

# Caring for Veterinary Patients – An Update



# Who Am I?

- Pharmacist with over 20 years of experience in veterinary pharmacy
  - Disclose that I developed and instruct online courses in veterinary pharmacy for students and pharmacists – University of Florida
  - Teach pharmacology to veterinary students in the Caribbean using distance education methods (Grand Cayman Island)
  - Regulatory affairs/regulatory compliance consultant to veterinary drug distributors
  - Pharmacist who has filled many, many veterinary prescriptions over the years
  - I am an old Fort Sumner girl.
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# Learning Objectives - Pharmacists

1. Compare and contrast common human and veterinary disease states with emphasis on therapeutic options.
  2. Describe fundamentals of pharmacokinetics that will support a pharmacist's ability to recognize species specific disease state differences.
  3. Recall DOC to treat common endocrine diseases, musculoskeletal diseases, CHF and behavioral modification. Additionally, recall the use of CBD products in pets.
  4. Recall the mechanism of action for drugs that are known to be toxic to canine and felines.
  5. Communicate effectively with animal owners and veterinarians to: meet state-mandated counseling requirements and ensure patient safety
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# Learning Objectives -Technicians

1. Recognize veterinary pharmacy as a specialized area within pharmacy practice.
  2. Compare and contrast common human and veterinary disease states with emphasis on therapeutic options.
  3. Recall drugs of choice to treat common endocrine diseases, musculoskeletal diseases, CHF and behavioral modification. Additionally, recall the use of CBD products in pets.
  4. List drugs that are known to be toxic to canine and felines.
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# **Species Specific PK and PD**

# Basics of PK and PD

***A cat is not a small dog. A dog is not a small person.***

Metabolism – *significant* differences in cats. They are deficient in glutathione, glucuronyl transferase making glucuronidation conjugation difficult and therefore can not metabolize drugs like people or other small animals.

GI transit time faster in monogastrics versus ruminants. Dogs>people. So, caution with some of the prolonged release, once a day cardiac drugs, theophylline SR.

Generally do not extrapolate doses outside of species such as a rodent vs. large mammal. Or a ruminant to monogastric. Or a reptile to a mammal. Use BMR as a guide.

Some animals have more/different receptors than others. Cattle have large number of  $\alpha$ -2 receptors making them very sensitive  $\alpha$  agonists.

Some species are more affected by GABA inhibition than others – horses.

# Clinical Examples

Prednisone is a prodrug. Cats and horses lack the enzyme necessary to convert prednisone to prednisolone. Therefore, administer prednisolone to those species.

Opiates will cause predictable sedation in dogs but can cause CNS excitation in horses and cats.

Dogs and cats metabolize benzodiazapines faster than people.

Xylitol is toxic to dogs.



# Clinical Examples

- Chocolate is toxic to dogs, specifically the methylxanthine theobromine.
- Theobromine competitively inhibits cellular adenosine receptors, resulting in CNS stimulation, diuresis, and tachycardia. Also increases intracellular calcium levels. The net effect is increased strength and contractility of skeletal and cardiac muscle.
- Clinical signs of chocolate toxicosis usually occur within 6–12 hours of ingestion. Initial signs include; polydipsia, vomiting, diarrhea, abdominal distention, and restlessness. Signs may progress to hyperactivity, polyuria, ataxia, rigidity, tremors, and seizures. Death is generally due to cardiac arrhythmias, hyperthermia or coma.



# Why is Tylenol toxic to cats?

- As little as one, 500mg tablet can kill a cat.
- Cats are deficient in glucuronyl transferase, because of that ingested APAP cannot form a conjugate with glucoronide. So, APAP can make it through Phase I metabolism but not Phase II and there is a build up of toxic Phase I metabolites. Glutathione, in a Phase II metabolic pathway tries to step in an help but it quickly becomes overwhelmed and the pt. develops methemoglobinema.
- Antidote: N-acetylcysteine provides an alternative substrate for conjugation with the reactive metabolites of APAP.



# Clinical Pearls

- NPH and Levemir can be used to treat DM in dogs. Lantus is used to treat diabetes in cats. Insulins are *not* interchangeable/substitutable for use in dogs and cats.
  - Gabapentin and tramadol are frequently being used in conjunction with veterinary label non-steroidal drugs such as carprofen for pain management. Multimodal therapy can look like; joint supplement + NSAID + Tramadol + Gabapentin.
  - The liquid formulation of gabapentin should never be dispensed to dogs because it contains xylitol as a sweetener and is toxic to canines. Watch OTC vitamins, sugar free candy and peanut butter as well.
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# Clinical Pearls

- The dose of levothyroxine for hypothyroidism in dogs is 4-5 times that of humans and will always be dosed twice a day (BID).
- Diazepam can be used to treat seizure disorders in dogs and cats. Dog dosing is ~1mg/kg PO or rectally, 120# St. Bernard = 54mg.
- Alprazolam can be used to treat anxiety or noise phobias such as thunder storms and firework noise.
- Human ciprofloxacin can be used in large breed dogs needing extended therapy because it can be less expensive than veterinary enrofloxacin (a prodrug to ciprofloxacin).
- Piroxicam can be used for anti-tumor activity in animals with cancer.

# Clinical Pearls

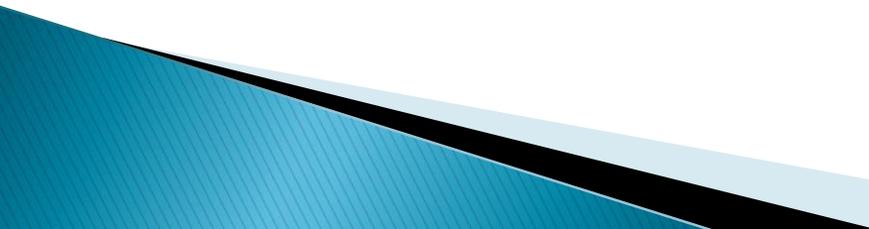
- Veterinarians are not eligible for National Provider Identifier (NPI) numbers.
  - Animal Poison Control Center (APCC). 888-426-4435
  - ASA use in dogs for  $\sim >7$  days, guaranteed a GI bleed.
  - OTC Kaopectate and Pepto-Bismol contain bismuth subsalicylate – an ASA derivative
  - Metamucil granules sprinkled on pet food can help to tighten loose stools.
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# Clinical Pearls

Pharmacists **can not** recommend OTC drug use to animal owners.

That is considered extra-label drug use and only a DVM can do that under federal and state law.

However, if a DVM directs an animal owner to purchase an OTC drug, you can be in a position to offer guidance and direction to support patient safety.



# Case Study

A customer approaches you with a note from a veterinarian to purchase cetirizine for a dog for itching secondary to atopic dermatitis.

The dosage is not clearly legible and the customer asks for your help.

What is your thought process?



I have no idea how this picture got here...but since it is, let's discuss.....



# **CBD in Pets**

# **What is the status in NM?**

Medical marijuana, and hemp- and marijuana-sourced CBD are all legal in New Mexico for medicinal purposes.

There are no laws specific to use in pets.



Thirty-three states have legalized marijuana for medicinal or recreational use by people—or both. And yet, none of these laws account for use of cannabis in veterinary medicine.

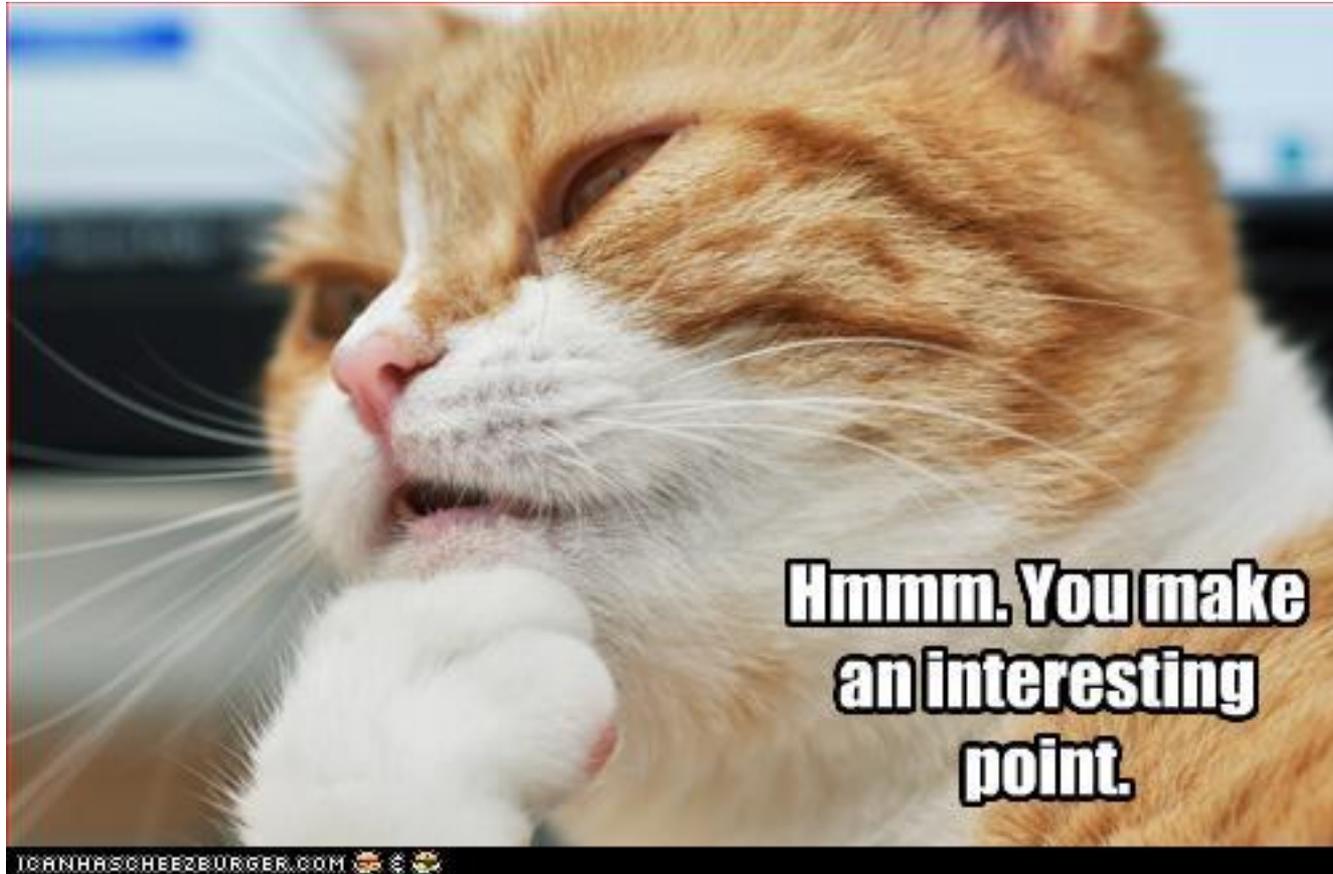
FDA is conducting a comprehensive evaluation of CBD and related products with a focus on educating the public about these products, informing the agency's regulatory considerations of these products.

CBD is primarily used with animals as an anti-inflammatory, analgesic, anti-anxiety, or anti-neoplastic therapy.

“...we know little about the potential effects of sustained or cumulative long-term use of CBD,” Randall Gnatt of FDA/CVM. “We don’t know about coadministration with other medicines or risks to animal populations. This doesn’t mean that we know CBD is categorically unsafe under all circumstances, but given the gaps in our current knowledge and the known risks that have been identified, we’re not at a point where we can conclude that CBD products are safe for use.”

JAVMA News The hype and hope of veterinary cannabis. Oct 2020. <https://www.avma.org/javma-news/2020-10-01/hype-and-hope-veterinary-cannabis>

# Sound familiar???



“The marketplace has outpaced the evaluation of products, veterinarians need to understand the potential benefits as well as risks surrounding these products for their patients and the liability risks for themselves. There has been much progress in bridging these gaps, but we need more work in areas of research, quality control, and FDA evaluation for veterinarians to have general confidence in available products.”



American Veterinary Medical Association (AVMA) cautions that state laws legalizing cannabis and CBD products for human use do not apply to animals.

As products become more widely available to humans, veterinarians have increasingly faced interest from pet owners about CBD and cannabis products.

Little valid research on the benefits and risks of cannabinoids in animals. There have been limited studies, anecdotal reports, and case studies about therapeutic benefits in pets, and they note that more well-controlled research is needed to make evidence-based recommendations pet owners.

Concern that pet owners may also choose them for their pets over other therapeutic agents with demonstrated efficacy, leading to therapeutic failures as well as potential adverse effects.

AVMA does not want to discount the potential benefit of cannabis products for pets, but there is a lot to consider pending better data.

“The therapeutic potential may be there, we just need to really understand what they do, I think the best thing veterinarians can probably do is provide the information and education to their clients. Clients also need to understand the issues with quality control around these products.”

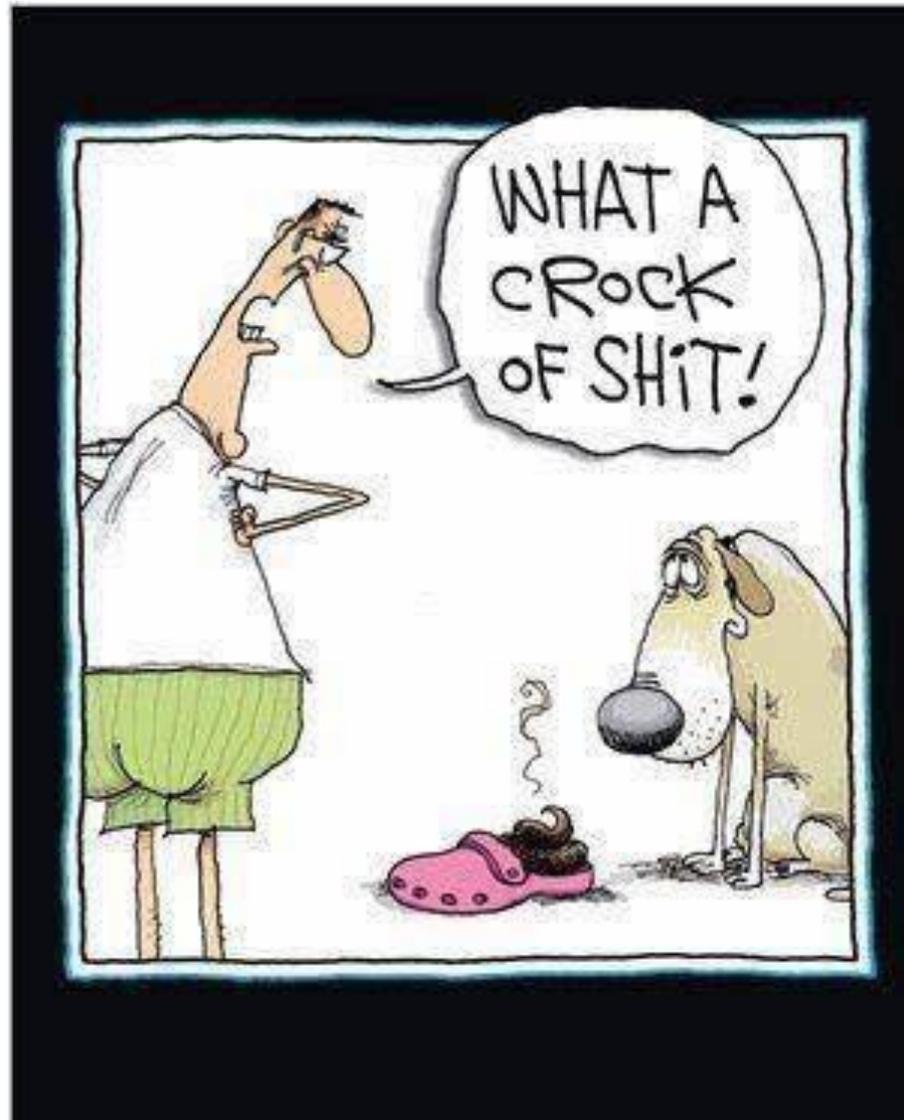
In November 2019, FDA issued warning letters to 15 companies for illegally selling cannabidiol-containing products in ways that violate federal law. Many of the products are intended for animals, particularly pets.

The agency says it's concerned about the safety of human food products from animals that consume CBD, as there is a lack of data establishing safe CBD residue levels.

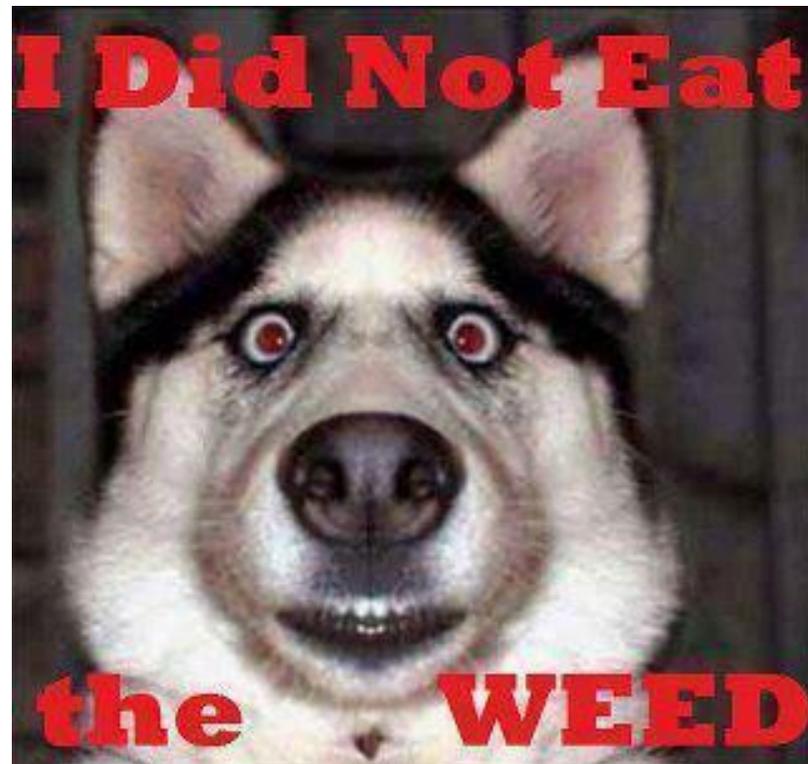
Given the lack of scientific information supporting the safety of CBD in food, the FDA is also indicating that it cannot conclude that CBD is generally recognized as safe to use in human or animal food.

JAVMA News FDA warns companies illegally selling CBD products February 2020

<https://www.avma.org/javma-news/2020-02-01/fda-warns-companies-illegally-selling-cbd-products>



# Marijuana Intoxication



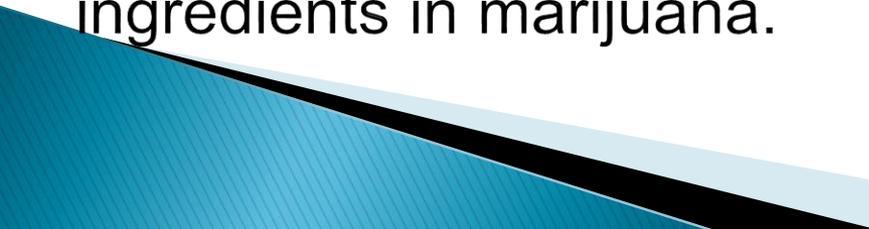
# Marijuana Intoxication

Seen in canines with access to edibles, dried products or inhaling smoke. *Does not make a dog high, makes them sick.*

Mild cases; lethargy, altered response to visual or verbal stimuli, red eyes/conjunctiva, stupor and behavior changes.

More severe cases; ataxia, hypothermia, hypotension, bradycardia, emesis, anorexia, urinary incontinence, diarrhea and vocalization. Coma and death are also possible in severe cases.

Clinical signs can occur within minutes to hours and can last for hours to days, in part due body fat storage of the active ingredients in marijuana.



# Marijuana Intoxication Treatment

THC causes the release of the neurotransmitters acetylcholine, dopamine, norepinephrine and serotonin in the brain. The increased release of these neurotransmitters leads to the various clinical manifestations.

IV fluids, decontamination, including inducing vomiting and charcoal to bind the poison may be performed if the ingestion was recent (less than 2 hours of ingestion) or large. Anti-emetics, oxygen, blood pressure monitoring, thermoregulation, and in severe cases, ventilator/respirator support.

[www.veterinarypracticenews.com/treating-marijuana-toxicity/](http://www.veterinarypracticenews.com/treating-marijuana-toxicity/)

[www.totalveterinarycare.com/blog/marijuana-poisoning-in-pets-qa/](http://www.totalveterinarycare.com/blog/marijuana-poisoning-in-pets-qa/)

[www.petpoisonhelpline.com/pet-safety-tips/marijuana-toxicity-pets/](http://www.petpoisonhelpline.com/pet-safety-tips/marijuana-toxicity-pets/)



# Degenerative Joint Disease DJD

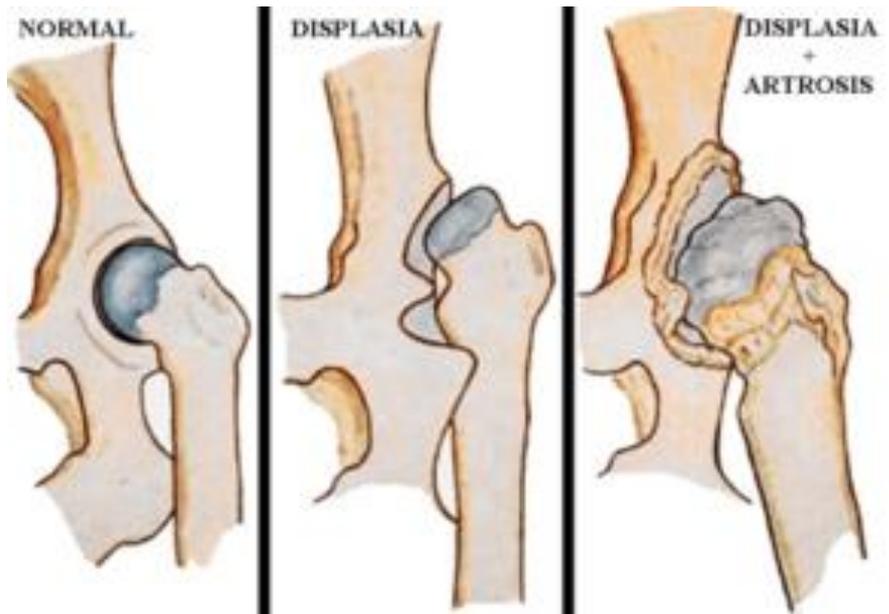
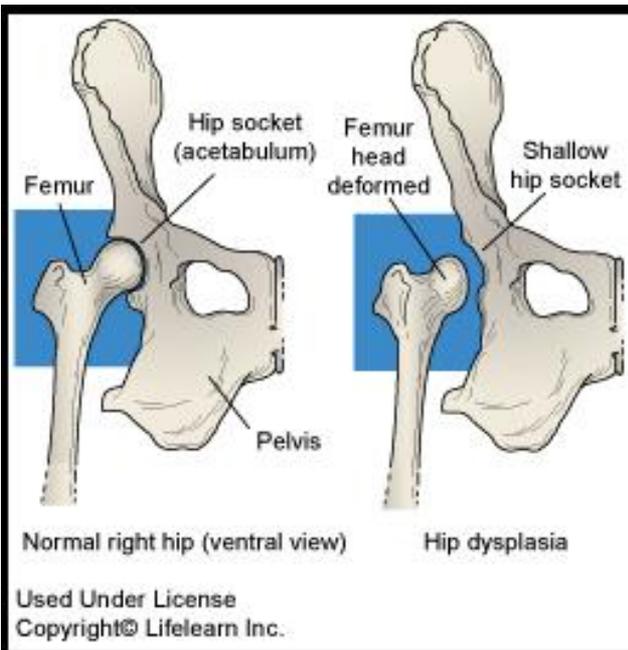


# Compare/contrast human and veterinary disease states.

Inflammatory musculoskeletal conditions such as hip dysplasia or other orthopedic issues in dogs. Typically progressive and chronic medical management for the remainder of the animal's life. Hip dysplasia is a crippling disease observed in almost every breed.

Common clinical signs in patients with DJD are;

- Difficulty getting up from a lying position
  - Difficulty in ascending or descending stairs
  - Changed in appetite or behavior
  - Stiff gait, lameness, reduced range of motion
  - Atrophy of muscles surrounding the affected area, “rabbit hop”
  - Joint swelling, joint instability, crepitus
  - Dull, aching pain
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“Orthopedic Nightmare”

# Treatment Options

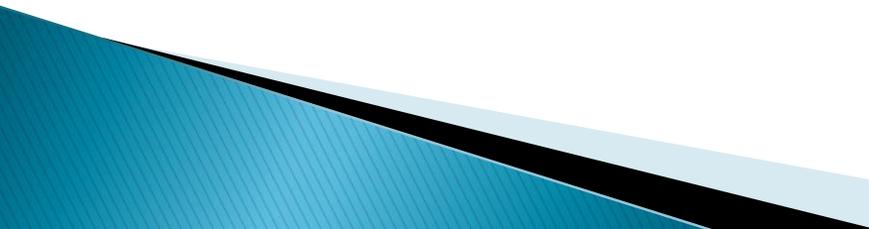
1. Joint supplement/condroprotective
  2. NSAID such as Rimadyl or Deramaxx
  3. Tramadol - analgesic effects better with an NSAID, ~3-5mg/kg
  4. Gabapentin tabs/caps only. **Liquid contains xylitol that is toxic to dogs!**
- There is no FDA approved for *chronic* use in cats. Some will try using Metacam chronically.



# **Diabetes Mellitus in Dogs and Cats**



# Compare/contrast human and veterinary disease states.

- Dogs and cats can develop insulin-dependent diabetes mellitus (DM) similar to humans. In both species, DM is a result of the loss or dysfunction of pancreatic beta cells. Eventually, the diabetic dog or cat will exhibit classic signs of diabetes such as; polyuria, polydipsia (PU/PD), polyphagia, and weight loss which sends them to the veterinarians office for a consult.
  - Cats – early on they are most similar to a Type II person, but will eventually progress to being insulin dependent.
  - Dogs – immune mediated, like a Type I person, will always be insulin dependent.
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# Compare/contrast human and veterinary disease states.

- Additional complications may include cataracts in dogs.
- Diabetic neuropathy will cause cats to become progressively weaker in the rear legs and they assume a unique posture termed plantigrade stance.



eClinic of small animal internal medicine, Zurich.

**Figure 3.**

Cat with plantigrade stance due to diabetic neuropathy.



# Compare/contrast human and veterinary disease states.

- Insulin and diet modification form the basis of treatment in canine and feline DM. Treat for improvement in PU/PD.
- Be aware of the unit strength of insulin formulation a pet is using and guide owners to purchase the correct corresponding syringes. Human products (Lantus<sup>®</sup>, NPH<sup>®</sup>, Levemir<sup>®</sup>) are formulated in a concentration of 100 units/mL, veterinary insulin products (Vetsulin<sup>®</sup>, ProZinc<sup>®</sup>) are formulated in a concentration of 40 units/mL.
- Pharmacists are well positioned to counsel and educate pet owners on the need for pairing of the correct insulin product with the corresponding syringes.
- One web site that pharmacists can recommend for owner education and support is [www.petdiabetes.com](http://www.petdiabetes.com)

Species	Drug Name	Common Dosing Ranges
<b>Feline</b> <b>**Meow**</b>	# Lantus <sup>®</sup> (glargine U-100)	0.25-0.5 units/kg SQ every 12 hours.
	* ProZinc <sup>®</sup> (protamine zinc insulin U-40)	0.1-0.3 units/pound (0.2-0.7 units/kg) SQ every 12 hours. Use U-40 syringes.
<b>Canine</b> <b>**Woof**</b>	* Vetsulin <sup>®</sup> (porcine zinc lente, U-40)	0.5 units/kg SQ once or twice daily Use U-40 syringes
	# NPH <sup>®</sup> (neutral protamine hagedorn U-100)	0.5-1 unit/kg SQ once or twice daily
	# Levemir <sup>®</sup> (detemir U-100)	0.1-0.2 units/kg SQ every 12 hours

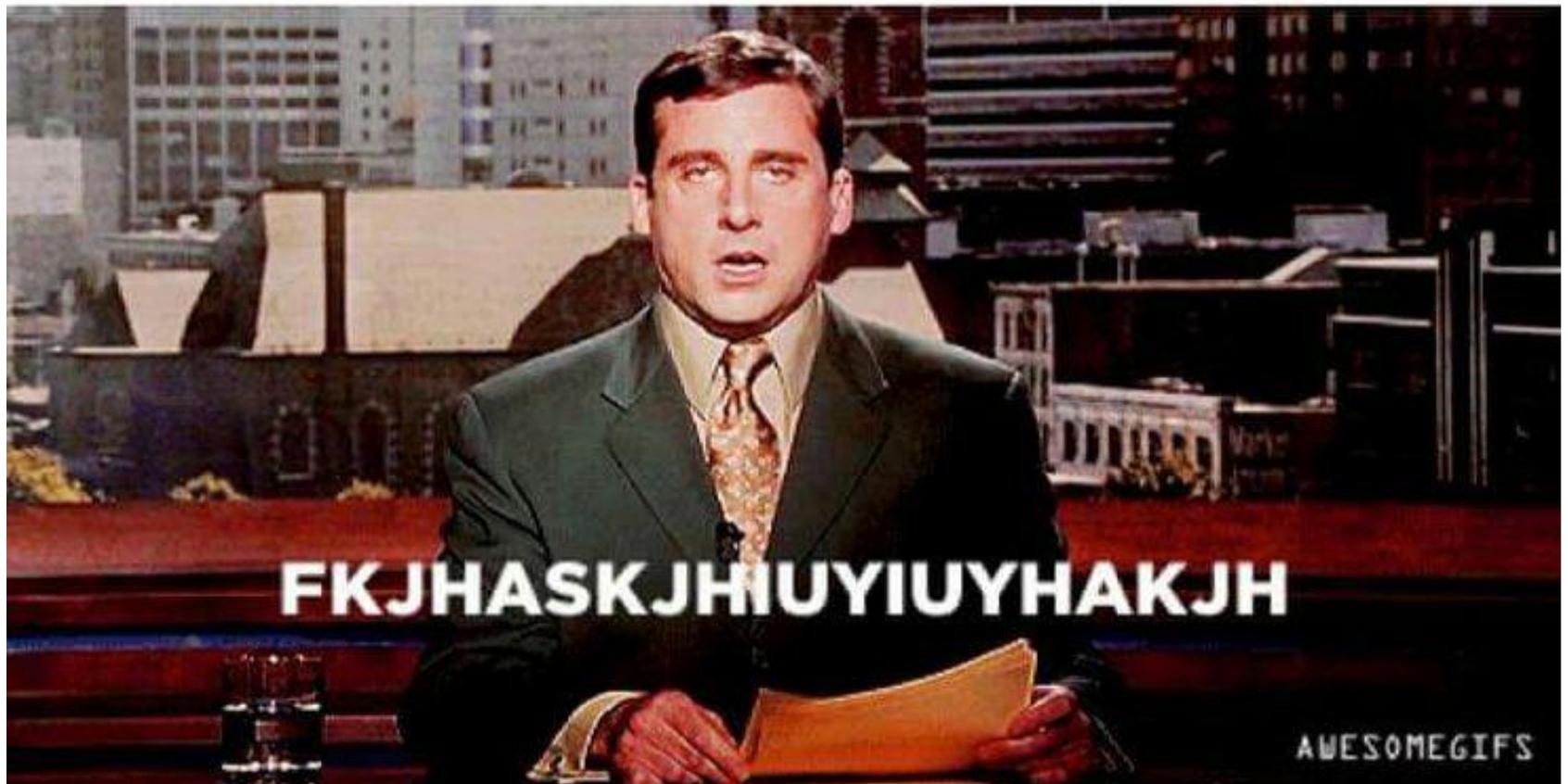


Signs of hypoglycemia; lethargy, vomiting, anorexia, abnormal gait, weakness, strange behaviors or tremors.

If signs of hypoglycemia, rub 1 to 2 teaspoons of corn syrup onto the gum tissue. If the animal responds within 5 minutes, offer them food. If the animal does not respond within 5 minutes, seek veterinary care.

My students

~~Me~~, trying to say generic drug names...



# **Behavioral Management Drugs**

# Compare/contrast human and veterinary disease states.

Behavioral symptoms of separation anxiety most commonly manifest as a pet vocalizing, chewing destructively, urinating, or defecating when the owner is away. Some pets may even show aggression, refuse to eat, vomit, or salivate excessively. Dogs who bark when they are alone.

If medication is the only approach used for treatment the results are often poor. Just like human behavior modification, i.e. smoking.

Tricyclic antidepressants (TCAs)

Selective serotonin re-uptake inhibitors (SSRIs)

Benzodiazepines (BDZ)

Buspirone

Trazodone

Monoamine oxidase inhibitors (MAOI's, least preferred)

# “Chill Protocols”

To decrease stress, anxiety associated with veterinary visits as well as in-clinic use for anxiety.

Gabapentin for cats; 50-100 mg/cat PO about 1 hour prior to appt. Sedation continues over 3 hours.

Trazodone

Dog; 2.5-5 mg/kg PO Q 12-24 hours, increase over 3 days PRN

Cat; 50mg/cat PO about 1 hour prior to visit.

**YOU GET TRAZODONE,  
YOU GET TRAZODONE**

**EVERYBODY GETS TRAZODONE!!**

**Ai took my last chill pill yesterday**

**You have been warned**



# Congestive Heart Failure



# Compare/contrast human and veterinary disease states.

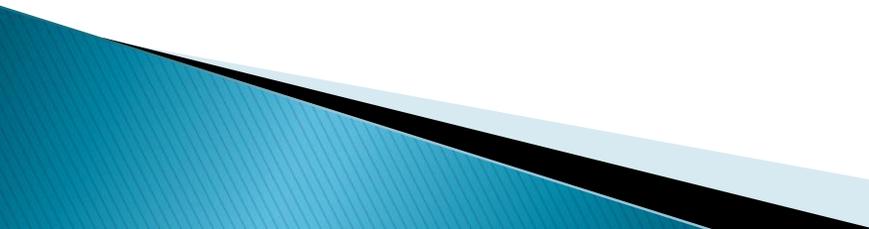
Clinical signs of heart failure are caused by the accumulation of fluids, low cardiac output, changes in cardiac and skeletal muscle and congestion.

A dog with CHF is typically brought into the veterinarian for cough, dyspnea, exercise intolerance, abdominal enlargement or syncope. Cats are usually brought into the veterinarian for breathing or walking problems. The breathing problems are due to pleural effusion or pulmonary edema.

Owners usually complain of exercise intolerance and syncope. Clinical signs are weak arterial pulses, tachycardia, arrhythmias, and cool extremities as well as weight loss, exercise intolerance, dyspnea, and decreased muscle mass.



# Compare/contrast human and veterinary disease states.

- The goal for managing CHF is to manage the clinical signs related to the disease. Since this is a progressive disease, there is no cure.
  - Therapy typically consists of three/four drugs, depending on underlying cause and stage.
    1. Diuretic – furosemide
    2. ACE inhibitor - enalapril
    3. Positive inotropic agent – pimobendin or digoxin
    4. Spironolactone
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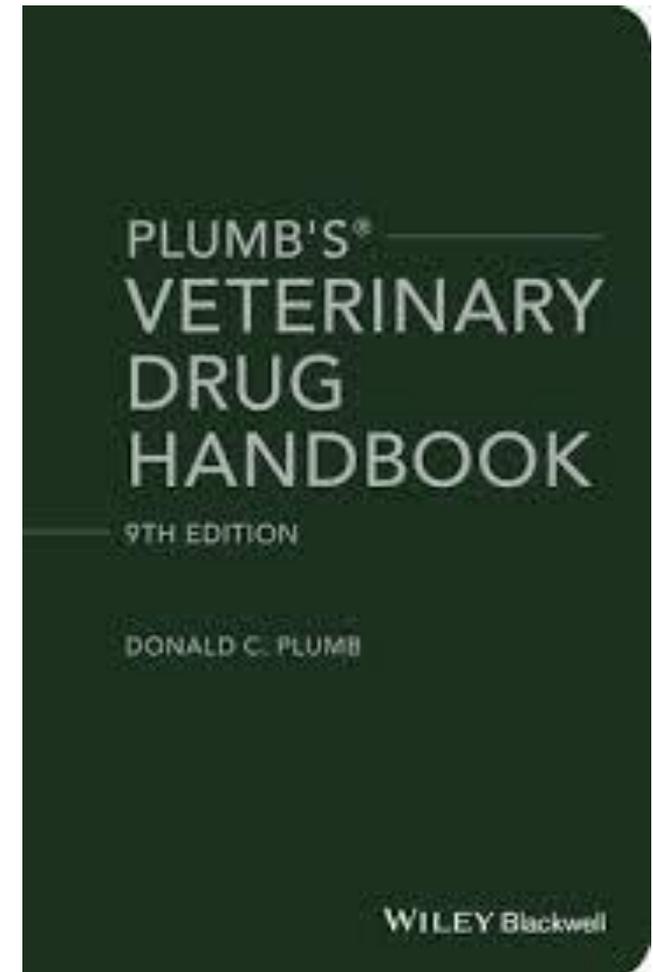
I AM DROPPING OFF PRESCRIPTIONS FOR BOTH MY DOG AND HUSBAND . GIVE BRAND DRUG ONLY FOR MY DOG. GENERIC IS OK FOR MY HUSBAND !



SUMANTA  
BARRUAH.

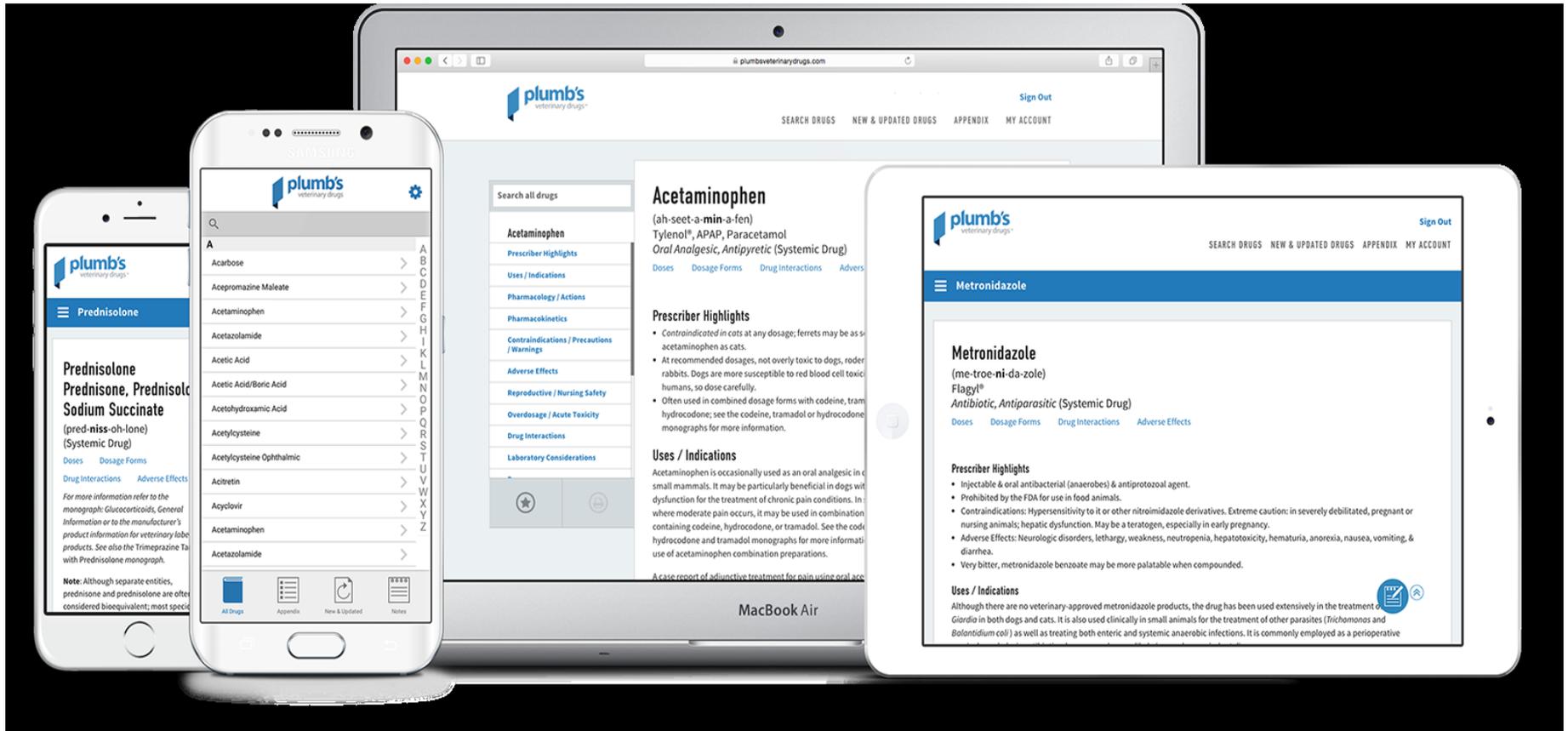
# Clinical Pearls

- If you see “SID” on a veterinary prescription in the sig it means once-a-day.
- The Veterinary Drug Handbook, written by a pharmacist, and is considered one of the most useful references in veterinary pharmacy. Verify indications, dosages, contraindications and a wonderful tool for patient counseling.
- Print or online (for 1 year) \$85.



“The Virus”

# And Then They Made it Better



### Prescription Label

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Patient Name:

Species:

Drug Name & Strength:

Directions (amount to give how often & for how long):

Prescribing Veterinarian's Name & Contact Information:

Refills:

[Content to be provided by prescribing veterinarian]

## Gabapentin

(gab-ah-pen-tin)

**Description:** Anticonvulsant/Nerve Pain Reliever

**Other Names for this Medication:** Neurontin®

**Common Dosage Forms: Veterinary:** None. **Human:** 100 mg, 300 mg, 400 mg, 600 mg, & 800 mg tablets or capsules. Compounded smaller sized capsules and a xylitol-free oral liquid may be available.

This information sheet does not contain all available information for this medication. It is to help answer commonly asked questions and help you give the medication safely and effectively to your animal. If you have other questions or need more information about this medication, contact your veterinarian or pharmacist.

### Key Information

- ▶ May be given with or without food. If your animal vomits or acts sick after receiving the drug on an empty stomach, try giving the next dose with food or a small treat. If vomiting continues, contact your veterinarian.

# Questions? Let me know if I can do anything to assist...

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