VETERINARY PHARMACY: OPPORTUNITIES AND CAUTIONS

Benjamin Brainard VMD
University of Georgia
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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
- **Outside prescriptions**
  - Cost savings for client
  - Decrease need for on-hand stock at vet office
  - Wider selection
Compounded medications
- To suit smaller sizes (mg/kg dosing)
- Compounding pharmacies
- ‘Homemade’ by veterinarian
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
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
Comounding

- 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

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
  - Pleuronic 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

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
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

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?
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
Benjamin Brainard VMD, Dipl. ACVAA, ACVECC
College of Veterinary Medicine
University of Georgia 30602
706-202-5665
brainard@uga.edu


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