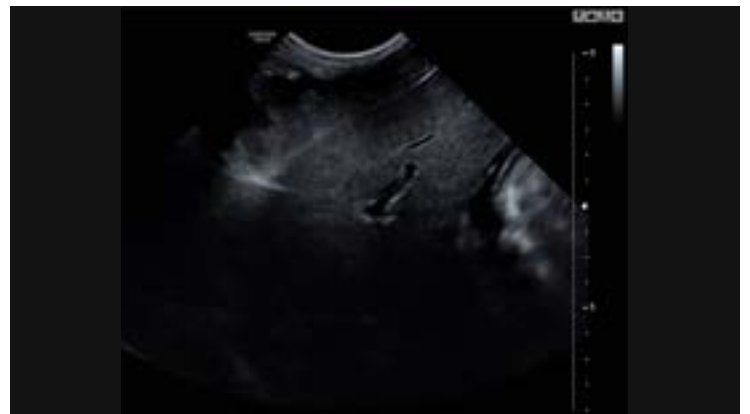


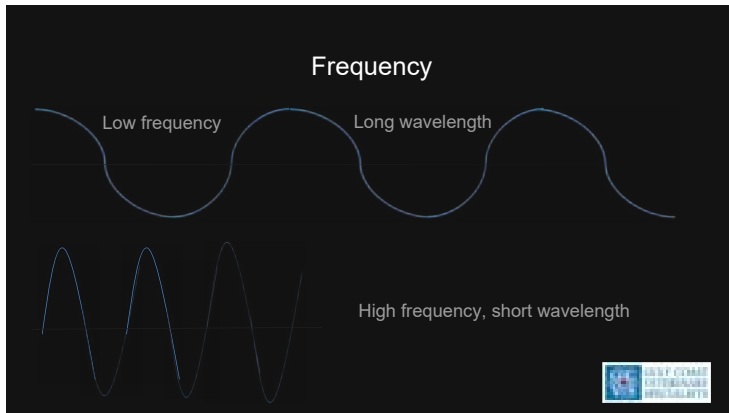
Knobology



Depth

- The "zoom" of the ultrasound world
- Excessive depth makes details hard to see and degrades image quality
- In large dogs: you may need to lower your frequency to achieve more useful depth
 - Higher frequency: better resolution
 - Lower frequency: better penetration



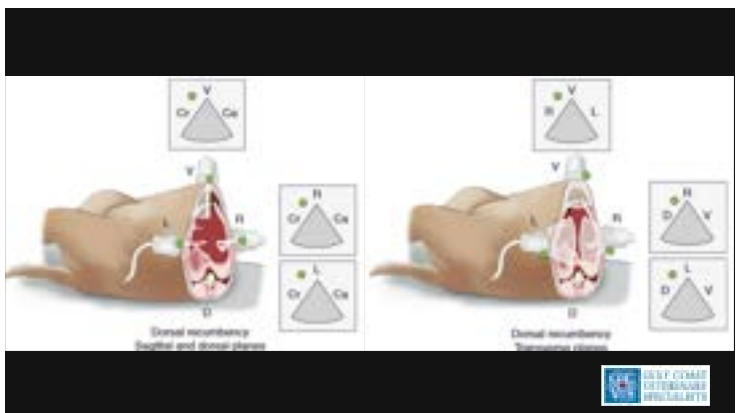
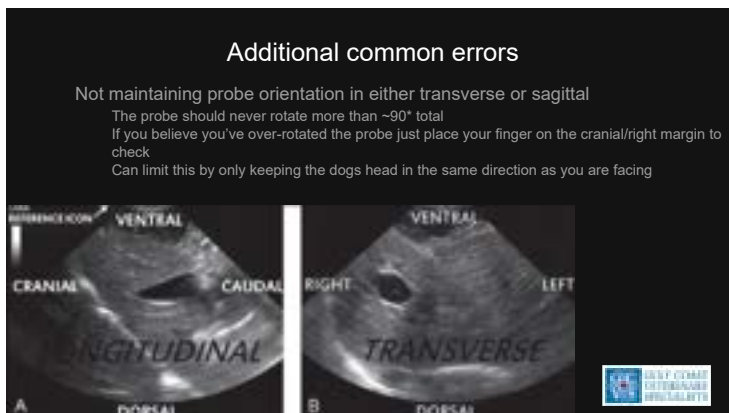
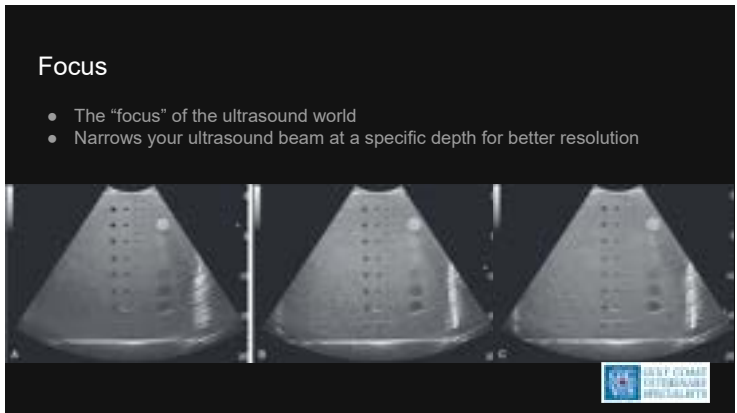
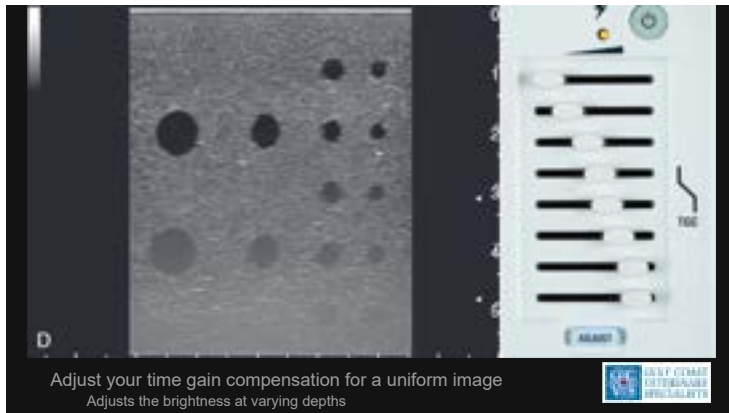


Gain

- Somewhat analogous to the "volume"
- The "brightness" of the ultrasound world

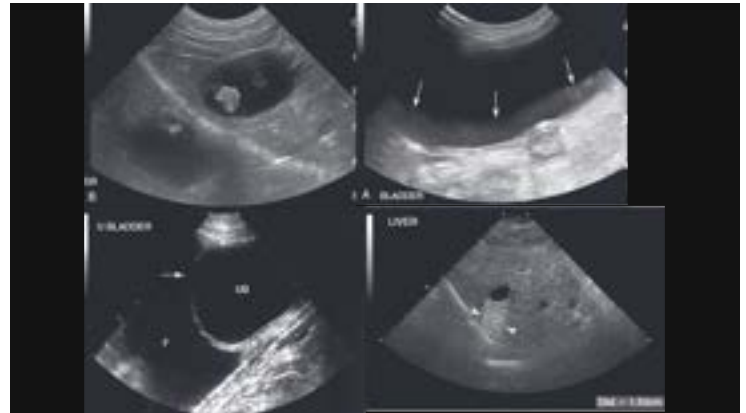


- Adjust your time gain compensation for a uniform image
 - Adjusts the brightness at varying depths



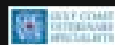
Additional common errors cont.

- Not freezing to measure
- Artifacts:
 - Mirror image- e.g. reflective diaphragm causing liver to appear in pleural space
 - Side-lobe/slice thickness- e.g. catching a piece of the bladder wall and mistaking for urinary debris
 - Edge-shadowing- e.g. shadowing from bladder wall causing artificial wall defect
 - Distal acoustic enhancement- e.g. structures distal to the bladder/gallbladder appear hyperechoic



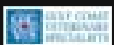
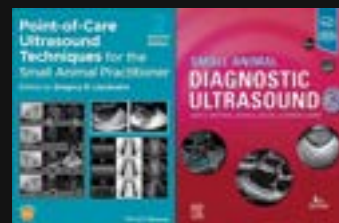
Summary

- AFAST can be used to identify variable amounts of fluid in a systematic fashion
- Treatment recommendations can be created based on the findings of AFAST
- AFAST can be utilized both in causes of trauma, but also post-surgical and medical cases
- Understanding the tools available to optimize your image will help improve detection of fluid and prevent errors secondary to artifacts.



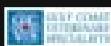
References

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24/7
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FOR EVERY
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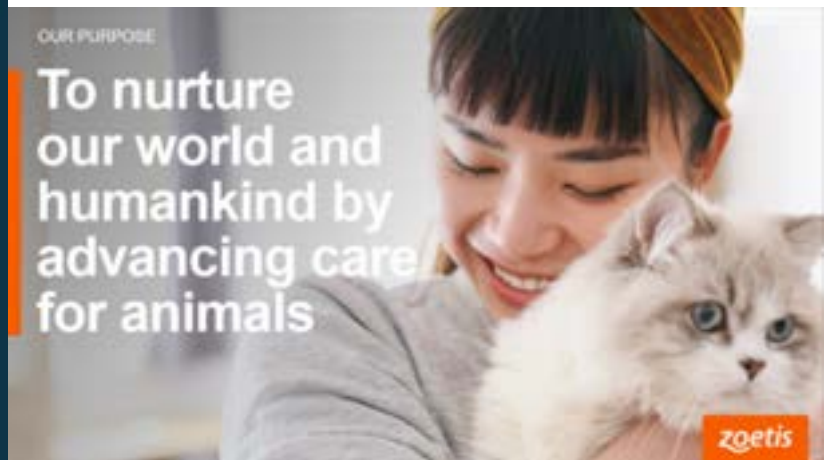
TO ADVANCE THE HEALTH & SAFETY OF THE VETERINARY ANESTHESIA PATIENT

- ✓ QUALIFIED TECHNICIANS
- ✓ POINT-TO-POINT TESTING
- ✓ VAPORIZER TESTING
- ✓ INSPECTIONS
- ✓ VAPORIZER EXCHANGES
- ✓ TECHNICAL SUPPORT
- ✓ CUSTOMER SERVICE
- ✓ EQUIPMENT SALES

121

OUR PURPOSE

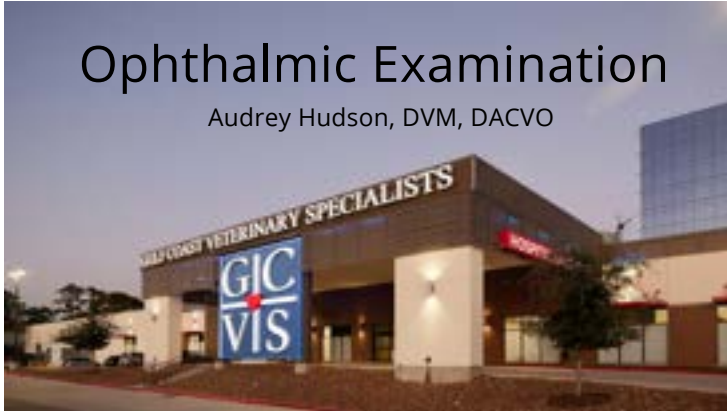
To nurture
our world and
humankind by
advancing care
for animals



zoetis

Ophthalmic Examination

Audrey Hudson, DVM, DACVO



Ophthalmic Examination

1. Preliminary Ophthalmic Tests
2. Neuro-Ophthalmic Exam
3. Head Exam - Distant Observation
4. Ophthalmic Exam – Detailed Examination

- 1 Anterior Segment Examination
- Posterior Segment Examination

2



Ophthalmic Examination

1. Preliminary Ophthalmic Tests

- 1 Schirmer Tear Test
- Tonometry
- Fluorescein Stain
-
- 3
-



Schirmer Tear Test



- ← Lipid Layer
- ← Aqueous Layer
- ← Mucin Layer
- ← Corneal Epithelium



Schirmer Tear Test

STT 1:

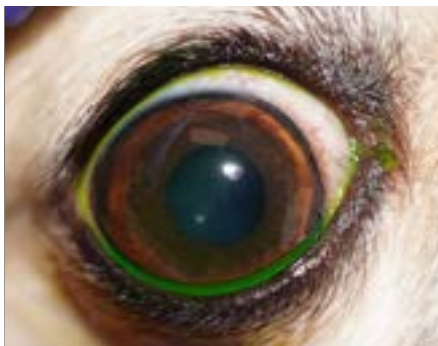
- Basal Tearing
- Tear Lake
- Reflex Tearing

Normal: 18-21mm/ 60sec

STT 2: (post proparacaine)

- Basal Tearing
- Tear Lake

Normal: 6-15mm/ 60sec



Schirmer Tear Test

- Strip = 25% Palpebral fissure length
- Tip bent over in palpebral fornix
- Firm hold on animal's face
- Holding lower lid in place
- Reassure owner



Veterinary Ophthalmology

Schirmer tear test I in dogs: results comparing placement in the ventral vs. dorsal conjunctival fornix

Ilana H. Vissel,^{1,2} Kyle L. Tullman,² Kim E. Love-Myers,² Rachel A. Allbaugh,² N. Matthew Ellwood,¹ D. Dennis Dean,⁴ Gillian Wilson,² and R. David Whitby^{2*}

2017

n=32 eyes (Research colony)



Dorsal fornix: 20.4mm.
Ventral fornix: 23.5mm

Statistically significant between the two locations.



Veterinary Ophthalmology

The 50th Annual Scientific Meeting of the American College of Veterinary Ophthalmologists, Maui, Hawaii, Nov 8-9, 2019

79 | Comparison of Schirmer Tear Test Results in Open and Closed Eyes in Clinically Normal Dogs

W. Herten,¹ J. Herten,¹ M. Wenz²

¹Department of Small Animal Clinical Sciences, Virginia-Maryland College of Veterinary Medicine; ²Laboratory for Study Design and Statistical Analysis, Virginia-Maryland College of Veterinary Medicine

No statistical difference

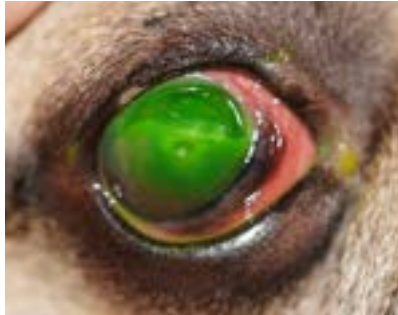
n=20 eyes	STT
Eyelids open	20.9 mm/min
Eyelids closed	20.4 mm/min



Schirmer Tear Test

Do Not Test If:

- Divot seen on cornea
- Risk of more ocular damage



Schirmer Tear Test

Do Not Test If:

- Not tolerated well



Tonometry

Direct: Manometry (paracentesis of anterior chamber)

Indirect: Tonometry

"Non-invasive measurement of IOP."

Estimate of intraocular pressure

Various types of tonometers

Applanation (TonoPen)

Rebound (TonoVet)

Normal: 15-20-ish mmHg



Tonometry: Rebound (TonoVet)

- **Rebound:** Electromagnetic. Deceleration of probe after contacting the cornea. of the rebound.
- No proparacaine needed.
- Hold perpendicular (90 degrees) to the corneal surface.
 - Error. Lose probe.
- Distance of probe to cornea: 4-8mm
- Species specific calibration
- Takes 6 readings. Discards high and low. Averages remaining four.
- Error: Excessive deviation. Incorrect positioning



Tonometry: Rebound (TonoVet)



Dog (d)



Tonometry: Rebound (TonoVet)

<1.8mmHg 1.8-2.5mmHg 2.5-3.5mmHg >3.5mmHg



Tonometry: Rebound (TonoVet)



Tonometry: Applanation (Tono-Pen)

- **Applanation:** Force required to flatten the cornea over the area of Electromagnetic. Deceleration of probe after contacting the cornea. of the rebound.
- Apply Proparacaine. (Wait 60 seconds)
- Pencil hold. Visualize probe to cornea contact.
- Applanate central cornea: Light and Brief.
- Takes 6 readings over 15 seconds
- Statistical confidence reading
 - 95% = 5% deviation (GOOD)
 - 80% = 20% deviation (RETEST)

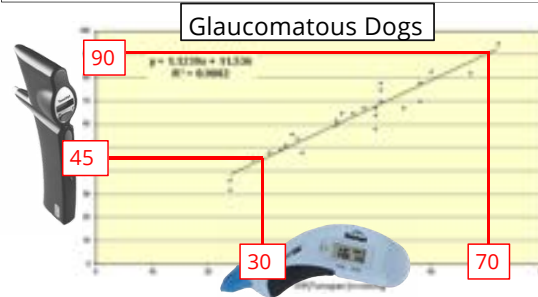


Tonometry: Applanation (TonoPen)



Clinical comparison of the TonoVet® rebound tonometer and the Tono-Pen Vet® applanation tonometer in dogs and cats with ocular disease: glaucoma or corneal pathology

Lana von Spinnen,*† Julia Karch,* Karl Rohlf and Andreu Meyer-Lindenberg*,† VO, 2015



Tonometer Differences

Applanation Tonometer (TonoPen Avia)

- <10mmHg: May overestimate IOP
- Normal IOP: Assume accurate
- >30mmHg: Increasingly underestimates IOP



Rebound Tonometer (TonoVet)

- Normal IOP: May underestimate IOP (2 mmHg)
- >30mmHg: More accurate than applanation IOP when
- Increasing IOP: Increased variability.



Tonometry Trouble Shooting

- Hard to get a falsely low reading.
 - Tonographic effect
- Easy to get a falsely high reading.
 - Jugular vein pressure
 - Extension of neck
 - Taut eyelids
 - Corneal periphery
 - Corneal pathology (ie. thickness)
 - Inexperience (10-12mmHg) – applanation > rebound
 - Brachycephalics?

Tonometry Trouble Shooting

Easy to get a falsely high reading.
Jugular vein pressure



o
o

Tonometry Trouble Shooting

Easy to get a falsely high reading.
Extension of neck
Taut eyelids



Tonometry Trouble Shooting

Easy to get a falsely high reading.
Taut eyelids (Dorsal- ventral)



Fluorescein Corneal Stain

- Indications:
 - Any **RED** eye.
 - Considering a topical steroid
- Lipophobic/ Hydrophilic
 - Corneal Stroma
 - +/- Epithelial junctions



Fluorescein Corneal Stain

- 1 Fluorescein solution 2%
- Impregnated Strip
 - Can create a single use solution.
- 2
 - Place Fluorescein strip in to 3ml sterile eye wash.
 - Break off needle
3. Fluorescein strip wetted with 1-2 drops of sterile eyewash.



Fluorescein Corneal Stain

Touch strip to dorsal bulbar conjunctiva.
Eyelids closed then opened (assure complete coverage.)
Irrigated with eyewash to remove excess to avoid false positive with pooling.
Slit lamp on 10x with cobalt blue filter.



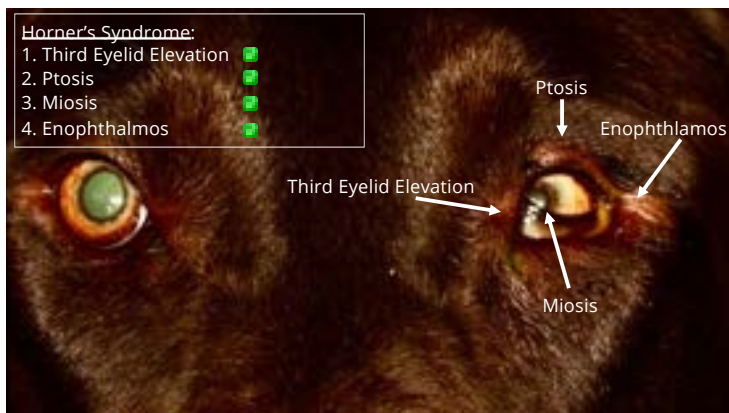
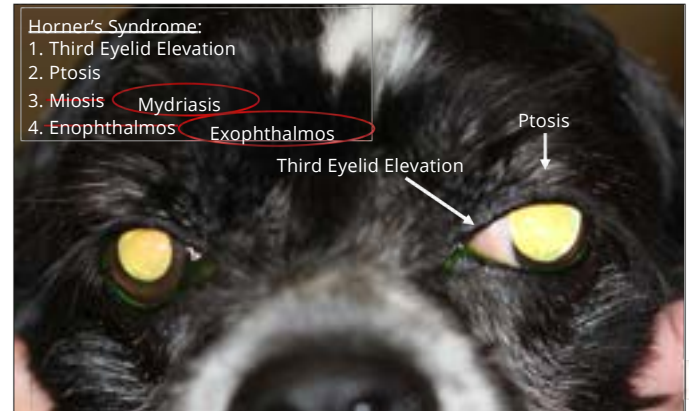
Neuro-Ophthalmic Exam

1. Distant Examination
2. Menace Response
3. Palpebral Reflex
4. Corneal Reflex
5. Dazzle Reflex
6. Vestibulo-ocular Reflex
7. Pupillary Light Response

Distant Observation



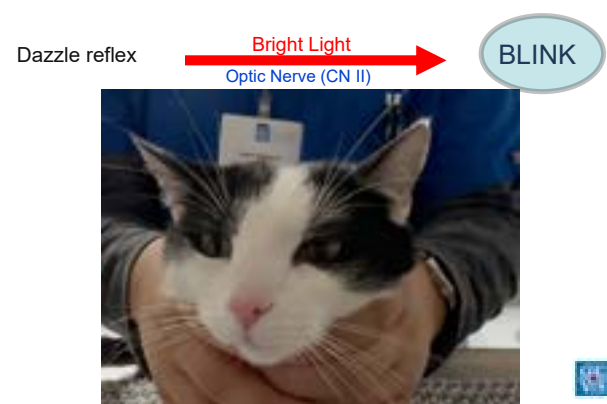
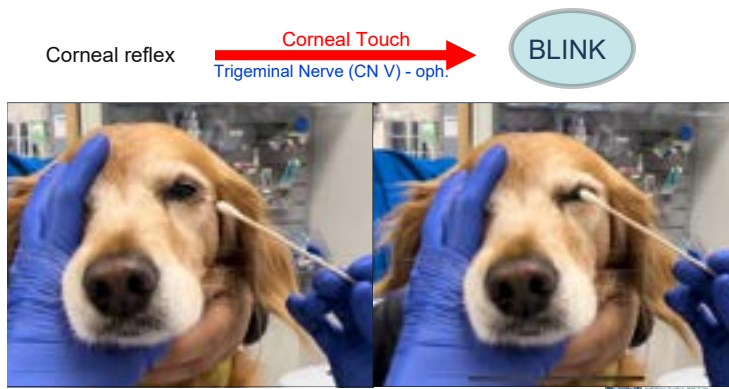
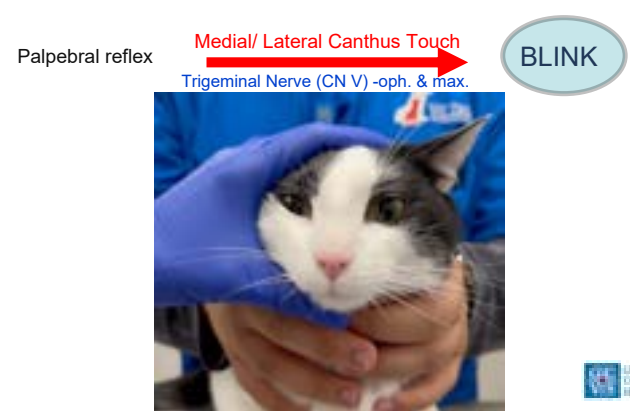
1. Facial muscles
 1. Facial expression (ear carriage; nose deviation; lip droop)
 2. Muscle of mastication (atrophy -temporalis muscles)
2. Palpebral fissures
 1. Ptosis
 2. Facial paralysis?
 3. Chest: Scleral Show
3. Third Eyelid
 1. Protrusion
 2. Retraction
4. Eye position
 1. Enophthalmos/ Exophthalmos
 2. Strabismus
 3. Nystagmus
 4. Visual Axis
5. Pupil size/ shape
 1. Watch for symmetry
 2. Dark: Shine light - Tapetal reflection
6. Vision
 1. Navigating around the room.
 2. Tracking people
 3. Cotton ball drop

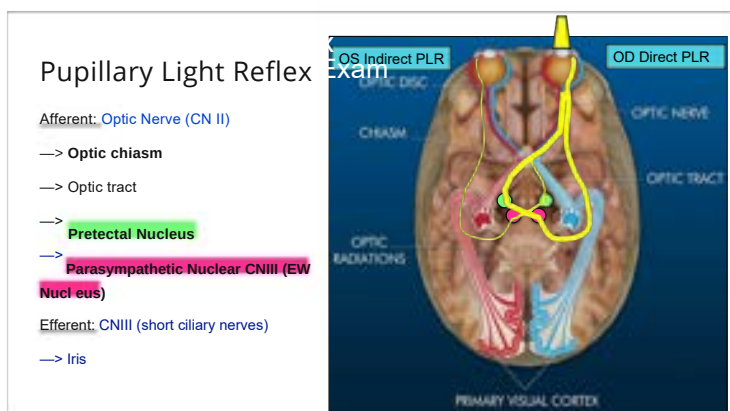
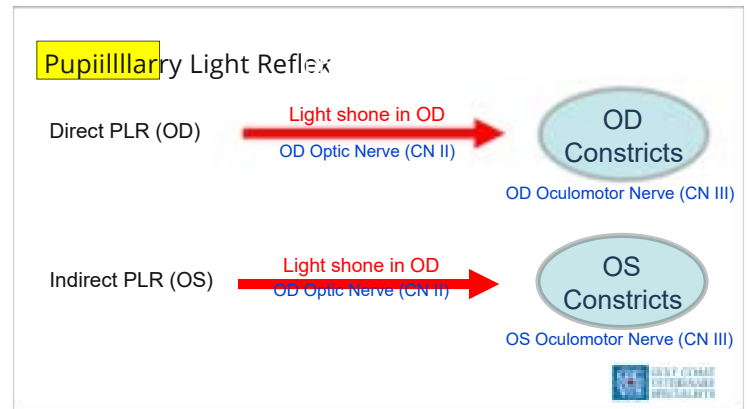


Cranial Nerves - Ophthalmology

- CN II: Optic Nerve VISION! (Rt Ganglion cells à chiasm (decussation))
- CN III: Oculomotor Nerve Motor: Medial, Dorsal, Ventral, & Ventral Ob. Recti. Lev Palp Sup; Parasympathetic: ciliary and iris sphincter mm.
- CN IV: Trochlear Nerve Dorsal oblique
- CN V: Trigeminal Nerve (oph) Sensory: Orbit, upper eyelid; (Motor: Mm of mastication)
- CN VI: Abducens Nerve Lateral rectus, Retractor bulbi
- CN VII: Facial Nerve Motor: Mm of facial expression
- CN VIII: Vestibulocochlear Nerve Vestibular nuclei – Coordinate eye, neck, trunk and limb position with position and movement of head.







Head Exam - Distant Observation



1. Open orbit (Dogs & Cats)
2. Orbital rim: frontal bone, lacrimal bone, zygomatic bone, and supraorbital ligament
3. Floor: Zygomatic gland, pterygoid muscle
4. Extraocular Muscles, Cranial Nerves (2, 3, 4, 5 (oph), 6), Retrobulbar fat
5. Proximity to: Tooth roots (PM4, M1, M2); Brachycephalic



Head Exam - Distant Observation



1. Open orbit (Dogs & Cats)
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5. Proximity to: Tooth roots (PM4, M1, M2); Brachycephalic



Head Exam - Distant Observation



1. Palpation – Asymmetry or Pain
 1. Bony orbit
 2. Dorsal orbit soft tissues
 2. Retropulsion (ventral orbit)
 - TEL elevation (palpebral conjunctiva)
2. Periocular swelling, Periocular skin
3. Tear staining
4. Eyelids: Margins, Swelling, Masses
5. Globe Size
6. Retroillumination (cataracts, retinal detachment)



Ophthalmic Exam – Anterior Segment Examination

1. Eyelids
2. Conjunctiva
3. Nasolacrimal System
4. Third Eyelid
5. Cornea
6. Aqueous Humor
7. Iris
8. Lens



Ophthalmic Exam – Posterior Segment Examination

1. Lens
2. Vitreous
- Fundus
 - Retina
 - Tapetum
 - Choroid
 - Optic Nerve

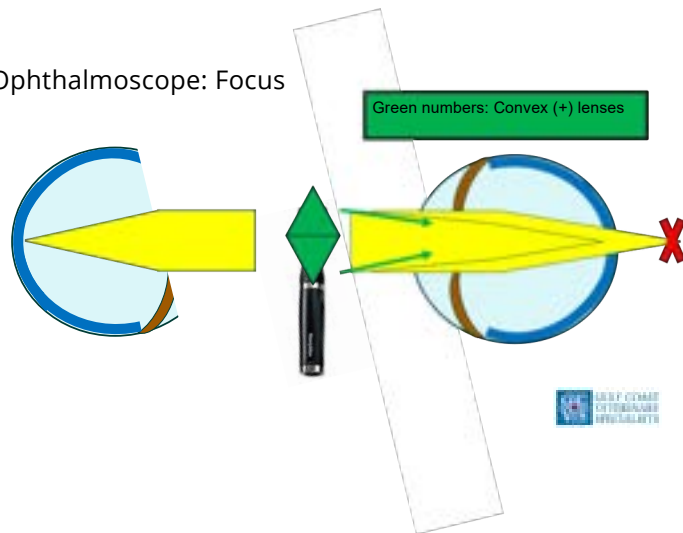


Ophthalmic Exam – Detailed Examination

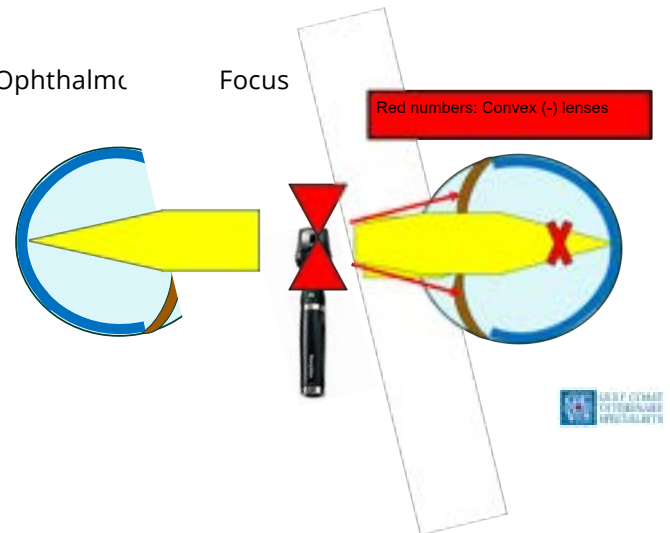
1. Coaxial System
2. Aperture
3. Viewing Lens
 - Green numbers: Convex (+) lenses
 - Red numbers: Concave (-) lenses



Ophthalmoscope: Focus



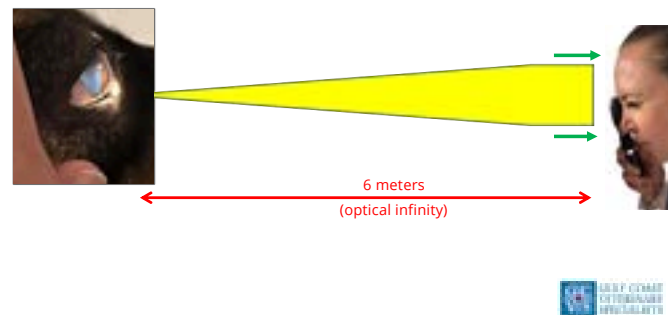
Ophthalmoscope: Focus



Ophthalmoscope: Focus



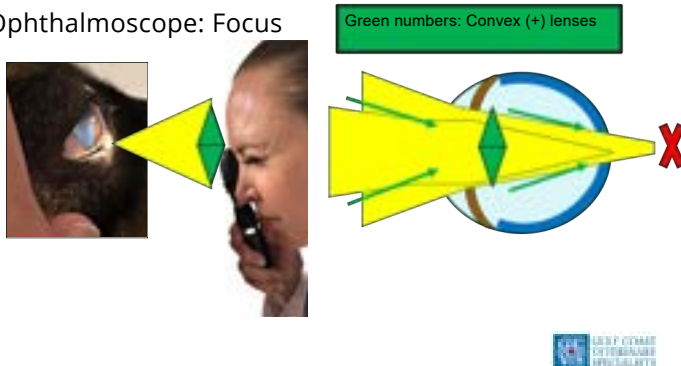
Ophthalmoscope: Focus



Ophthalmoscope: Focus

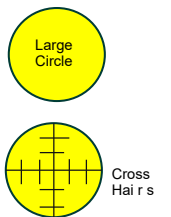


Ophthalmoscope: Focus



Ophthalmoscope: Adnexal Exam

1. Eyelid margins
 - 1. Position
 - 2. Pathology
2. Nasolacrimal (NL) apparatus
 - 1. NL puncta openings
 - 2. NL puncta position
3. Third eyelid (TEL)
 - 1. Palpebral
 - 2. Bulbar (cotton-tipped applicator)
4. Conjunctiva
 - 1. Palpebral
 - 2. Bulbar



Ophthalmoscope: Corneal Exam

Limbus

Vascularization

Appropriate response
Inappropriate response

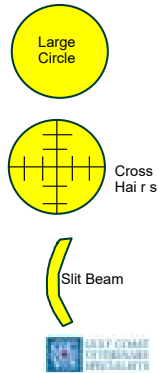
Edema

Cell (WBC, bacteria)

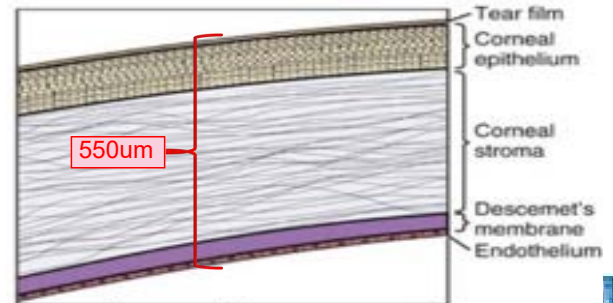
Lipid

Mineral

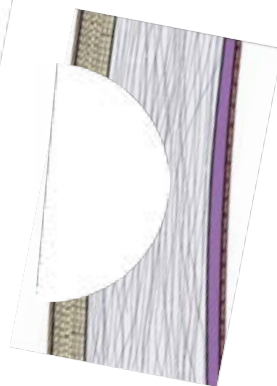
Fibrosis



Corneal Exam - Thickness



Corneal Exam - Thickness



Corneal Exam - Thickness



Ophthalmoscope: Intraocular Exam

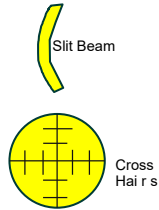
Anterior Chamber

Depth
Opacities
Cysts
Hypopyon
Lipid

Dysocria
Rubeosis Irides
Pigmentation

3. Anterior Lens

- 1 Anterior lens capsule
- 2 Cataract
- 3 Lens Position



Ophthalmoscope: Fundic Exam

1. Retroilluminate Lens

2. Vitreous

3. Retina

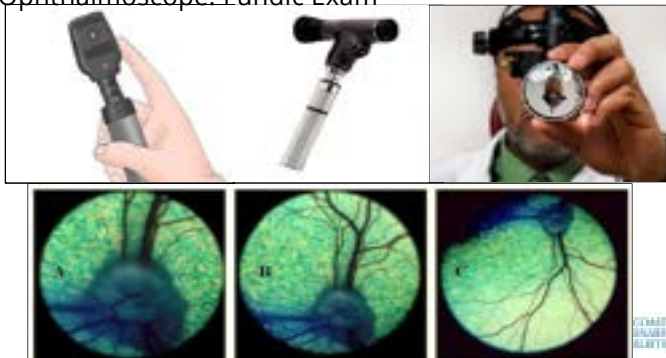
- 1 Detachment
- 2 Infiltration
- 3 Degeneration

4. Optic nerve

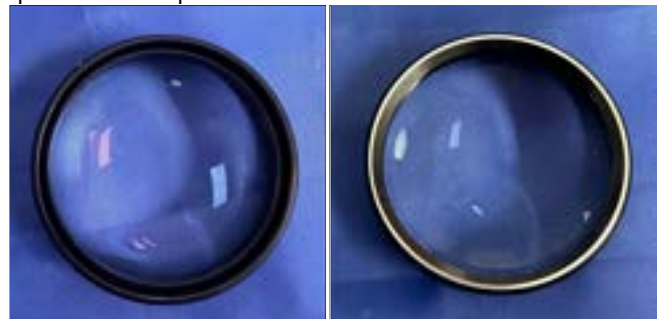
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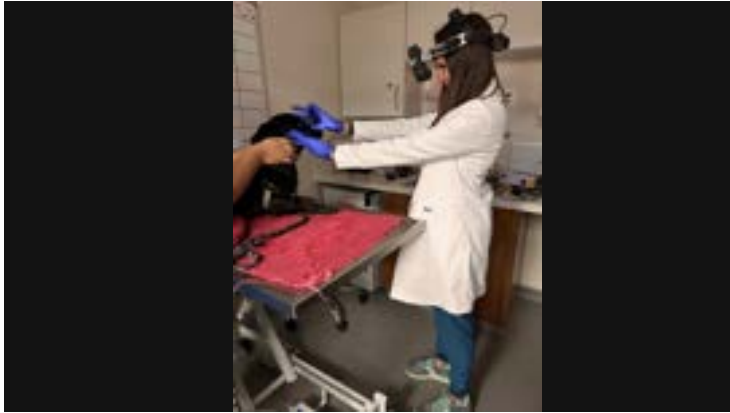
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Ophthalmoscope: Fundic Exam

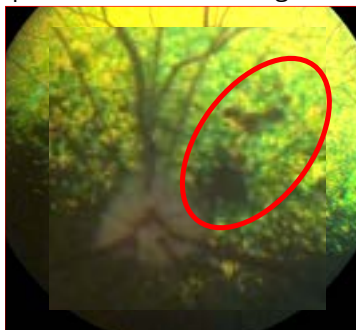


Ophthalmoscope: Normal

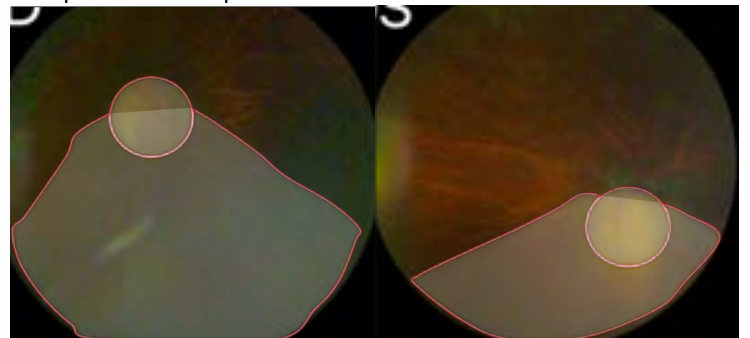




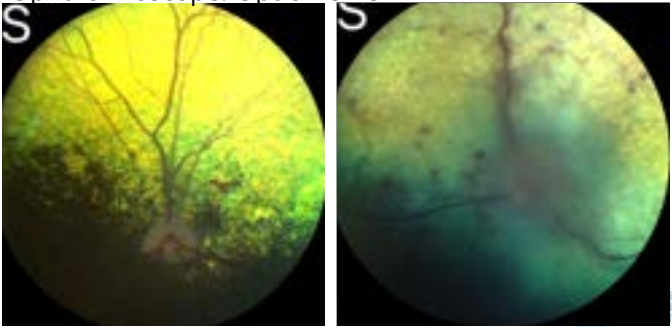
Ophthalmoscope: Retinal Hemorrhages



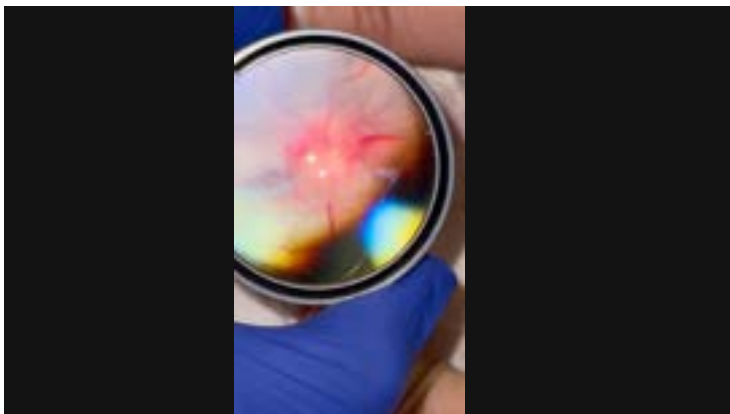
Ophthalmoscope: Retinal Detachment



Ophthalmoscope: Optic Nerve



Ophthalmoscope: Tigroid Fundus (Normal)



Thank You!
Team Ophthalmology

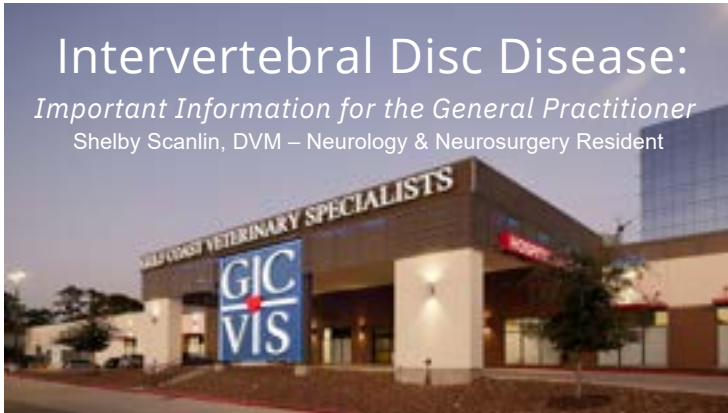
- Odalys
- Mili
- Isabella
- Cindy – Supervisor. Videos, pictures, organizing our service



Intervertebral Disc Disease:

Important Information for the General Practitioner

Shelby Scanlin, DVM – Neurology & Neurosurgery Resident



Outline

- History
- Review of anatomy
- Intervertebral disc disease pathophysiology
- Neurologic exam and lesion localization
- Clinical signs
- Diagnostics
- Treatment
- Outcome



History of Intervertebral Disc Disease

- First described in the late 1800s by Dexler
 - AKA enchondrosis intervertebralis
- Hansen and Olsson proposed a classification system in the 1940-50s
 - Two distinct types of disc degeneration = 1) chondroid metaplasia 2) fibroid metaplasia
 - Led to the subsequent classification of IVDD into Hansen Type I/II herniations
- “IVD extrusion” vs “IVD protrusion”



Overview of Intervertebral Disc Disease

- One of the most common neurologic emergencies
- Uncommon in the general mixed breed dog population (~2%)
- Common in predisposed breeds:
 - Dachshunds (19-24%)
 - French Bulldogs (45.5%)
 - Other chondrodystrophic breeds
- Costly medical procedure that can sometimes necessitate surgical intervention and/or quality of life discussions



Anatomy



Cervical Vertebrae:
C1-C7

Thoracic Vertebrae:
T1-T13

Lumbar Vertebrae:
L1-L7

Sacral Vertebrae:
S1-S3

Caudal Vertebrae:
6-23



Spinal Cord - Anatomy

• Divided into segments

- Cervical = 8
- Thoracic = 13
- Lumbar = 7
- Sacral = 3
- Caudal = 5

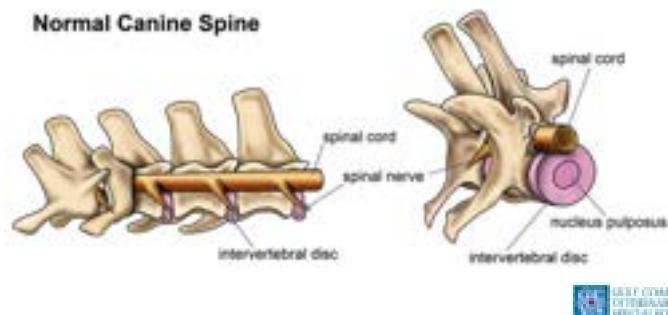
• Intumescences

- Cervical → C6-T2
- Lumbar → L4-S3

• Not all spinal cord segments are found within their corresponding vertebrae

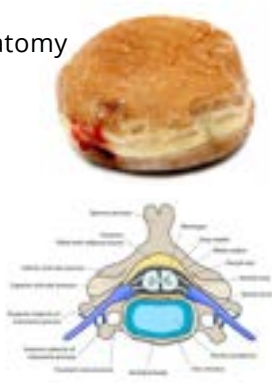


Normal Canine Spine



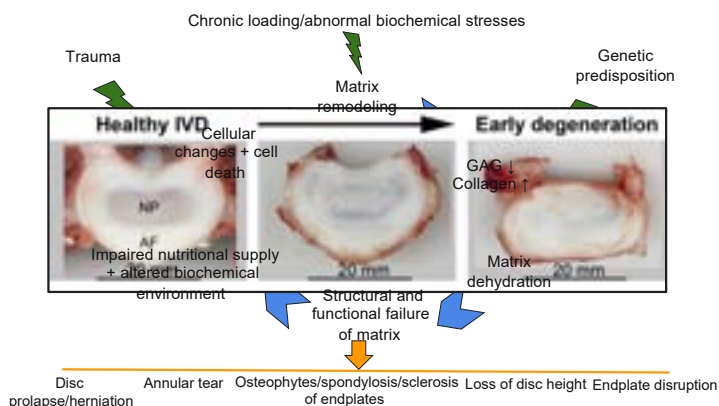
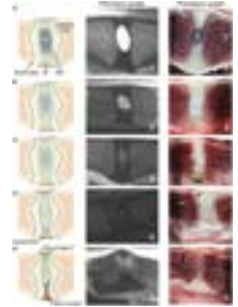
Intervertebral Disc Disease - Anatomy

- IVD = jelly donut
- Composed of 4 regions:
 - Nucleus pulposus (jelly)
 - Transitional zone
 - Annulus fibrosus (exterior dough)
 - Cartilaginous endplates
- Ligaments:
 - Dorsal longitudinal
 - Ventral longitudinal
 - Intercapital ligament

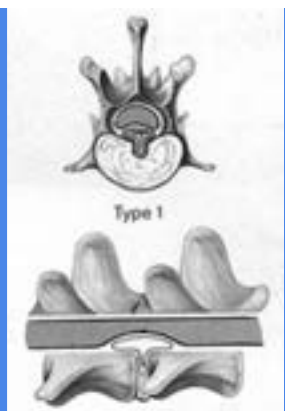


Intervertebral Disc Disease - Anatomy

- Annulus fibrosis:
 - Onion-like layers
 - Collagen fibers
 - Top portion is thinner and weaker
- Nucleus pulposus:
 - Embryonic jelly-like tissue
 - Lies dorsally
 - Prone to herniate dorsally



Forms of Intervertebral Disc Disease



Intervertebral Disc Disease - Forms

Compressive

Hansen type I = "extrusion"

Hansen type II = "protrusion"

Non-compressive

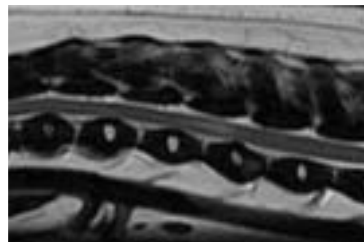
Acute nucleus pulposus extrusion (ANNPE)

Hydrated nucleus pulposus extrusion (HNPE)

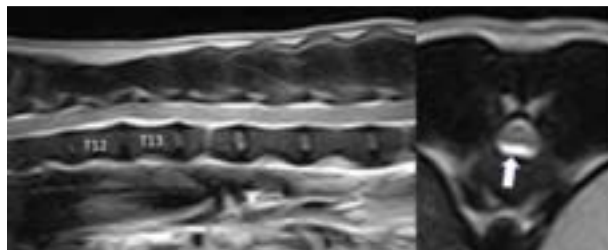
- Fibrocartilagenous embolism (FCE)



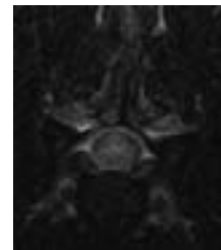
Acute Non-Compressive Nucleus Pulposus Extrusion (ANNPE)



Hydrated Nucleus Pulposus Extrusion (HNPE)



Fibrocartilagenous Embolism (FCE)



Neurologic Examination



Neurologic Examination - Components

- 1) Mentation and behavior
- 2) Posture and gait
- 3) Proprioception
- 4) Cranial nerves
- 5) Spinal reflexes
- 6) Spinal palpation
- 7) Nociception



Neurologic Examination - Localization

Neuro Exam	C1-C5	C6-T2	T3-L3	L4-S3
Posture & Gait	Paresis/plegia Long strided gait x4 Proprioceptive ataxia	Paresis/plegia "Two-engine gait" Proprioceptive ataxia	Schiff-Sherrington TL normal PL - paresis/plegia Proprioceptive ataxia	TL - normal PL - paresis/plegia Proprioceptive ataxia
Cranial Nerves	Ipsilateral Horner's	Ipsilateral Horner's	N/A	N/A
Postural Reactions	Ipsilateral deficits or x4	Ipsilateral deficits or x4	TL - normal PL - ipsilateral or both	TL - normal PL - ipsilateral or both
Reflexes/Tone	TL - normal to increased PL - normal to increased	TL - normal to absent PL - normal to increased	TL - normal PL - normal to increased CT cutoff	TL - normal PL - normal to absent Decreased to absent anal tone/perineal reflex

Neurologic Examination - Severity

- 1) Hyperesthesia
- 2) Ambulatory paraparesis
- 3) Non-ambulatory paraparesis
- 4) Paraplegic with intact deep pain perception
- 5) Paraplegic with absent deep pain perception



Spinal Walking - "The Great Pretender"

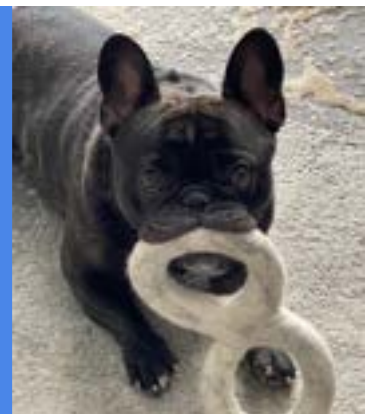


Spinal Walking

- Acquisition of involuntary motor function in paraplegic DPN animals
- Reflex gait develop from interactions between the central pattern generator (CPG) + proprioceptive feedback
- Requires intensive physical therapy
- Younger and lightweight dogs have a greater chance at becoming a spinal walker



Patient Examples



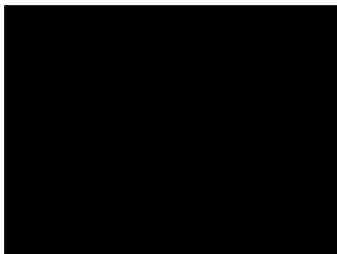
Hyperesthesia



Ambulatory Paraparesis



Non-ambulatory Paraparesis



Paraplegic - Intact Nociception (DPP)



Paraplegic - Absent Nociception (DPN)



Diagnostic Approaches



Spinal Radiographs

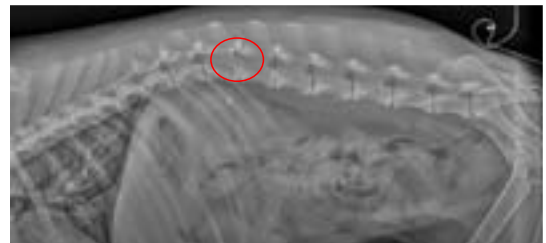
Can be used as a screening tool if suspicious

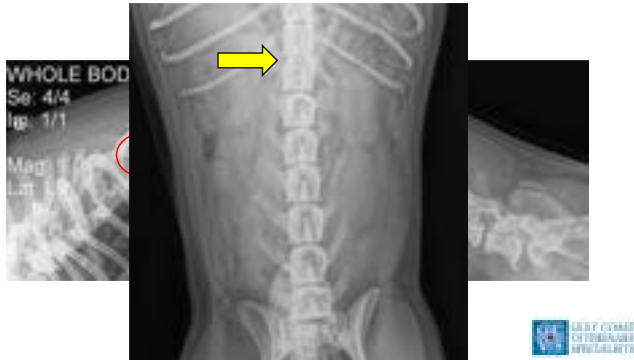
○R/O - fractures, neoplasia, malformations

- Best for mineralized tissues in the spinal canal
- Does NOT give you information on location and/or lateralization
- Most of the time = unnecessary and potentially harmful



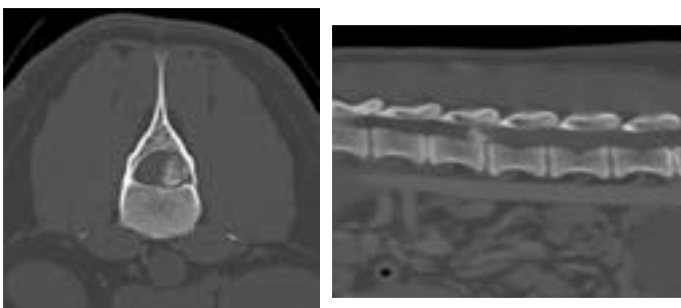
Spinal Radiographs - Best Case Scenario





Computed Tomography (CT)

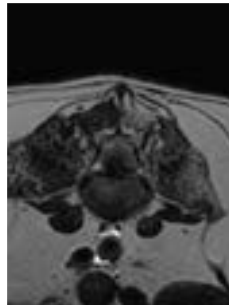
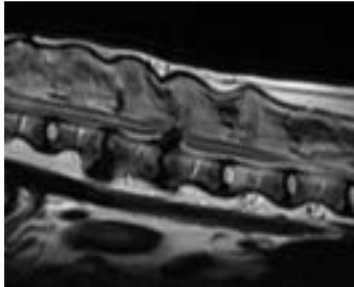
- Quickest cross sectional imaging technique
- Requires general anesthesia
- Can be cheaper than MRI
- Best for young, small, chondrodystrophic breeds
- Can distinguish acute vs chronically extruded disc material
- Does NOT provide insight into parenchymal injury



Magnetic Resonance Imaging (MRI)

- Gold standard diagnostic technique (>98.5% sensitivity)
- Requires general anesthesia
- Best soft tissue visualization
- ⚠️ = prolonged acquisition time, availability, cost
- Prognostication





Medical Management vs Surgical Intervention



Medical Management vs Surgery - Outcomes

Injury Severity	Medical Outcome	Surgical Outcome
Spinal pain only and ambulatory PP	80%	98.5%
Non-ambulatory paraparesis	81%	93%
Paraplegia DPP	60%	93%
Paraplegia DPN	21%	61%



Medical Management

- Activity restriction - 4 weeks!!
- Anti-inflammatory medications (NSAID vs steroid)
- Pain medications
- Adjunctive treatments
- Bladder management (+/-)
- Continual decline → surgical intervention



Surgery

- Goals:
 - Decompress the spinal cord
 - Restore blood flow
 - Prevent recurrence if possible (aka fenestrate)
 - Do NO harm
- Timing of surgical decompression
- Is a durotomy necessary?
- To fenestrate vs not to fenestrate

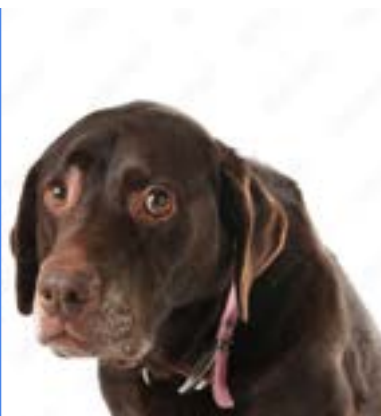


Surgical Options

- Hemilaminectomy
- Pediculectomy
- Mini-hemilaminectomy
- Ventral slot
- Dorsal laminectomy



The "M" Word

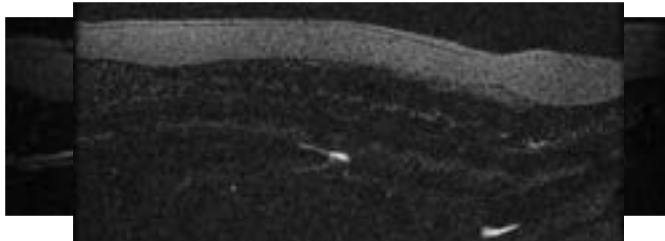


Myelomalacia

- Progressive necrosis, ischemia, and hemorrhage of the spinal cord that expands cranially/caudally from initial injury
- Clinical signs:
 - Ascending paralysis
 - Loss of PL reflexes
 - Absent abdominal tone
 - Cranial migration of the CT reflex
 - Hypoventilation
- Definitive diagnosis = histopathology



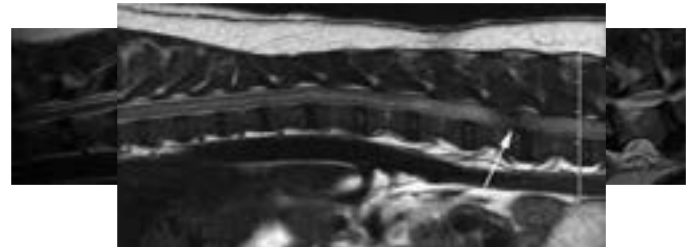
Myelomalacia



HASTE



Myelomalacia



T2W



Not All "Down Dogs" Are Emergencies



When is a “down dog” an emergency?

- 1) Rapid onset of severe clinical signs
- 2) Progressive worsening of clinical signs despite rest and/or medical management
- 3) Severe pain



Summary



Summary

- IVDD is a common disease affecting both dogs and cats
 - Short legs and long back = predisposition
 - Not all patients require surgical intervention
 - Neurologic grade/ability on presentation often dictates prognosis
- Time is of the essence
 - Prevention is key but all dogs are at risk



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Canine Atopic Dermatitis

- Generally believed to be due to an interplay of both intrinsic and extrinsic

factors

- There is clearly a genetic basis but no consistent mutations are recognized
- Skin barrier most thought to be affected
- There is a clear predisposition for pathogenic Staph. and Malassezia
- Environmental factors play a role



Canine Atopy Dermatitis Diagnosis

Diagnosing Atopy

- The diagnosis of canine atopic dermatitis is a diagnosis of exclusion
- The presence or absence of seasonality or seasonal exacerbation of clinical signs is helpful but not solely indicative of allergies
- Consider and rule out all of major sources of skin infection and pruritus



Diagnosing Atopy

- For non-seasonal patients, food trials are still highly recommended due to the overlap in food allergies and atopy
- Food allergies can happen at any age and can occur regardless of the diet(s) a patient has been on
- Prescription diets are highly preferred over over-the-counter options
 - Ingredients still matter



Diagnosing Atopy

- Stereotypical clinical signs or patient history:

- Clinical signs started before <3 years of age
- Patient lives mostly indoors
- Corticosteroid responsive pruritus
- Chronic or recurrent yeast infections
- Affected front feet
- Affected ear pinnae
- Not affected ear margins
- Non-affected dorsolumbar area
-
-

Fulfilling 5 or 6 of these criteria carries very high sensitivity and specificity for an atopic diagnosis



Canine Atopy Dermatitis

Treatment

Atopic Treatment – Setting Expectations

- Atopic dermatitis, above all else, is a lifelong incurable disease
- Treatment is costly, frustrating, and ideally hands-on
 - A multimodal approach is best, but we don't always pick the right combination from the get-go



Atopic Treatment – A Multimodal Approach

- The best treatment approach will come from a combination of infection control and prevention, itch management, and allergy avoidance, wherever possible
- There is no one size fits all approach to address these tenets for a patient and its owners
 - Therapies need to be balanced against owner burden and compliance



Atopic Treatment –Infection Control

●Both ear and skin infections need to be considered

- Active infections must be resolved first
 - § Cytology, cytology, cytology
 - § When in doubt, culture skin infections

●Routine bathing and/or ear cleaning is highly recommended

- Recommended up to once or twice weekly when a patient is affected, either year round or seasonally



Atopic Treatment –Bathing

●Bathing is helpful to remove allergens from a patient's skin and coat, to remove infectious organisms from the same areas, and to re-affirm the skin barrier in the process

- Bathing is not too drying because of ceramides and phytosphingosines in the products
- Chlorhexidine is the preferred ingredient, can be synergistic with an added antifungal
- Sodium hypochlorite is a good alternative for chlorhexidine-sensitive patients



Atopic Treatment –Ear Cleaning

●Ear cleaning is a "bath for the ears"

- Cleaning is meant to remove debris that can harbor infection and to remove infection itself
- Neutral pH, non-irritating cleansers preferred



Atopic Treatment –Alternatives for Infections

- Spot-on moisturizers and spot-on anti-pyoderma products
- Staphage Lysate injections
- Probiotics
- Omega3 Fatty Acids



Atopic Treatment –PruritusControl

- There are several anti-pruritics available and each have a role
 - Not every dog will respond to each option
 - Not every option is appropriate for every dog or every itch/dermatitis

1. Corticosteroids
2. Cyclosporine
3. Oclacitinib
4. Cytopoint

Most to least anti-inflammatory



Atopic Treatment –Corticosteroids

- Steroids provide the most broad coverage anti-inflammatory option and are very rapid in their action

- Best suited for severe dermatitis or concurrent infection
- A new option can be found when things are better managed



Atopic Treatment –Cyclosporine

- Cyclosporine (Atopica, Cyclavance, Sporimune) has potent anti-inflammatory

function, albeit with a delayed onset of activity

- Best suited for patients where other drugs have failed
 - § Not controlling itch well enough, not preventing infections, not controlling inflammation to the right extent, etc.



Atopic Treatment –Apoquel

- Apoquel is most suited for mild to moderate inflammation

- Less potent for otitis externa
- Less capable during concurrent infection



Atopic Treatment –Cytopoint

- Cytopoint is best suited for dogs with very mild inflammation

- Perfect for use in patients with other comorbidities
- Can be used safely in conjunction with other medications
- Proactive use is better than reactive administration



Atopic Treatment –Allergy Avoidance

- Not a very practical or possible strategy

- Pollens are too ubiquitous to avoid, no matter the setting
- Dust and storage mites can be mitigated but are still omnipresent

What can we do if we can't avoid the allergens? We can try to desensitize patients with allergen specific immunotherapy.



Canine Atopy Dermatitis

Allergen Specific Immunotherapy (ASIT)

Atopic Treatment –ASIT

- Immunotherapy stands alone as the only option that can address the underlying

syndrome

- Highly recommended in any confirmed atopic dog affected ≥ 6 months each year
- § The younger the patient the greater the reason to consider immunotherapy



Atopic Treatment –ASIT

- Allergen-specific immunotherapy is considered effective 70% effective
 - 70% of patients will be ≥50% improved after 6-12+ months
 - Lifelong use is nearly always required
- Some patients need less medications and others can get off drugs altogether



Atopic Treatment –AllergenTesting

- Both intradermal and serologic allergen testing methods are valid
 - Vaccines made from either test have statistically similar success rates
 - What matters most atopy is confirmed, and that the test used generates positive results that make sense for the patient
- Sometimes both tests are necessary in the case of incomplete or illogical results



Atopic Treatment –CCDs

- Be mindful for the influence of cross-reactive carbohydrate determinants (CCDs)
 - CCDs are unique, highly antigenic carbohydrate structures found on plant and insect allergens
 - These are a source of cross-reactivity and polysensitization in serologic testing



Atopic Treatment –VaccineAdministration

- Allergy vaccine is typically done one of two ways: subcutaneous vs. oral
 - The choice is owner dependent but SQ is most common
 - If one does not work, the other can be tried



Atopic Treatment –Vaccine Expectations

- We recommend patients be continued on all their same medications and topical regimen for at least 6 months
- Immunotherapy is a long-term process and results are not expected for months
 - Trying therapy for those 6-12+ months is the only way to determine if it can be effective



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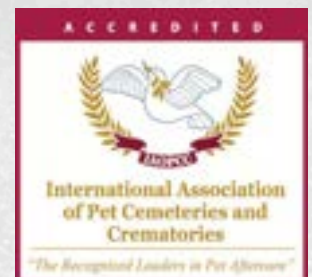
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Opioid Abuse and Controlled Substance Diversion: Veterinary Implications

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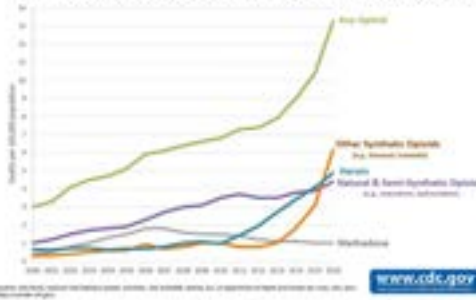
Why Are We Here?

Causes of Death



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Overdose Deaths Involving Opioids, by Type of Opioid, United States, 2000-2016



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Opium Poppy



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Opium



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