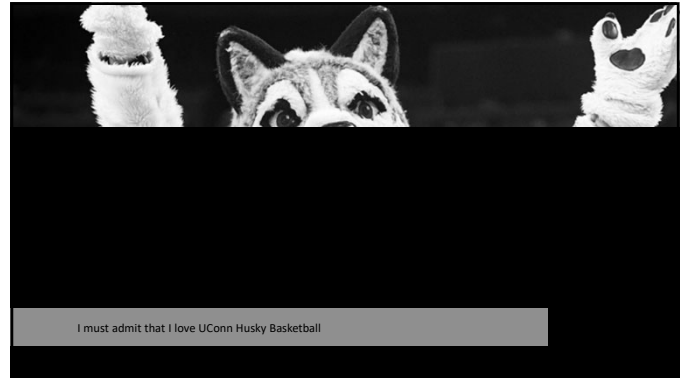


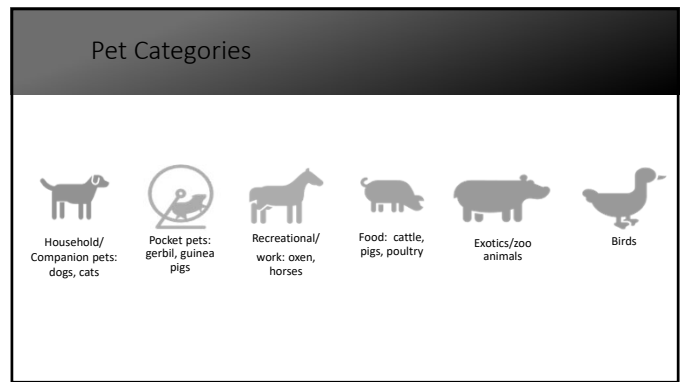
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5




6

### Average Cost of Owning a Pet

**Dog: \$1557.00/ year**  
 Veterinary costs: \$479.00  
 Pet insurance: \$550.00  
 Food: \$350.00  
 Grooming: \$99.00  
 Toys: \$79.00

**Cat: \$970.00/ year**  
 Veterinary costs: \$250.00  
 Food: \$310.00  
 Pet insurance: \$ 360.00  
 Toys: \$50.00  
 Dog walking, dog daycare

**ADDITIONAL COSTS**  
 Boarding 1 week: \$253.00  
 Birthday cakes, presents,  
 Clothing, costumes,  
 Behavioral training,



Forbes.com/advisor/pet-insurance/pet-ownership-statistics

7

### Multi Billion-dollar Industry (2022)

- \$136.8 billion spent on pets, up from \$123.6 billion in 2021
- \$31.5 billion spent on supplies, live animals, and over the counter medications
- Pet prescription medications: \$13.99 billion in 2022
- 42% of owners can't cover an unexpected veterinary bill of \$999 or less without going into debt

Forbes.com/advisor/pet-insurance/pet-ownership-statistics

8

1991 American Veterinary Medical Association (AVMA): "A veterinarian shall honor a clients request for a prescription or veterinary feed directive in lieu of dispensing"

It is unethical and unlawful for Veterinarians to write a prescription outside of the veterinary/client relationship



Use of prescription drugs in veterinary medicine | American Veterinary Medical Association (avma.org)


9

### 2251 Veterinary Pharmacies in the US

Veterinary Pharmacy PG1 Residencies:

- Purdue- 1 spot
- NC State- 2 spots
- Texas A&M – 1 spot
- University of Wisconsin- 1 spot
- University of Illinois- 1 spot
- UIC Chicago- 1 spot at UI

Post graduation opportunities: working at Veterinary teaching hospitals, in academia, in independent compounding centers and specialty clinics, USDA or the FDA



American College of Veterinary Pharmacists, https://vetmed.org

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### Challenges of Filling Prescriptions

- Veterinarians **DO NOT** have NPI numbers.
  - NPI numbers are for human healthcare providers, for billing Medicare/Medicaid
- **Not all** Veterinarians have a DEA number.
  - They cost money to obtain
- Veterinarians **DO** have a state license number
  - May create problems with retail computer systems since it is a different number of digits
- Most veterinarians **DO NOT** have access to electronic prescription technology.

https://www.drugtopics.com/view/veterinary-prescriptions-made-easy


11

### Pharmacists speak a different language

<b>Human Medicine</b> QD= Once daily QOD= every other day	<b>Veterinary Medicine</b> SID= Once daily EOD= every other day
---	---

SID often transcribed as BID or QID

TIW ( 3x /week) often transcribed as TID



https://www.fda.gov/animal-veterinary/resources-you/microgram-prevention-worth-milligram-cure-preventing-medication-errors-animals

12

Pharmacists may be unaware of areas where they are legally prohibited from engaging:

**Pharmacists**

- may have inadequate veterinary pharmacotherapy training
- cannot legally recommend OTC products for veterinary patients without a veterinarian's recommendation or prescription

**Pharmacists**

- are legally required to offer counseling before dispensing a new prescription
- know human medicine but may lack knowledge or lack the resources to find veterinary information


**May lead to inappropriate counseling**

<https://www.drugtopics.com/view/veterinary-prescriptions-made-easy>

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**Create a working relationship with your local veterinarian**

- To discuss appropriate treatment regimens for pet patients according to its species, age and size
- To choose the appropriate vehicle, dosage form, flavoring agents, and preservatives



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**Pet Medications to Know (for dogs and cats)**

**Antibiotics:** Doxycycline, trimethoprim-sulfa, amoxicillin-clavulanic acid, metronidazole, cephalixin, enrofloxacin, penicillin, clindamycin

**Non-steroidals/anti-Inflammatories:** Carprofen, meloxicam, firocoxib, robenacoxib

**Opioids/Pain:** Oxycodone, butorphanol, meperidine, fentanyl, gabapentin

**Steroids:** Prednisone, prednisolone, dexamethasone

**Behavior Modifiers:** Diazepam, fluoxetine, trazodone, alprazolam, clomipramine


**Others:** Insulin, levothyroxine, methimazole, atenolol, digoxin, sildenafil

pbahealth.com

16

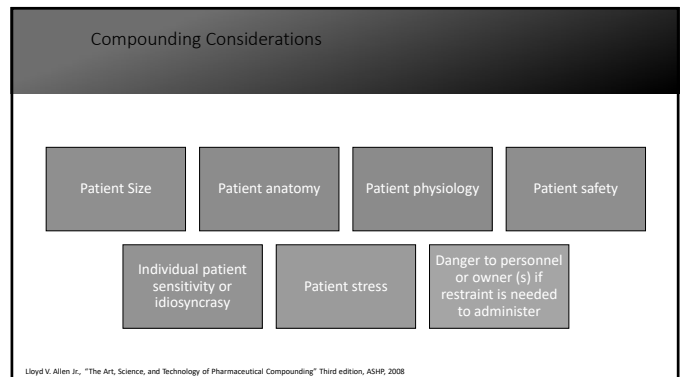
**Crossover Medications**

- This category of drugs serves both human and animal patients at different doses.
- Doxycycline
- Enalapril
- Fluoxetine
- Furosemide
- Gabapentin
- Omeprazole
- Ondansetron
- Phenobarbital
- Tramadol
- Zonisamide



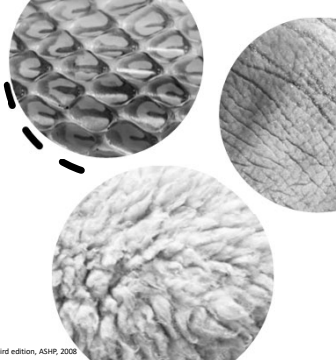
pbahealth.com

17



18

- Variations among animal species can cause differences in absorption
- Consider systemic drug availability and elimination rates




Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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### Active learning!

**Farmer Brown's large Maine Coon cat needs fluoxetine. Considering size, anatomy, and skin absorption, which animal would require a similar dose of fluoxetine transdermal gel?**

- A. A small terrier dog
- B. A medium sized Sphynx (hairless) cat
- C. A large barn owl



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**Mr. Whiskers is a domestic American cat. He weighs 6.3 pounds, although he needs to gain at least 3 pounds. He needs medication for his heart condition, and the veterinarian wants to prescribe lisinopril 0.25 mg/kg once daily. YIKES! You calculate that Mr. Whiskers weighs 2.9 kg and needs a dose of 0.725 mg of lisinopril. Can you compound this dose?**

- A. No, the veterinarian needs to find a different medication
- B. Yes, but it would be easier to give 1.5 mg every other day
- C. Yes, because a commercial product is unavailable in this strength

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### When to compound?

Overall treatment goals?	What is known about the physical and chemical compatibility of the drugs?	Stability of the drug or drugs?	Are similar products available on the market?
Regulatory concerns?	A pet or food animal?	Any humans handling hazards?	Can a device be utilized?

Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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### When to Compound?

- When a commercial product is unavailable
  - drug recalls, shortages, or yet to be developed
- When an approved drug needs to be modified
  - lack of appropriate size, formulation, or route
- When the likelihood of nonadherence is high
  - combining drugs, stronger dosage, or taste factor




Compounding: FAQs for veterinarians | American Veterinary Medical Association (avma.org)      Josh Jackson / The Tr

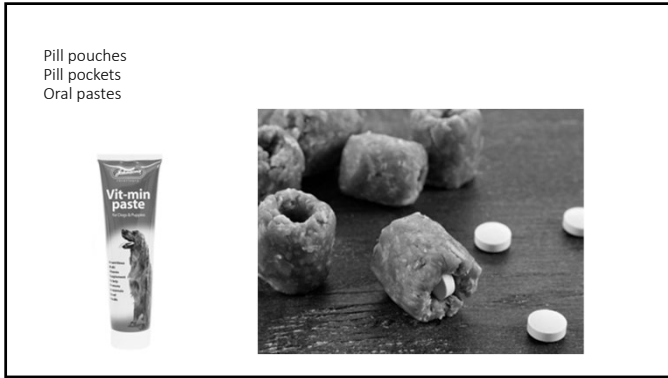
23

### Devices for administering medications

- Oral syringes
- Balling guns
- Droppers



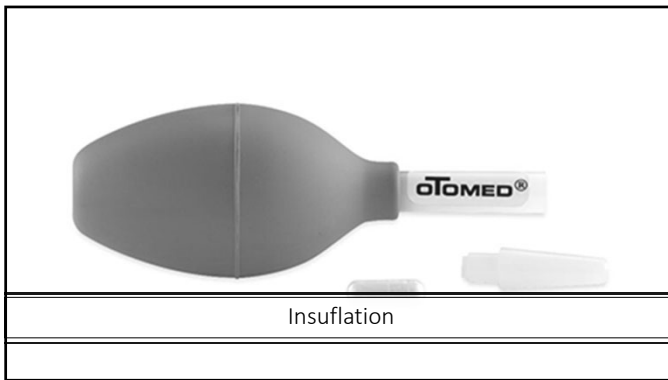
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**ACTIVE LEARNING!**

Your 30-pound hound, Bosco, is begging to eat the food you left on your plate after dinner. In keeping with your house rule never to feed the dog from the table, you take your plate to the sink and get Bosco's bowl. Which of the following things should you throw in the trash rather than feed to Bosco?

- The piece of grilled, boned ribeye steak
- The grapes and raisins on the salad
- The plain baked potato with yogurt

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Human foods that should not be given to pets

Food item	Type of pet	Toxicity/ reasoning
Avocado	Dogs, cats, chickens, horses, cows, pet birds	Persin-oil fungicide
Onions, chives, garlic (allium family)	Dogs, cats, chickens, rabbits	Sulfites. disulfides
Chocolate	Dogs, cats, horses, rabbits	Theobromine & caffeine
Citrus fruits	Cats, chickens	Citric acid, essential oils-irritate CNS, tremors/seizures
Cinnamon	Dogs, Cats	Throat irritant
Grapes, raisins	Dogs, cats, rabbits	Kidney failure
Macadamia nuts	Dogs, cats	Toxicity unknown

People Foods Pets Should Never Eat, ASPCA pro, <https://www.aspcapro.org/resource/people-foods-pets-should-never-eat>

30

### The Official Top 10 Pet Toxins of 2023 | ASPCA

**THE TOP 10 TOXINS OF 2023**

- 1 Over the Counter Medications
- 2 Human Food and Drinks
- 3 Human Prescription Medications
- 4 Chocolate
- 5 Veterinary Products
- 6 Plants and Fungi
- 7 Household Products
- 8 Rodenticides
- 9 Insecticides
- 10 Recreational Drugs

If you suspect your pet has ingested something toxic, please contact the ASPCA Animal Poison Control Center at (888) 426-4435 or your veterinarian.

ASPCA | (888) 426-4435  
Animal Poison Control Center

<https://www.aspcanet.org/news/official-top-10-pet-toxins-2023>

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### Factors that Influence Toxicity

- Absorption, metabolism, elimination
- Dose of toxin per body weight
- Animals age, size, nutritional status
- Stress level, overall health
- Young animals- not fully developed
- Evolution:
  - Dogs—Opportunistic gorgers
  - Cats – Picky eaters

The Official Top 10 Pet Toxins of 2023 | ASPCA

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### ACTIVE LEARNING!

Your client, Venice Marriot, needs to have a medication compounded for her teacup chihuahua Tokyo. Venice indicates that she and Tokyo prefer medications that are pink. After discussing the pros and cons of compounding with color, which food coloring should you use to make a pink oral solution?

- A. Natural beet extract
- B. FD&C Red No. 3
- C. Neither

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### Sweeteners

**Xylitol:** contains 2/3 calories of sucrose, mild increased saliva effect

**Extremely toxic to Dogs**

- Quickly released into blood stream
- Causes immediate & potent release of insulin
- Leads to severe hypoglycemia, liver failure, seizures, coma, death
- 1 piece of sugar free gum or 1 breath mint can be fatal to a 10 lb. dog

*Xylitol is in everything: BBQ sauce, candy, gum, jam, ketchup, peanut butter, cough syrup, deodorant, shampoo, laxatives, skin care products, toothpaste, ODT tablets, prescription medications, gabapentin oral solution*

What Artificial Sweeteners Are Bad for Dogs? Artificial Sweetener Safety (akc.org)

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### Sugar substitutes

- Aspartame (Equal) - blue packet
- Erythritol – non caloric
- Saccharin (Sweet & Low ) - pink packet
- Stevia (Truvia) -green packet
- Sucralose (Splenda) - yellow packet
- Monk fruit- newer, similar to stevia

What Artificial Sweeteners Are Bad for Dogs? Artificial Sweetener Safety (akc.org) https://www.akc.org/expertadvice/nutrition/artificial-sweetener-safety-for-dogs

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### Corn Syrup?

Cheap, humectant, sweetener and flavoring agent all in one found in many dog cookies , but...

- Can be addictive!
- Can increase blood sugar significantly
- Better: vegetable-based glycerin (e.g., coconut glycerin) or molasses, stevia, or honey

Zero Sugar for Dogs - Uses, Advantages, & Disadvantages - The Dogs Journal https://thedogsjournal.com

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**JYWO** Needs a reference

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### Food Dyes or Colorants?


Use sparingly!

Use natural products, when possible, for example beetroot powder

Blue dye #2, red #40, yellow #5 & 6 can cause hypersensitivity or allergic reactions in pets

Caramel color (4-ME) is under investigation by the FDA as a possible carcinogen in dogs and cats.

In most cases coloring is more important to the pet owner than to the pet!



Is Food Coloring Safe For Dogs? | Nature's Advantage | natureadv.com

37


### Preservatives and Additives

**AVOID:**

- Butylated hydroxy anisole (BHA) added to fats & oils, carcinogens
- Butylated hydroxytoluene (BHT) can cause liver/kidney damage
- Ethoxyquin, a preservative/hardening agent. Also used in pesticides & rubber. Illegal to use on humans
- Propylene glycol, a humectant. Extremely toxic to cats
- Polysorbate 80 (Tween 80), surfactant used in soaps or excipient to stabilize aqueous formulations.
  - \* Causes allergic reactions, tachycardia, can lead to anaphylactic reaction
- Essential Oils (tea tree oil, peppermint oil, eucalyptus) can be toxic, especially to cats (continual groomers) lethargy, depression, ataxia, tremors, seizures, or death

Stick to natural products:  
 Ascorbic acid  
 Citric acid  
 Lemon, Honey  
 Vitamin E

*Most fragrances are added to please the owner, not the pet*



https://www.dogfoodinsider.com/need-know-preservatives

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### Chewable Treat Base (100g)

<b>Powdered Animal Food</b>	<b>65 g</b>
<b>Gelatin base, melted</b>	<b>qs 100 g</b>
<b>Active Drug</b>	<b>qs</b>

Melt the gelatin base  
 Incorporate powdered food  
 Add active drug and mix well  
 Pour into molds and allow to set

Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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### Basic Oral Paste Formula ( 100 g)

	Formula 1	Formula 2	Formula 3
Polyethylene glycol 300	65 g	25 g	
Polyethylene glycol 3350 (powder)	35 g	25 g	25 g
Propylene glycol		50 g	25 g
Molasses (for horses)			50 g

Polyethylene glycol formulas are prepared by heating to a temperature of about 70 degrees C followed by cooling and stirring  
 Propylene glycol in formula 2 should be added while the preparation is hot  
 Add API when cooled


Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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### Active learning!

Which of these basic oral paste formulas would be best to use for Farmer Brown's cat?


- Formula 1
- Formula 2
- Formula 3



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### USP<795>

- In effect November 1, 2023
- Designated Person
- More Focus on cleanliness
- Manufacturing & compounding records
- Training



[795] Pharmaceutical compounding—nonsterile preparations USP General Chapter 795 | USP  
 https://www.usp.org/compounding/general-chapter-795

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## Slide 37

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**JYWO** Needs a reference

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## Slide 38

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## Slide 40

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**JYWO** Check format. You're better off to use an actual table for this slide

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**Flavoring**

**Cats:** not too sweet, but not bitter: fish, cod liver oil, tuna, sardines, salmon, beef, chicken, cheese, bacon, peanut butter, butterscotch

**Dogs:** Meats & sweets: bacon, beef, liver, chicken, turkey, cheese, peanut butter, molasses, caramel, anise, marshmallow, raspberry, strawberry, honey



Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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**Flavors**

**Birds:** Fruity Flavors: Banana, grape, orange, raspberry, tangerine, tutti-frutti, pina colada

**Gerbil:** Sweet and fruity. Banana cream, orange, peach, tangerine, tutti-frutti


**Goats:** Molasses, honey, apple, caramel, cherry

**Horses:** apple, apple/Caramel, cherry, butterscotch, molasses, maple, eggnog, honey, anise/licorice

**Iguana:** Must smell good. Poor sense of taste. Banana, cantaloupe, kiwi, orange, tangerine, watermelon, other melons

**Poultry:** Cantaloupe, corn, meal, milk, vanilla, butternut, watermelon

**Rabbits:** Find their favorite fruit or veggie and use it. Banana cream, carrot, celery, lettuce, parsley, pineapple, vanilla, butternut



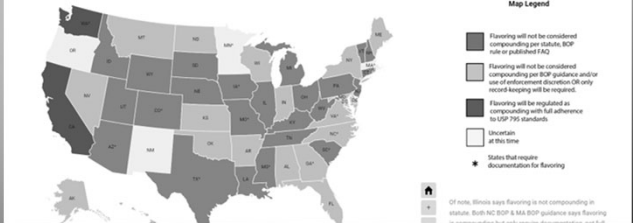
Lloyd V. Allen Jr., "The Art, Science, and Technology of Pharmaceutical Compounding" Third edition, ASHP, 2008

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**Board of Pharmacy Positions Towards Flavoring on November 1, 2023**

While USP has always provided guidance that they consider medicine flavoring to be a form of compounding, it is State Boards of Pharmacy that regulate and enforce nonsterile compounding standards. 49 of 52 Boards of Pharmacy have determined that USP 795 nonsterile compounding standards do not apply to the simple practice of medicine flavoring, with most Boards saying they do not consider flavoring to be compounding at all.


Click on a state to read its policy toward flavoring, or use the drop down below.



State Boards of Pharmacy Positions on Flavoring (flavorx.com)

45

**Active Learning!**




**Which flavoring would be best suited for a picky Emperor penguin at Mystic Aquarium?**

A. Orange or mango flavoring      B. Sardine or tuna flavors      C. Beef or liver flavoring

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**FDA (FD&C act)**

- Allows animal drug compounding when the source of active ingredient is a finished FDA approved drug and not a bulk drug substance (BDS)
- BDS: Used to make a drug that becomes an active ingredient in the drugs finished dosage form (aka API)
- FDA BDS list for use in veterinary products: effective April 2023 Separate lists for food producing animals, wild-life, and pets
- Exceptions: a BDS can be used when a commercial product is unavailable or is inappropriate for animal use.
  - An FDA approved drug may have excipients or preservatives which an animal cannot tolerate (Xylitol)
  - Dose may be too large or flavoring unacceptable



Animal Drug Compounding | FDA https://www.fda.gov/animal-veterinary/unapproved-animal-drugs/animal-drug-compounding

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**Guidance for Industry**

(GFI)#256 in effect as of 4/1/2023

- Compounding Animal Drugs from Bulk Drug Substances
- Allows pharmacies to purchase and use bulk drug substances from FDA registered suppliers if a certificate of analysis (COA) is included
- Requires compounders to report adverse effects to FDA within 15 days
- Veterinarians must provide patient specific detailed clinical information explaining why a pet cannot use an FDA approved manufactured product



Animal Drug Compounding | FDA https://www.fda.gov/animal-veterinary/unapproved-animal-drugs/animal-drug-compounding

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### Slide 43

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**JYWO** Needs a reference

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### Slide 44

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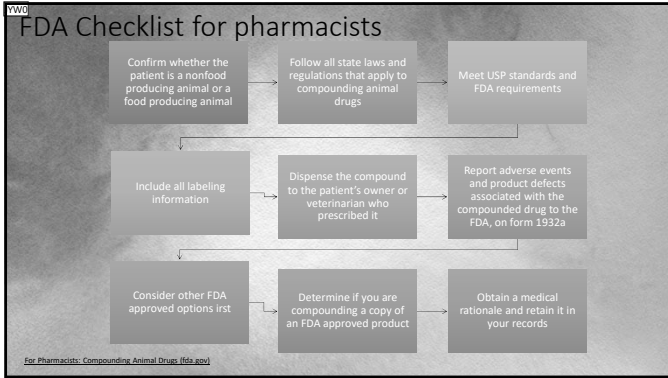
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### Slide 47

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**Labeling (extra label) must include:**

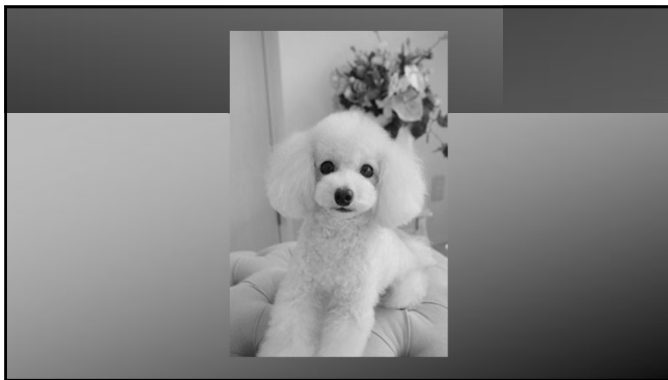
Report suspected adverse reactions to the pharmacist who compounded the drug and to FDA Using online Form FDA 1932a

This is a compounded drug, Not an FDA approved or indexed drug

Caution federal law restricts this drug to use by or on the order of a licensed veterinarian

For Pharmacists: Compounding Animal Drugs (fda.gov)

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**How could this happen?**

- The pharmacist did not know
  - the solution contained xylitol
  - xylitol was harmful to dogs
- The computer system had no drug utilization review process in place for veterinary drugs
- The pharmacy did not have a veterinary drug reference book or a veterinary formulary
- Most state boards of pharmacy do not require pharmacies to carry a veterinary drug reference book

52

**Active learning!**

**What can be done to improve pharmacy personnel's knowledge of veterinary medications?**

- Have a veterinary drug handbook in the pharmacy and make sure the computer system flags veterinary precautions
- Take a continuing education activity on veterinary pharmacy and require all other staff members to take it also
- Take out extra liability insurance and pray

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**Husky Paws for Alaskan Malamutes**

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## Slide 49

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**JYWO** Needs a reference

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## Slide 50

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