

VETERINARY PHARMACY: OPPORTUNITIES AND CAUTIONS

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DISCLOSURES

Ben Brainard declares no conflicts of interest or financial interest in any product or service mentioned in this program, including grants, employment, gifts, stock holdings, and honoraria. He receives grant/research support from Abbott Animal Health and Abaxis, Inc.

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LEARNING OBJECTIVES

Following this presentation, attendees should be able to:

- 1** List common adverse drug interactions in veterinary patients.
- 2** Explain current trends in veterinary prescribing and compounding.
- 3** Describe relevant laws governing veterinary compounding.

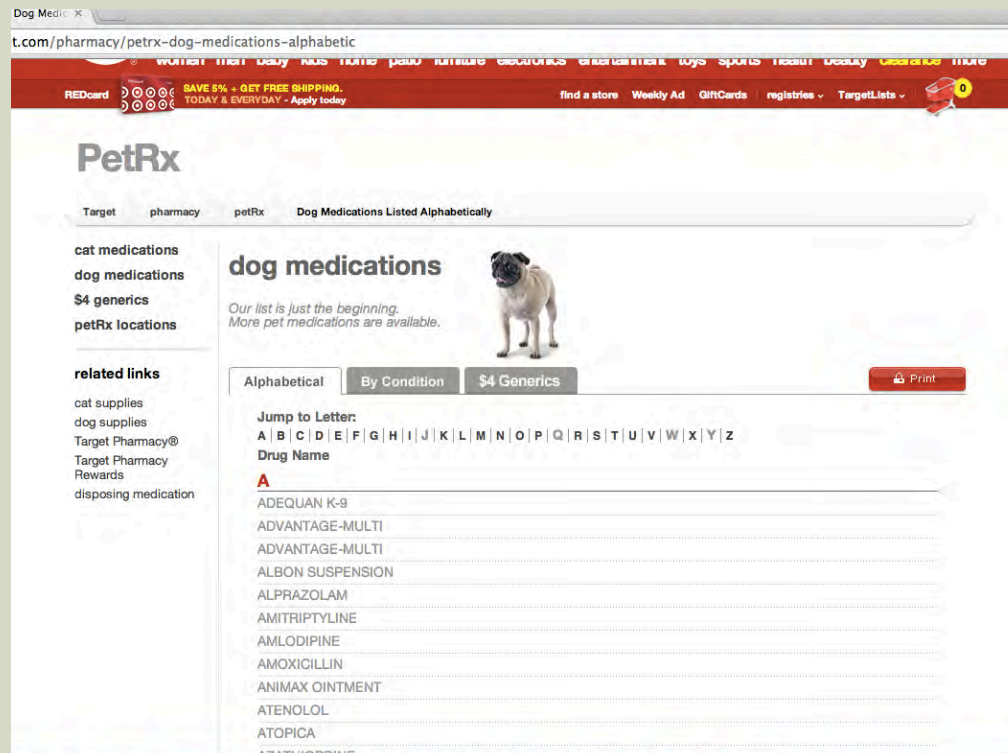
VETERINARY PRESCRIBING

- Individual veterinarian
 - Veterinary labeled products
 - Pharmaceuticals
 - Biologics
 - Antiparasiticides
 - Human generic medications



VETERINARY PRESCRIBING

- Outside prescriptions
 - Cost savings for client
 - Decrease need for on-hand stock at vet office
 - Wider selection



The screenshot shows the Target PetRx website interface. The URL is [t.com/pharmacy/petrx-dog-medications-alphabetic](https://www.target.com/pharmacy/petrx-dog-medications-alphabetic). The page features a navigation bar with the PetRx logo and a breadcrumb trail: Target > pharmacy > petRx > Dog Medications Listed Alphabetically. On the left, there are links for 'cat medications', 'dog medications', '\$4 generics', and 'petRx locations'. Below these are 'related links' for 'cat supplies', 'dog supplies', 'Target Pharmacy Rewards', and 'disposing medication'. The main content area is titled 'dog medications' and includes a small image of a pug. It features a 'Jump to Letter' section with a grid of letters (A-Z) and a list of drug names starting with 'A', including ADEQUAN K-9, ADVANTAGE-MULTI, ALBON SUSPENSION, ALPRAZOLAM, AMITRIPTYLINE, AMLODIPINE, AMOXICILLIN, ANIMAX OINTMENT, ATENOLOL, and ATOPICA. A 'Print' button is visible in the top right corner of the list area.

VETERINARY PRESCRIBING

- Compounded medications
 - To suit smaller sizes (mg/kg dosing)
 - Compounding pharmacies
 - 'Homemade' by veterinarian



AMDUCA

(ANIMAL MEDICINAL DRUG USE CLARIFICATION ACT)

- Prescription animal drugs and approved human drugs
 - Use for indications not listed in the labeling
 - Specific diseases
 - Different dosages/frequencies/routes
 - Different species

- Withdrawal time
 - Concern in animals to be used for food
 - Concern in performance animals
 - Covered under AMDUCA
 - FARAD
 - Food animal residue avoidance databank
 - FARAD.org

<http://www.fda.gov/AnimalVeterinary/GuidanceComplianceEnforcement/ActsRulesRegulations/ucm085377.htm>

SCOPE OF AMDUCA

- Any extralabel use
 - By or on the order of a licensed veterinarian
 - Valid veterinarian-client-patient relationship
 - Must not result in violative residues in food-producing animals
 - Must conform with regulations at 21 CFR Part 530
- List of drugs specifically prohibited from extra-label use
 - Food-producing animals
 - Chloramphenicol
 - Phenylbutazone
 - Fluoroquinolones
 - Nitrofurazone
 - Cephalosporins

COMPOUNDING

- Frequently necessary due to patient size
- Must be performed by a licensed veterinarian or pharmacist
 - When no approved drug can be used
 - May be directed for use as labeled or extra label
 - Use FDA-approved drug (not bulk drug)
- Must be dispensed for a specific patient
 - Cannot dispense for a clinic to re-dispense



Hoffman SB, et al. J Vet Pharmacol Ther. 2002;25:189.

Boretti FS, et al. J Vet Intern Med. 2013;27(2):377.

COMPOUNDING CONCERNS

- May not take into account pharmacology
 - Combine ground tablets into solution of incorrect pH
 - Large doses of extended release tablet
- Rarely tested for safety/efficacy
- Alternate methodology
 - Pluronic gel (“pluronic lecithin organogel-based vehicle”)
 - Methimazole: “generally low to undetectable bioavailability in a PLO form”
 - Other studies more positive
- Additives
 - Xylitol may be toxic in dogs
 - Hypoglycemia
 - Idiosyncratic hepatotoxicity

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DISPENSING CONCERNS

- **Dosages**
 - Frequently different between common human and animal doses
 - Soloxine (up to 0.9 mg PO q 24h in dogs)
 - Phenobarbital (generally 2 mg/kg PO q 12h in dogs)
- **Drug substitution**
 - Confusion
 - Azathiaprine vs azithromycin
- **If large amount of veterinary dispensing is performed:**
 - Recommend veterinary formulary to verify drugs and doses
 - Integrate into retail prescription software/alert systems:
 - Doses, contraindications, side effects, and drug interactions
 - Breed or species-related concerns

IMPORTANT DRUG INTERACTIONS: NSAIDS

- **Non-steroidal drugs + corticosteroids**
 - GI ulceration
 - GI perforation
 - Vet may prescribe prednisone to dog who receives intermittent NSAID from owners
- **Meloxicam**
 - Human formulation associated with GI perforation in dogs
 - Overdosage
- **Aspirin**
 - Low dose (0.5 mg/kg PO q 24h) for antiplatelet effects
 - Generally not used for analgesia (GI upset)
- **Ibuprofen**
 - Narrow therapeutic window, generally not used
 - Very toxic for cats, ferrets
- **Naproxen**
 - Extreme toxicity in companion animals

IMPORTANT DRUG INTERACTIONS: NSAIDS

- **Veterinary-labeled NSAIDs**
 - Rimadyl®, Novox® (Carprofen)
 - Metacam®, Orocam® (Meloxicam)*
 - Etogesic® (Etodolac)
 - Deramaxx® (Deracoxib)
 - Previcox®, Equioxx® (Firocoxib)
 - Onsior® (Robenacoxib)*

* Labeled for cats

<http://www.fda.gov/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/DrugLabels/ucm050105.htm>

OTHER VETERINARY CURIOSITIES

- Acetaminophen
 - Contraindicated in cats (methemoglobinemia)
 - Includes products such as Vicodin ®, Percocet ®
- Ivermectin
 - Used in small doses for heartworm prevention
 - Used in higher doses for specific treatments (eg. Demodex)
 - Collies and herding breeds very sensitive: neurotoxic
 - Lack P-glycoprotein receptor
- Azathioprine/azithromycin
 - Azathioprine significant bone marrow toxicity
- Permethrin-containing flea products
 - Significant toxicity in cats



Martinez M, et al. J Vet Pharmacol Ther. 2008;31:285-300.
Beale KM et al. Am J Vet Res. 1992;53:1236-40.

TOXICITY OF HUMAN MEDICATIONS FOR PETS

- **SSRIs**
 - Sedation, ataxia
 - Tremors/seizures
- **ADHD Medications (methylphenidate etc)**
 - Hyperactivity, hypertension
 - Cardiac arrhythmias
- **Cardiac medications (beta blockers, calcium channel blockers)**
- **Venlafaxine (Effexor®)**
 - Why do cats like it?



HUMAN MEDICINES THAT CAN HARM PETS II

- Psoriasis cremes
 - Result in hypercalcemia → renal failure
- 5-FU
 - GI toxicity
 - Bone marrow toxicity
- Inhalers (albuterol)
 - Hypoglycemia
 - Hypokalemia
 - Tachycardia/hypertension



INSULIN DOSING IN VETERINARY SPECIES

- Glargine: U100
- NPH: U100
- Vetsulin®: (porcine zinc insulin): U40
- Prozinc®: (protamine zinc recombinant human insulin): U40
- Regular (ICU only, IV and IM use): U100

ANIMAL INGESTION OF HUMAN MEDICATION

- Refer to veterinarian immediately
- ASPCA poison control
 - 888-426-4435
 - www.aspca.org/pet-care
 - \$65
- Pet poison helpline
 - 800-213-6680
 - www.petpoisonhelpline.com
 - \$39



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- 1. Common side effects of co-administration of steroids and non-steroidal medications to dogs include:
 - a. Hypertension
 - b. Gastrointestinal ulceration
 - c. Gastrointestinal perforation
 - d. A and b
 - e. **B and c**
- 2. Dispensing compounded medications to an entity such as a veterinary clinic for later dispensation to individual clients is permitted, under the auspices of AMDUCA (Animal Medicinal Drug Use Clarification Act)
 - a. True
 - b. **False**
- 3. Side effects of canine ingestion of some human-labeled psoriasis creams can include
 - a. Hypertension
 - b. Cardiac arrhythmias
 - c. **Hypercalcemia**
 - d. Hypokalemia
 - e. Sudden death
- 4. It is illegal under AMDUCA to dispense generic human-label drugs (eg. 5 mg. enalapril tablets) for veterinary patients if a veterinary-labeled product exists (eg. 5 mg. Enacard® tablets).
 - a. True
 - b. **False**