

Veterinary Medical Practices: Pharmacology - Student Notes

Directions:

Fill in the blanks.

Terms & Terminology Segment

1. Pharmacology

- Is the study of medicine which focuses on the uses, effects and modes of actions in _____
- Is divided into the study of pharmacokinetics and _____

2. Pharmacokinetics

- Is the study of drug absorption, _____, metabolism and excretion
- Affects the route of administration, dose, dose intervals and _____ of drugs

3. Pharmacodynamics

- Is the study of the _____ and physiological effects of drugs and their _____

4. Drug

- Is a substance used to treat, cure, prevent or diagnose a _____
- Classifications include:
 - diagnostic
 - _____
 - preventive

5. Diagnostic Drugs

- Are used as a part of a test in order to identify and label a _____
- Help veterinarians determine proper treatment
- Examples include:
 - iodine used to help detect health problems during _____
 - dexamethasone suppression test is used to assess the adrenal gland function by injecting the drug and measuring the response

6. Therapeutic Drugs

- Are used in the _____ of a condition
- Examples include:
 - antibiotics
 - aspirin
 - _____ (pain relief)

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7. Preventive Drugs

- Are used to _____ a condition
- Examples include:
 - _____ medicine
 - flea and tick treatments
 - vaccinations

8. Drug Sources

- Include:
 - plants
 - animals
 - _____
 - synthesized
 - biological

Clinic Corner: Plants are the oldest source of drugs.

9. Drug Names

- Include:
 - chemical
 - _____
 - brand name

10. Chemical Name

- Provides scientific and _____ information
- Describes the _____ structure of the drug

Clinic Corner: Chemical names are rarely used in clinical medicine because they are long and complex.

11. Generic Name

- Is the _____ identifying name of the drug
- Is sometimes referred to as the non-proprietary name
- Commonly describes the active _____

Clinic Corner: Generic names are always written using lower case letters and are the same in all countries.

12. Brand Name

- Is referred to as the _____ name
- Is the name owned by the drug _____
- Is registered with the U.S. patent office

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13. Drug Categories

- Include:
 - over-the-counter (_____)
 - prescription
 - _____ (VFD)
 - controlled substance

Clinic Corner: The FDA classifies OTC, prescription and VFD as marketing categories.

14. Over-the-Counter Drugs (OTC)

- Are available to _____ without a prescription
- Common examples include:
 - aspirin
 - Benadryl®
 - _____
 - hydrocortisone

15. Prescription Drugs

- Are regulated by the U.S. Food and Drug Administration (FDA)
- Are limited to use under the supervision of a _____ veterinarian
- Must be _____ with the following statement or legend:
 - “Caution: Federal law restricts the use of this drug to use by or on the order of a licensed veterinarian.”

Clinic Corner: Because the caution statement or legend is required, prescription drugs are sometimes referred to as legend drugs.

16. Veterinary Feed Directive (VFD) Drugs

- Is intended for use in animal _____
- Is permitted only under the supervision of a _____

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17. Controlled Substances

- Are drugs considered to be dangerous due to potential human _____ or misuse
- Are classified as “_____” by the FDA and enforced by the Drug Enforcement Agency (DEA)
- Common examples include:
 - oxycodone
 - morphine
 - hydrocodone
 - pentobarbital

18. Drug Compounding

- Is the preparation, mixing, assembling, packaging and/or labeling of a drug
- Is used to prepare a _____ drug product to fulfill an individual patient's need
- Examples include:
 - flavoring
 - dosing for weights
 - changing pills into _____

19. Withdrawal Period

- Reflects the amount of time necessary for an animal to _____ an administered drug and the amount of time needed for the _____ levels to decrease to a safe level
- Is printed on the product label or package insert

20. Extralabel Drug

- Also referred to as “off-label use”
- Is _____ as:
 - “Actual use or intended use of a drug in an animal in a manner which is NOT in _____ with the approved labeling.”

Clinic Corner: Veterinarians can use both approved animal and human drugs in an extralabel manner. When treating non-food animals a veterinary-client-patient relationship must exist.

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21. Extralabel Drug

- Examples include:
 - _____ (only approved for use in humans) to treat epilepsy in dogs
 - ivermectin (_____ only approved for cattle) in dogs and cats
 - enrofloxacin (baytril) solution as a topical ear medication (only approved as injectable)

Clinic Corner: Extralabel drugs are used when a drug is not used in a way which is outlined with the approved FDA label directions. For example: the dosage, interval, route or species may differ.

22. New Animal Drug (NAD)

- Is defined as:
 - “A drug intended for use in _____ which is not Generally Recognized As Safe and Effective (GRASE) by qualified experts for the uses listed on the label.”
- Applications are required by manufactures to obtain marketing and selling approval from the _____

Clinic Corner: The adjective “new” does not mean the drug just entered the market, but is a term outlined in the Federal Food Drug and Cosmetic Act.

23. Veterinary/Client/Patient Relationship (VCPR)

- Requires the veterinarian to:
 - take responsibility for the health of the patient
 - make a _____ and then keep up with the care of the patient with timely visits
 - be available for follow-up evaluation or has arranged care and treatment
 - provide oversight of treatment, _____ and outcome
 - maintains patient records

Clinic Corner: The client’s, or owner’s, responsibility is to properly follow the veterinarian’s advice and instruction.

Governing Bodies & Regulations Segment

1. Regulatory Agencies

- _____ how drugs are used in veterinary medicine
- Include both state and federal _____

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2. Federal Agencies

- Include:
 - U.S. _____ and Drug Administration (FDA)
 - Center for Veterinary Medicine (CVM)
 - Drug Enforcement _____ (DEA)

3. U.S. Food & Drug Administration (FDA)

- Is a scientific, regulatory and public health agency with _____ encompassing the following:
 - food products (other than meat and poultry)
 - human and animal drugs
 - therapeutic agents of biological origin
 - medical devices
 - _____ products
 - cosmetics
 - animal feed

4. U.S. Food & Drug Administration (FDA)

- Enforces key legislative acts, such as:
 - _____
 - Federal Food, Drug and Cosmetic Act, 1938
 - Amendment to the Federal Food, Drug and Cosmetic Act, 1968
 - Animal Medicinal Drug Use Clarification Act, 1994
 - Animal Drug Availability Act, _____

5. Pure Food & Drugs Act, 1906

- Prevents the manufacture, sale or transportation of _____ or harmful foods, drugs or medicines
- Purpose was to protect the public against _____ of food and drug products

6. Federal Food, Drug & Cosmetic Act, 1938

- Required manufacturers to provide evidence of drug _____ before distribution
 - when properly following _____ instructions

Clinic Corner: Animal drugs were regulated in three sections: new drugs, antibiotics and food additives if used on food-producing animals.

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7. Amendment to the Federal Food, Drug, & Cosmetic Act, 1968

- Required manufactures of animal drugs to prove drug safety and _____ for intended use by:
 - detecting unsafe drug residues in food
 - providing acceptable drug _____ periods

8. Animal Medicinal Drug Use Clarification Act, 1994

- Allowed veterinarians to prescribe _____ drugs for animals under certain _____
 - approved new animal drugs
 - approved human drugs

9. Animal Drug Availability Act, 1996

- Amended the Federal Food, Drug and Cosmetic Act to provide new _____ to the way _____ regulates new animal drugs and medicated feeds
 - increased the number of approved new animal drugs on the market

10. The Center for Veterinary Medicine (CVM)

- Is a _____ of the U.S. Food and Drug Administration (FDA)
- Regulates the following:
 - _____
 - animal feed
 - veterinary devices

Clinic Corner: The CVM does not regulate the practice of veterinary medicine, vaccines for animals (USDA) and some flea and tick products (EPA).

11. Drug Enforcement Administration (DEA)

- Is a division of the U.S. _____
- Enforces the controlled _____ Act of 1970

12. Controlled Substances Act, 1970

- Is a federal drug policy which regulates the manufacture and _____ of controlled substances
- Categorizes drugs into five “schedules” or classifications based on their _____ for abuse, status in international treaties and medical benefits

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13. Records of Controlled Drugs

- Must include:
 - orders
 - receipts
 - uses
 - _____
 - thefts
- Must be kept for two _____

14. State Agencies

- Include:
 - Board of Veterinary _____ (BVM)
 - Board of _____ (BOP)

15. Board of Veterinary Medicine (BVM)

- Protects the health and safety of the public and animals through the regulation of the practice of veterinary _____
- Regulates in accordance with the _____ veterinary practice act

16. Board of Pharmacy

- Regulates wholesale and pharmacy _____ of veterinary drugs
- Regulates veterinarians which prescribe and distribute controlled _____

17. Veterinary Prescription Drugs

- Are to be used or _____ only within the context of a veterinarian-client-patient relationship
 - must be properly labeled before dispensing
 - dispensing and treatment records must be filed
 - should be dispensed in quantities required for the treatment, avoiding _____ refills

18. Veterinary Prescription Orders

- Are issued by licensed veterinarians to authorized drug distributors for delivery of _____ drugs to:
 - a client directly
 - a _____ to dispense to a client

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19. Drug Labels

- Must include:
 - name, address and telephone number of veterinarian
 - name, address and telephone number of client
 - _____
 - date of treatment, prescribing or dispensing of drug
 - name, active ingredient, quantity of the drug dosage and _____

20. Drug Labels

- Must include:
 - route of _____
 - number of refills
 - cautionary statements
 - expiration date
 - slaughter withdrawal, or milk _____ times
 - signature

Common Veterinary Drugs Segment

1. Common Veterinary Drugs

- Include:
 - behavior modifying drugs
 - non-steroidal anti-inflammatory drugs
 - _____
 - anti-parasitic drugs
 - _____ and sedatives
 - corticosteroids
 - anabolic steroids
 - chemotherapeutics

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2. Behavior Modifying Drugs

- Are used to treat _____ problems, such as:
 - fear
 - anxiety
 - _____
 - compulsive disorder
- Include:
 - antidepressants
 - anxiolytic drugs (i.e., anti-anxiety)

Clinic Corner: Hormones, such as synthetic progestin, have been used to aid in behavioral problems.

3. Non-steroidal Anti-inflammatory Drugs

- Are also known as _____
- Common uses include:
 - pain relief
 - _____ treatment in dogs
 - pain management after surgery

Clinic Corner: Osteoarthritis is the permanent deterioration of the cartilage which surrounds the joints.

4. Antibiotics

- Are drugs used to treat _____ and to kill or stop the growth of _____
- Examples include:
 - clavamox
 - baytril

5. Anti-parasitic Drugs

- Are used to prevent or kill internal and external _____
- Examples include:
 - ivermectin
 - pyrantel
 - _____

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6. Common Parasites

- Include:

Common Internal Parasites	Common External Parasites
<ul style="list-style-type: none"> - heartworms - tapeworms - whipworms - roundworms - coccidia - <input type="text"/> 	<ul style="list-style-type: none"> - fleas - ticks - mites - <input type="text"/>

7. Anesthetics & Sedatives

- Are used for restraint, minor procedures and general _____
- Allow the patient to be unaware and not feel pain during surgery or other procedures or relax _____ throughout the body

8. Anesthetics & Sedatives

- Include:

Type	Use
Local anesthetics	<input type="text"/>
Sedatives and tranquilizers	relax an animal during procedures
Sedative - analgesics	are used for short procedures to relax the animal and relieve pain
General anesthetics	<input type="text"/>

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9. Corticosteroids

- Are used in pets to treat inflammation, allergies, itching, pain, trauma and skin, ear or _____
- Include:
 - prednisone
 - dexamethasone
 - _____
 - methylprednisolone
 - prednisolone

10. Anabolic Steroids

- Are used to strengthen muscles and support growth, recover an animal's appetite or treat certain types of anemia
- Examples include:
 - winstrol v
 - used to help _____ dogs
 - equipoise
 - used for race horses to increase red _____ production
 - finaplix
 - pellets are used in cattle for increased meat production

11. Chemotherapeutics

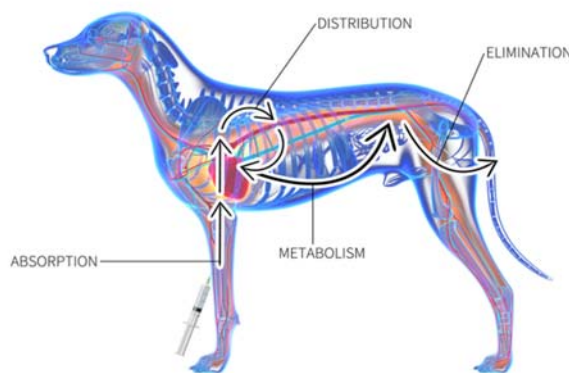
- Are used to treat animals with cancer which has already _____ to other areas of the body
- Attack cells in the process of growth and division, by:
 - shrinking a large tumor
 - killing _____ cancer cells
 - slowing the growth of cancer cells after surgery

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Pharmacokinetics Segment

1. Pharmacokinetics

- Is the physiological movement of drugs _____ the body and how drugs move into, through and out of the body
- Includes four steps, ADME:
 - absorption
 - distribution
 - _____
 - excretion



2. Drug Absorption

- Is the first step in the passage of a _____ through the body
- Is the movement of a drug from the site of _____ into the fluids of the body, which will then move to the site of action

Clinic Corner: Unless administered by an IV, a drug will have to cross several cell membranes before reaching circulation.

3. Bioavailability

- Is a subcategory of absorption
- Is the percentage of drug administered which actually enters _____
- IV and _____ drugs immediately enter the blood and are 100 percent available

Clinic Corner: Orally administered drugs commonly have low bioavailability because they first have to be dissolved in gastric or intestinal fluids.

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4. Drug Absorption Processes

- Which allow drugs to move across cell _____ include:
 - passive diffusion
 - facilitated diffusion
 - active transport
 - pinocytosis/ _____

5. Passive Diffusion

- Is the movement of drug molecules from an area of high concentration to an area of low concentration until _____ is reached
 - does _____ require energy or use of energy

6. Facilitated Diffusion

- Is a process by which molecules are transported across the _____ membrane by using a special carrier _____
- Helps drugs move across the cell membrane

Clinic Corner: Carrier molecules are transport proteins. Transport proteins bind to the substance and alter its shape in order to bring the substance into or out of the cell.

7. Active Transport

- Uses both a carrier molecule and energy
 - energy is needed because the drug molecules move against the concentration _____
- Allows drugs to gather in high _____ in a cell or body compartment

8. Factors Affecting Drug Absorption

- Include:
 - lipid _____
 - drug pH
 - _____
 - patient factors (e.g., health, age, etc.)

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9. Pinocytosis/Phagocytosis

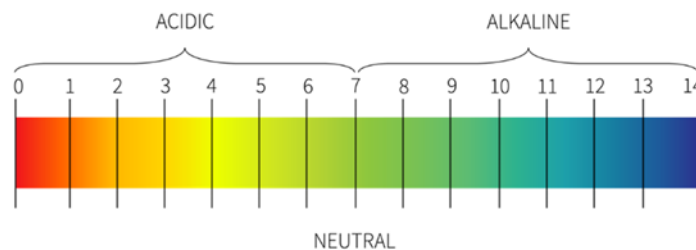
- Is when a molecule is _____ taken in or engulfed by a cell
 - requires energy
 - is important for the movement of larger molecules
- Pinocytosis
 - cell membrane surrounds and engulfs liquid _____; also known as “cell drinking”
- Phagocytosis
 - occurs when the cell membrane surrounds and engulfs solid particles; also known as “cell eating”

10. Lipid Solubility

- Is one of the most important determinants of drug _____
 - as a general rule, drugs which are highly lipid soluble are absorbed and distributed more _____

11. Drug pH

- Is the measurement of acidity or _____ of a substance
- Is based on a scale of 14, lower numbers are acid, higher are alkaline, 7 is _____



12. Molecular Size

- Determines how rapid the _____ of the drug will be
 - the smaller the _____ size of the drug, the faster it will absorb

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13. Patient Factors for ADME

- Include:
 - blood flow
 - pain
 - stress
 - hunger
 - _____
 - food _____
 - health
 - age
 - pH

14. Drug Distribution

- Is the movement of drugs from systemic _____ to the tissues and ends with the drug reaching the target tissue or site of action
- Factors include:
 - volume of distribution
 - _____
 - tissue perfusion
 - membrane permeability

15. Metabolism

- Is also known as _____
- Is the chemical _____ of drug molecules into metabolites by body cells
 - makes drugs more water soluble so they can be excreted from the body
- Sites include:
 - liver (primary site)
 - kidneys, small intestine, brain, lungs and skin

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16. Metabolism Drug Interactions

- Include:
 - inactivation
 - active drug turns into an inactive metabolite
 - activation
 - inactive drug turns into an active _____
 - modification
 - activity after the conversion of an active drug to metabolite
 - intoxication
 - drug is moved into a normal cells metabolic pathway and then fails to react, resulting in cell _____

17. Elimination

- Is the _____ of a drug from the body
- Routes include:
 - kidney
 - liver
 - intestine
 - lungs
 - milk
 - sweat
 - _____

Drug Administration Segment

1. Medical Treatment Steps

- Are assessed once a _____ has been made
- Include:
 - diagnosis
 - _____
 - dosing regimen

2. The Six “Rights” of Proper Drug Administration

- Include:
 - the right _____
 - the right dose
 - the right time
 - the right route and _____
 - the right patient
 - the right documentation

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3. The Right Drug

- Ensures the patient receives the drug which was _____
- Includes:
 - reading the label three times
 - never giving medication from a container that is _____

4. The Right Dose

- Is the correct amount of drug _____ at one time to achieve the desired effect
- Includes:
 - loading dose
 - maintenance dose
 - _____

5. Loading Dose

- Is the initial dose given to establish a _____ range
- Is often larger than _____ doses

6. Therapeutic Range

- Is the drug concentration within the body to produce the desired effect in the animal with no signs of toxicity
- Factors include:
 - properties of the drug
 - _____ of the animal
 - absorption of the drug
 - distribution of the drug
 - _____ of the drug
 - excretion of the drug

7. Maintenance Dose

- Is a dose which maintains or keeps the drug in the therapeutic range
- Is the amount of drug required to keep a desired _____ in the animal's _____

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8. Total Daily Dose

- Is the total _____ of the drug given within _____
 - for example:
 - 30 mg of a medication given four times a day = 120 mg total for the day

9. Dosage Regimen

- Represents the dosage interval, dosage, administration route and _____ of treatment as a whole
 - for example:
 - 30 mg/kg three times daily (TID) orally (po) for 10 days
- Come from studies in normal _____ but often require changes due to:
 - disease
 - age
 - weight
 - pregnancy

10. Dosage Interval

- Is how _____ the dose was given
 - for example:
 - once daily or twice daily

11. Tolerance

- Is a _____ response to a drug because the drug has been used repeatedly
 - animal may require a _____ dose

12. Effective Dose

- Is the amount of drug or dose which produces a _____ effect
- Is determined by a positive result from at least _____ of the animals given the test dosage

13. Lethal Dose

- Is the quantity of a drug which will or may be sufficient to cause _____ in an animal
- Is determined by a giving a dose of a _____ drug which kills 50 percent of animals receiving it

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14. The Right Time

- Is extremely important when correctly administering _____
- Includes:
 - administering medication at _____ times of the day
 - for example:
 - some medications must be given before or after meals

15. The Right Route & Technique

- Is how and where the medication goes into the body
- Must be followed by the _____ label on the medication and should be checked at least _____ times before administering the medication to the animal

16. Routes of Administration

- Include:
 - _____
 - oral
 - local
 - inhalation
 - topical

17. Parenteral Administration

- Is given by route other than the GI tract and is _____
- Is administered by _____ or syringe

18. Common Injectable Routes

- Include:
 - intramuscular (IM)
 - _____ (IV)
 - subcutaneous (SQ or SC)

19. Intramuscular Injection

- Is injected directly into the muscle
- Is much _____ to inject compared to intravenous or subcutaneous injections
- Is used for medication which are administered in small _____

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20. Intravenous Injection

- Is injected within the _____
- Can be administered in the following ways:
 - bolus administration
 - intermittent therapy
 - continuous _____ of fluid

21. Bolus Administration

- Is when a drug is _____ into a large volume of fluid with a syringe or needle
- Is most commonly used to rapidly increase or magnify a response, especially during _____ procedures

22. Intermittent Therapy

- Involves _____ a drug in a small amount of fluid and giving it to the animal during a _____ of 30 to 60 minutes

23. Continuous Infusion of Fluid

- Involves giving large volumes of fluid over long _____ of time
- Is a dosing regimen used to deliver a constant amount of drug per unit time
- Is commonly used when _____ drugs are need for long periods of time

24. Subcutaneous Injection

- Is given _____ the skin
- Is used when the drug is injected into the _____ layer between the skin and the muscle
- Absorbs more slowly than if it were injected into a vein

25. Other Injectable Routes

- Include:
 - Intraperitoneal- into the lining of the _____
 - Intradermal- into the skin
 - Intra-arterial- into the artery
 - Intra-cardiac- into the heart
 - Intra-articular- into the joint
 - Intraosseous- into the bone
 - _____ - into the mammary gland

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26. Inhalation Administration

- Is when the animal breathes the drug into the _____ tract
 - gas particles then enter the _____ of the lung and diffuse across the membrane
 - drug molecules then enter the blood

27. Topical Application

- Is applied on the surface of the skin or _____ membrane
- Can be an ointment, gel, cream, liniment, paste, lotion, powder, aerosol, etc.
 - must first dissolve and then penetrate the skin
 - absorbs much _____ than any other route

28. Oral Route

- Sends the medicine directly to the _____ and is more convenient to give
- Process includes:
 - releasing from the tablet or liquid
 - transport to the GI tract
 - passage through the _____

29. Factors Influencing Administration

- Include:
 - some drugs have different effects depending on the route of _____
 - some can be given IM and not IV
 - some may be destroyed by _____

30. The Right Patient

- Protocol includes:
 - always prepare _____ for one patient at a time
 - give the medication as soon as it is prepared
 - do not talk to others while administering medication
 - do not stop to do something else while in the middle of giving medication
 - pay close _____ at all times

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31. The Right Documentation

- Protocol includes:
 - each time a medication is administered, it must be _____
 - documentation must be done at the time the medication is given
 - always double check paperwork after administering _____ and again at the end of the day

Dose Calculations Segment

1. Calculating Doses

- Factors include:
 - _____
 - strength
 - volume
 - _____ of the animal

2. Concentration

- Is important for dosing in liquid drugs (oral and injectable)
- Refers to the amount of _____ drug (strength) in a given volume
- Concentration = Strength ÷ Volume

3. Strength

- Measures the amount of _____ of a drug per _____ unit
- In medications is available in different dosages
 - for example:
 - 10 mg per tablet or 50 mg per tablet

4. Volume

- Refers to the amount of liquid within a _____
 - for example:
 - A bottle of medication holds 50 mL or an animal receives 10 mL of a medication

5. Weight of the Animal

- Is an _____ factor when calculating doses
 - a prescription will be written as giving the _____ amount of cc's, number of pills, etc., per pound (lb.) or kilogram (kg)

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6. Common Conversions

- Include:
 - 1 liter = 1,000 mL
 - _____
 - 1 gram = 1,000 mg
 - 1 kg = 2.2 lbs.

7. Recommended Dose Formula

- _____ of animal x prescribed dose = _____
 - for example:
 - a veterinarian prescribes a dose of medication which is 1 mL for every 10 lbs., this means a 10 lb. animal will receive 1 mL
 - What if the animal weighs 45 lbs.?

$$45 \text{ lbs.} \times \frac{1 \text{ mL}}{10 \text{ lbs.}} = \frac{45 \text{ lbs.} \text{ mL}}{10 \text{ lbs.}} = 4.5 \text{ mL}$$

The animal will receive 4.5 mL

8. Convert to Kilograms

- Weight in kg = _____
2.2

$$20.45 \text{ kg} = \frac{45 \text{ lbs.}}{2.2} \qquad 4.54 = \frac{10 \text{ lbs.}}{2.2}$$

- Weight of animal x prescribed dose = _____

$$20.45 \text{ kg} = \frac{1 \text{ mL}}{4.54 \text{ kg}} = \frac{20.45 \text{ kg mL}}{4.54 \text{ kg}} = 4.5 \text{ mL}$$

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9. Concentration Dose Formula

- What if your veterinarian knows the weight of the animal and you are told to give 150 mg of a medication; the _____ on the bottle is 250 mg for every 5 mL?
- Use the following equation:
_____ x volume = amount to give strength

$$\frac{150 \text{ mg}}{250 \text{ mg}} \times 5 \text{ mL} = \frac{750 \text{ mg mL}}{250 \text{ mg}} = 3 \text{ mL}$$

The animal will receive 3 mL