

Veterinary dosage forms

Introduction

- ❖ Animal health issues and products are of interest to the pharmacist from stand point of sales, research(i.e., new products or new dosage forms of existing products) and zoonosis (disease of animals that may secondarily be transferred to humans).
- ❖ Drugs are given to animals such as
 - Companion animals (cats, dogs, birds, horses,...)
 - Food producing/economical animals (cattle, hogs, poultry, sheep...) for the following reasons.

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1. To treat disease (therapeutics)

- To sick animals to restore good health and alleviate symptoms of diseases.
- Include drugs prescribed by veterinarians to control disease. Example antibiotics and antiparasitic agents, and drugs intended to improve welfare, e.g. Analgesics and anti-inflammatory agents.

2. To prevent disease (prophylactic)

- To healthy animals with the intention of preventing disease
- To include vaccines, and immunological preparations
- Also include antibiotics and anti-parasitic drugs administered to populations of healthy animals to protect them from bacteria and parasites they are likely to encounter in the environment in which they are reared.

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3. To increase productivity (productivity promotants)

- To normally "healthy" animals to manipulate reproduction, increase milk yield, alter body composition or improve food conversion efficiency during growth.
- Include hormones like
 - Prostaglandins: to synchronize mating
 - Bovine somatotrophin (BST): To increase milk yield
 - Anabolic hormones: to increase lean tissue growth rate and improve food conversion efficiency.

Routes of administration

- Mostly products utilized in veterinary practices are administered orally. Because it is most economical, most convenient and easiest method to administered substances to large number of animals.
- Other routes have been utilized and varieties of dosage forms used.

Potential routes of administration and typical dosage forms

Oral – premixes, solutions, suspensions, emulsions, emulsions, pastes, tablets, capsules, boluses.

Parenteral: intra-venous, intra-arterial, intra-peritoneal, intra-muscular, intra-spinal, intra-cardiac, intra-dermal.

Topical and transdermal: methods of applications include:-spot-on, pour-on, dips, ear tags, collars, dust bags, ointments, powders, liniments, creams.

Others: sublingual (tablets, depots), rectal, and vaginal (suppositories), nasal (gas, aerosols), intramammary (solutions, suspension), ophthalmic (solutions, suspensions, inserts, ointments), inhalations (gas, aerosols).

Selection of route of administration and dosage forms

- ❖ Often the route and dosage form for a particular drug are chosen on bases of customary means of administering the medication to animals.
- ❖ Questions that should be answered in decision process for determining the best route of administration for a veterinary dosage forms:
 - Concentration of drug used?
 - Where in the body is the action needed?
 - How fast is the action needed?
 - For how long is the action needed?
 - Any problem with this route?
 - Safety of the treatment?
 - Cost of the treatment?

Dosage forms

1. capsules, tablets, and boluses

- Capsules and tablets are most widely administered to humans. This is primarily because of convenience and accuracy.
- These are less popular for animals for the reasons
 - administration is time consuming and uncertain. Uncertain because animals may spit out or drop from their mouth after the administrator has left or moved on to another animal.
 - In addition, amount of drug given to large animals (cow, horse) can be considered.

For example, dose of sulfonamides will be 15g per 150-lb (68kg) body weight. So for animal (cow, horse) having body weight of 750-lb (340kg) cow or horse would receive 75 g of the drug.

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- ❖ a special type of tablet called " Bolus" is commonly used.
 - ❖ Boluse:-
 - bolus is nothing more than a very large tablet ranging in size from 3g-16g or more.
 - Commonly called "horse pills" but not used exclusively with horses.
 - Capsule or cylindrical shaped for ease of swallowing.
 - Administered by an apparatus known as **balling gun**.
 - ❖ Balling gun consist of a barrel with a plunger that can hold one or more boluses.
 - ❖ The tube is inserted into the animal's mouth over the base of the tongue and plunger is depressed to push the bolus into the gullet.
- Formulation : typically used excipients include: fillers, binders (wet and dry), disintegrants, lubricants, glidants, antiadherants, wetting agents, antioxidants, preservatives, colorants.

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2. Feed additives premixes

- ❖ Animal dosage form that the pharmacist would least familiar with. ⇨ since there is no analogy in human drug dosage forms.
- ❖ Feed additive premixes are formulated to contain bulk drugs with excipients, in a form that is readily combined with the animal feed.
- ❖ Used mainly for prophylactic treatment against diseases of parasites, or for growth promotion.
- ❖ Feed additives may be given from day of age (hatching-in poultry rations) to market.
- ❖ Majority of of drugs are withdrawn from feed several days to a month before the animal is sent to market for consumption.
- ❖ Formulation consist of drug with carrier, diluent, or absorbant.

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Carriers

- Functions by absorbing small fine particles of drug on to its surface or onto the pores of the carrier particles.
- Commonly used premixes employ grain carriers such as rice hulls, corn germ meal, corn gluten meal, and wheat middlings.
- The carrier will usually be 2-3 or more of the formulation.
- Oil may be added to bind drug to carrier. Example, hydrocarbon oil such as mineral oil or vegetable oil such as soybean oil.
- To improve flow and to prevent caking, anti-caking agents like silicon dioxide, or magnesium aluminium trisilicate are incorporated.

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Diluents

- Used in feed-additive premixes to dilute or standardize activity.

Example: ground limestone, sodium sulphate, kaolin, corn-cob flour, ground-rice, sized corn germ meal, corn gluten meal.

Absorbents

- ✓ Used in feed-additives when the drug substance is liquid.
- ✓ The liquid is sprayed onto absorbent in a mixer as the mixer is running. Example, vermiculite, filler's earth, corncob fractions, and clay.

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3. Drinking water medication

- A common form of medicating animals for herb or flock health.
- The medications are formulated as:
 - A. Dry powders for reconstitution into liquid concentrates to be added to the drinking water, or to be added directly to drinking water, or
 - B. Concentrated solutions that are dispensed into drinking water
- Advantages (vs. feed-additive premixes)-sick animals continue to drink water, whereas they may not eat.

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4. Oral pastes and gels

- ❖ Convenient form of administering antidiarrheal agents, anthelmintics, and others to small and newborn animals (orally).

Examples: dogs, cats, piglets, etc.

Advantages

- ❖ Cannot be expelled from animal's mouth readily (tablet or liquid).
- ❖ Paste of proper consistency adheres to tongue or buccal cavity and not readily dislodged.
 - ☞ animals eventually will end up with swallowing.
- ❖ Administered with syringe or other specialized device volumetrically.
- ❖ Pastes are also used to mass medicate horses and cattle using multiple-dose syringe or paste dispenser.
- ❖ For horses or cattle, the syringe or dispenser is equipped with a long tip to deposit paste on the tongue at the rear of the mouth.

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Vehicles

- three types of vehicles used in formulating paste or gel
 - Oily or oleaginous bases
 - Aqueous bases
 - Organic solvents

Oleaginous bases

- ✓ Consists of vegetable or mineral oils thickened with xanthan gum, HPC, aluminium monostearate, colloidal silica, or other suitable agents.
- ✓ Lubricant properties of oil make the formulations less adhesive.

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Aqueous bases

- Least expensive and pose no toxicity problems.
- Aqueous solutions or suspension of drug is thickened to form paste or gel.
- Variety of thickening agents are used:
 - Natural: accacia, alginic acid, bentonite, tragacanth
 - Synthetic/ semisynthetic: xanthan gum, carbomer, HPMC, NaCMC

Major prblems: syneresis (separation of liquids)

↳ to avoid this, absorbing materials such as MCC, Kaolin, colloidal silicon dioxide, and starch are used.

Organic solvents

- Glycerin, propylene glycol, and polyethylene glycol thickened with carboxyvinyl polymer to provide bases.
- Consistencies ranging from soft jelly to peanut butter are achieved.

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5. Drenches and tubing products

- ❑ medications are administered to horses by running a lubricated tube up through their nostrils and down into the stomach. This is known as **tubing**.
- ❑ A funnel is attached to the tube and held above the horse's head and the liquid medication is poured down the tube.
- ❑ Thickening agents are counter indicated, as the formulations will thicken and resist flow.
- ❑ Wetting agents are used to increase flow rate.
- ❑ The administration of drugs to animals by pouring a liquid medication down the animal's throat is called **Drenching**.
- ❑ Drenches are administered by syringes or drenching guns.

Topical dosage forms

- Several unique topical dosage forms for animals. This includes:
 - 1) Pour-on and spot-on applications
 - 2) Dust bags
 - 3) Dips
 - 4) Ear tags
 - 5) Flea and tick collars
- used to treat and prevention of internal and external parasites.

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1. pour-on and spot-on applications:
 - ❖ Liquid products that exert systemic activity after being poured onto an animal's back line (pour-on) or applied as a one-spot concentrated on animal's back or rump (spot-on)
 - ❖ Contains insecticides or antihelmentics dissolved in organic solvents, such as dimethyl sulfoxide and others.
 - ❖ Mainly used for control of cattle grubs and lice.
 - ❖ There is one spot-on, pour-on product containing levamisole, a broad-spectrum anthelmentic agent.

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Advantages:

- Risk of trauma and inhalation pneumonia associated with drenching or damage at injection site (for parenterals) are eliminated.
- No special skin is required for application, since they are administered by using sprays or spotter bottle (bottles with squeez-on applicator).
- Sterile precautions aren't necessary.
- Troublesome animals are dosed easily with safety to the person performing the application.
- Speed of treatment is quick.

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2. Dust bags

- Cattle are treated with insecticide powders through the use of a device called dust bag (for flies and lice).
- Accomplished by animals brushing against the dust bag as they walk beside it or under it.
- Dust bags have inner pours storage bag containing insecticide dust formulation with lower or side parts for discharging powder.
- Cattle can have free choice application, or are forced to use them, depending on where they are hung.
- Forced use bags are hung in doorways, lanes, and such.
- Free choice applications can be achieved by suspending dust bags from over head structures, such as trees or poles

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3. Dips

- One of the oldest methods of treating animals (especially sheep and cattle), for parasites on surface of skin.
- The dip formulation containing the drug is diluted in a large dipping bath through which the animals are driven.
 - Animals totally immerse in the bath
 - Insecticides cover all areas of the skin
- The bath must be long, wide, and deep enough to cause immersion of animals.
- The formulation must be non toxic to animals, but toxic to ectoparasites.

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4. Ear tags

- flexible plastic ear tags have been used to identify individual animals.
- Pierced with a pliers-like tagger and the tag is kept in place by fitted button or self-locking design.
- The natural grooming habit of animals spreads insecticide incorporated into the plastic of the tag around the areas of the body afflicted with ectoparasites and flies.

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5. Fleas and Tick collars

- ❖ Commonly used for companion animals (dogs and cat).
- ❖ Also known as slow-release pesticide generator.
- ❖ Two types
 - Vaporous collars
 - Powder producing collars

NB: both contain insecticide and plasticized solid thermoplastic resin.

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i. Vaporous collar

- Contains relatively high vapor pressure liquid pesticide mixed throughout the collar.
- Pesticide is slowly released and fills the atmosphere around/adjacent to the animal's surface with a vapor of pesticide.
- Kills the pest, but is innocuous to animals.

ii. Powder producing collars:

- Contains a solid dispersion of drug in the resin.
- Shortly after the collar is processed, particles or molecules of pesticide migrate from within the resin and form a coating of particles, known as 'bloom' resembling dust or powder on collar surface.
- Ticks and fleas tend to concentrate in or migrate through neck area of the animal.
- They contact pesticide on or release by collar and killed.

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Advantage: (vapour Vs powder)

- ❑ By movement of the dog, cat, powder crystals (blossoms) are rubbed or wiped onto the fur, which expands contact area for the pesticide to continue to control ticks and fleas.

vaccines

History of vaccine

- The word "vaccine" comes from the latin word vaccinus, which means "pertaining to cows." what do cows have to do with vaccines? The first vaccine was based on the relatively mild cowpox virus, which infected cows as well as people. This vaccine protected people against the related, but much more dangerous, smallpox.

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- Dr. Edward Jenner had discovered one of the fundamental principles of immunization. He had used a relatively harmless foreign substance to evoke an immune response that protected someone from an infectious disease. His discovery would ease the suffering of people around the world and eventually lead to the elimination of smallpox, a disease that killed a million people, mostly children, each year in Europe.