

Liberty Wildlife Medical Services

Medical Services
Training Program

• Section Five •

Medications and Dosages

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Intro to Medications and Dosages

Animals arrive at Liberty Wildlife for a variety of reasons. Some animals, due to their conditions, require medication to aid in their recovery. Medications are drugs that provide non-surgical treatment of disease, trauma, or other conditions.

Some medications directly address medical problems. Some may be *prophylactic* or preventative in nature.

In this section, you will be introduced to medications. The different types of medications will be presented, along with routes and methods of administration. This section will also define a new list of abbreviations and explain the proper way to write a medication schedule. Commonly-used medications will be reviewed. Two separate methods for calculating dosages will be presented followed by a lab activity that will recap the entire section.

Deciding What Medications to Use

Wild animals usually arrive at Liberty Wildlife without a detailed history of their condition. We do the best job we can to determine the nature of injuries and the possible cause. The condition of the animal being treated often gives us important clues and we use these clues to determine if medications might aid the recovery process.

Medications can be grouped into categories which help to explain their purpose.

- **Anti-Infectives**: Anti-infectives are substances that counteract infection. These medications are selected based on their ability to combat a particular pathogen. This group of medications includes antibiotics, antifungals, and antiparasitics.
 - **Antibiotics**: Antibiotics have the capacity to kill or inhibit the growth of bacteria.
 - When to suspect a bacterial infection
 - Obvious infection (visual)
 - Elevated white count
 - Probable candidate for infection (exposed bone, severe tissue, severe trauma, active old injury, etc.)
 - Weight loss or loss of appetite
 - Culturing the site
 - Take a culture sample and submit it to a lab for a “culture and sensitivity.” Cultures must be taken prior to giving an antibiotic to obtain an accurate result. These cultures can be taken from a wound, abscess, the mouth, the vent, a fecal sample, and other sites. Note: Cultures are not always taken. There are several broad-spectrum antibiotics that have proven to be effective in most cases. When in doubt, a specimen can be collected and then refrigerated for future use if needed.

- Select the antibiotic
 - A report is produced by the laboratory identifying drugs that are “sensitive” or will affect the identified pathogen. From this *sensitivity report*, an appropriate antibiotic can be chosen.
 - Antifungals: Antifungals are agents that destroy or check the growth of fungi.
 - Fungal infections can be cultured
 - Some fungus infections have blood screening tests available (i.e. Aspergillosis)
 - Anti-parasitics: Anti-parasitics are agents that destroy parasites
 - When to suspect a parasitic infection
 - Weight dropping or not gaining while eating
 - Eggs observed in fecal floats
 - Exposure suspected
- Anti-inflammatory: These groups of medications counteract or suppress inflammation and the inflammatory response. There are steroidal and non-steroidal medications that are used.
 - Infectious agents
 - Trauma
 - Surgical procedures
 - Musculoskeletal disease
- Anesthesia: (Given with veterinary supervision only) This group of medications is used to help in restraint of an animal, eliminate pain sensation during medical and surgical procedures, control seizures, and humane euthanasia.

Commonly Used Medications

The following is an overview of the common types of medications in use at Liberty Wildlife.

Anti-infectives

This group of medications includes antibiotics, antifungals, and antiparasitics. Anti-infectives are substances that counteract infection. A type of medication is selected based on its ability to combat a particular pathogen. Antibiotics have the capacity to kill or inhibit the growth of bacteria. Antifungals are agents that destroy or check the growth of fungi. Antiparasitics are agents that destroy parasites.

Some of the commonly used anti-infective agents are listed below:

Enrofloxacin (Baytril®)

Available in injectable and pill form. Injectable Baytril may also be given orally (PO) or subcutaneously (SQ). The oral method is preferable since injections of Baytril can cause severe muscle necrosis. Also, caution should be used in giving Baytril to very young animals.

Sulfamethoxazole and trimethoprim (Sulfatrim® Suspension)

Available in a suspension for oral medication. Effective for use in the smaller birds. Very broad spectrum antibiotic.

Cefadroxil (CefaDrops® or CefaTabs®)

Available in drops and pill form. Has been effectively used in smaller birds for respiratory infections.

Doxycycline (Vibramycin®)

Available as a suspension for oral medication. Very effective against chlamydiosis (psitticosisi).

Pipercillin

Available as a reconstituted injectable and given IM or IV, two or three times each day. Piperillin has a very short shelf life when reconstituted. After reconstitution, it should be drawn up into one or one-half cc syringes and frozen until used. Useful in treating bumblefoot or other difficult infections that have been cultured and found to be sensitive.

Amikacin

Injectable. Should be used only when absolutely necessary. Birds should be thoroughly hydrated during the course of treatment to reduce the chances of kidney damage. Not for use in raptors or animals that exhibit renal dysfunction. Smaller birds require a special dilution.

Itraconazole (Sporonox®)

Human drug used in treatment of aspergillosis. Available in capsule form.

Fenbendazole (Panacur®)

Antiparasitic medication for treatment of nematodes, trematodes, and cestodes (worms). Paste or suspension.

Carnidazole (Spartrix®)

Tablet form. Commonly used to treat canker or trichomoniasis. Usually used as a single dose. Can be used as a preventative during season, as it has not shown signs of toxicity in birds.

Metronidazole (Flagyl®)

Liquid. Commonly used to treat canker or trichomoniasis. Comes in 125 mg and 250 mg strengths. (Must be diluted with propylene glycol for small birds.)

Ivermectin (Ivomecs®)

Liquid. Excellent for gapeworms or mites. Used to treat nematodes and arthropods. (Must be diluted with propylene glycol for small birds)

Anti-inflammatory

This group of medications can interact or suppress inflammation. These medications are used to reduce the inflammatory response to infectious agents, trauma, surgical procedures, or a musculoskeletal disease. These can be steroidal or non-steroidal.

Dexamethasone

Injectable. Steroid. Used when animals are presented with head or back injury (spinal trauma) or central nervous disorders. Treatment is usually twice a day (BID) for at least three days, sometimes as long as five days but no longer.

Metacam

Injectable or oral suspension. Non-steroidal. Treatment of inflammation and pain associated with musculoskeletal disorders.

Anesthetics (Given with veterinary supervision only)

This group of medications are used to help in restraint of an animal, eliminate pain sensation during medical and surgical procedures, control seizures, and humane euthanasia.

Isoflurane

Volatile gas. Administered by anesthesia machine. Used for the induction and maintenance of general anesthesia.

Ketamine (Ketaset®)

Injectable. For restraint or brief surgical procedures

Diazepam (Valium®)

Anti-anxiety and anti-convulsant agent. Used to treat seizures. Can be combined with ketamine for more complete general anesthesia in surgical procedures.

Euthanasia (Beuthanasia-D®)

Injectable. Deep anesthesia for rapid and humane euthanasia.

Medication Considerations

Dosage, Frequency, Duration, and Dose

After the medication has been established, the dosage, frequency, and duration must be determined. This information, along with the other specifications on the drug and the animal, will provide us with the dose, or amount to be administered at a given time.

Dosage

Dosage is the established amount of a drug that has proven to be effective as an agent. Dosages are often different for mammals, birds, or reptiles, or even for specific species (such as cranes or vultures), or groups (such as raptors or waterfowl). They may also vary by the form of the drug, such as a pill, injectable solution, oral suspension, and by the frequency in which it is given.

Dosages are often written in a format that specifies the amount of drug per unit of weight. For example, a dosage of 25 mg per pound would indicate that an animal should have 25 mg of the specified drug for each pound of weight. If the animal weighed 2 pounds, it would need 50 mg of the drug.

Dosages are available for most drugs and species. Lists of common dosages are printed pharmacological indexes or formularies. They can also be provided by the veterinarians.

Frequency

When you have determined the drug, you are using and have the acceptable dosage for the animal being treated, you must determine the *frequency*. Frequency is the number of occurrences of a periodic process in a unit of time. For example, we need to know if we should give a drug once a day, twice a day, three times a day, or every other day.

Frequency is related to the dosage of the drug form being used for the animal being treated. You will find the frequency listed with the dosage in pharmacological indexes or formularies. Always note the frequency when looking up dosages.

Duration

Another important component of drug administration is the *duration*. The duration is the amount of time that the drug administration will continue.

Durations vary greatly. They can range from one-time administration to cover a period of months. The duration should be established in the beginning, but can be re-evaluated as time goes on.

Dose

The dose is the amount of a drug that is administered at one time. The dose is calculated for each animal based on the weight of the animal, the proper dosage for the animal, and the concentration of the drug.

Medication Calculations

The correct dose of a drug for a specific animal is calculated using three criteria:

- The weight of the animal.
- The dosage of the drug for the species being treated.
- The concentration and form of the drug being used.

We have two methods of calculating a dose. One is a manual method using a simple calculation based on the three criteria listed above. The second is method uses this same information and reference chart called the *Formulator*®, which provides a predetermined factor as a “calculation helper”.

When you are ready to calculate a dose, sit down with the information you need, *relax*, and begin. Take your time and do your calculations using both methods as a double-check system.

Simple Calculation Method

- Remember the relationships involved
 - Weight: The weight of the animal must be in the same form as the weight unit that is listed in the indicated dosage. For example, if the dosage indicates 5 mg/lb, you will use the animal’s weight in pounds. If the dosage indicates 25 mg/kg, you will need the animal’s weight in kilograms. If the dosage indicates 1 mg /gm, you will need to put the animal’s weight into grams.
 - Dosage: The dosage is how much of the drug the animal needs per unit of weight. You will find this figure printed in the pharmaceutical index or formulary.
 - Concentration: The concentration is how much of the drug is contained in a unit (ml, unit, or tablet) of the drug you are using. You will find the information on the drug bottle or container.
- Not WDQ, WDC!
The WDQ we often see on charts refers to the standard stress-reducing treatment of warm, dark and quiet. WDC is what you need to figure a dose correctly, in two different ways. First, WDC means warm, dark, calculate! Relax and conduct your calculations so that you can think undisturbed. Secondly, WDC means weight, dosage, concentration. The correct order of the three figures you will need in your calculation.
- Calculation
 - **W**eigh the animal.
 - Locate the proper **d**osage for the medication and type of animal in the red pharmaceutical index or the formulary.
 - Note the weight, unit of the dosage, and make sure your animal’s weight has been translated into the correct form.
 - Identify the **c**oncentration on the medication container

- Translate the animal's weight into the needed format.
 - If the dosage indicates mg/kg, your weight should be in kgs.
 - If the dosage is mg/ lb, your weight should be in pounds.
 - If the dosage is mg/g your weight should be in grams.
 - To translate pounds to grams multiply weight (lbs) by 454.
 - To translate pounds to kilograms, divide weight (lbs) by 2.2
- The order of the calculation is WDC or weight times dosage divided by concentration.

$$\frac{\text{Weight} \times \text{Dosage}}{\text{Concentration}}$$

- Multiply the weight by the dosage
- Divide the result by the concentration.
- This will give you the *dose* which is the amount of the medication to dispense in a single application.

Example (Simple Calculation Method)

- We must give Baytril to a red-tailed hawk that weighs 2.75 pounds.
- The dosage for Baytril® in raptors is 5 to 10 mg/kg. Taking a mid-range figure, we will work with 8 mg/kg.
- We must now put the weight of our animal into kilograms (kg). It weighed 2.75 pounds (lbs).
- 2.75 lbs divided by 2.2 lbs/kg equals 1.25 kg. The animal weighs 1.25 kilograms.
- Next we identify the form of the drug we are using. Baytril® comes in an injectable form and in tablets. We are giving the injectable form which has a concentration 22.7 mg/ml.
- Now we gather our figures, WDC. (W times D divided by C).
 - Weight 1.25 kg
 - Dosage 8 mg/kg
 - Concentration 22.7 mg/ml
- Looks like this:

$$\frac{1.25 \text{ kg} \times 8 \text{ mg/kg}}{22.7 \text{ mg/ml}}$$

- This means each dose should be .4 ml or .4 ccs of injectable Baytril®.
- $1.25 \times 8 = 10$. $10 / 22.7 = .4$

The Formulator®

The *Formulator*® is a laminated card which provides a “factor” to use when calculating a dose. The Formulator is located in the front pocket of the red pharmaceutical index. The most significant difference in this method of calculation is that the animal’s weight *must* be in grams.

- Obtain the animal’s weight in grams. Grams, grams, grams! The Formulator® will only work if the weight is in grams.
 - To translate the weight into grams, take the pound weight and multiply by 454.
- Obtain the dosage from the red pharmaceutical index or formulary.
- Obtain the concentration from the bottle.
- The Formulator® is a chart with numbers down the left side and running across the top. The left side of the card lists drug dosages. The top of the card list drug concentrations.
- Locate the dosage on the column on the left side of the card. • Locate the concentration in the figures at the top of the card.
- Find the intersection between the drug dosage and the concentration. *This is the factor, not the dose!*
- Multiply this factor by the gram weight of the animal to obtain the dose.

Example (Formulator®)

- We must give Baytril to a red-tailed hawk that weighs 2.75 pounds.
- The dosage for Baytril® in raptors is 5 to 10 mg/kg. Taking a mid-range figure, we will work with 8 mg/kg.
- We must now put the weight of our animal into grams.
 - It weighted 2.75 pounds (lbs).
 - 2.75 lbs times 454 g/lb equals 1248.5 gm.
 - The animal weighs 1248.5 gm.
- Next, we identify the form of the drug we are using. Baytril® comes in an injectable form and in tablets. We are giving the injectable form which has a concentration 22.7 mg/ml.
- Now we gather our figures, WDC, and take out the Formulator®
 - Weight 1.25 kg
 - Dosage 8 mg/kg
 - Concentration 22.7 mg/ml
- Locate the dosage on the left side of the Formulator®.
- Locate the concentration on the top side of the Formulator®.
- Now identify the number at the intersection of the dosage and concentration numbers. This is your factor. (The factor at the intersection of 8 mg/kg and 23 mg/ml is 0.00035.)
- Multiply the weight in grams by this factor. 1248.5 gms times 0.00035 equals 0.4. The dose would be **.4 ccs** of injectable Baytril®

Routes of Administration

There are several different methods for administering medications. They commonly given orally or by injection, or applied topically.

Per Os

Medications that are administered *per os* (by mouth) are given orally.

There are many advantages to oral administration. A precise dose can be given without causing the additional trauma associated with injection. Many drugs are available as oral suspensions which are easy to draw up and dispense. Some types of medications can be hidden in food to make administration easier. If an animal can eat on its own, it can self-medicate, a very low-stress method of administration as it will not have to be captured or handled.

There are some disadvantages to per os administration, too. Birds may have to be captured and fully restrained. This is stressful. Whenever a liquid is administered there is a danger the bird might aspirate. Also, not all drugs are absorbed orally. In fact, food often reduces drug absorption. Sick animals often consume less food, so they may not be receiving the correct dosage. The medication may not taste good and may be spit out or left untouched.

Parenteral

Medications that can be administered subcutaneously or intramuscularly are given *parenterally* or by injection.

There are many advantages to parenteral administration. An accurate dose and large volumes can be administered. Although the animal must be captured, restraint time is usually minimal. Adsorption from intramuscular injections is rapid. Parenteral administrations can be given subcutaneously help to alleviate muscle necrosis or other trauma at the injection site such as seen with Baytril®.

There are some disadvantages to parenteral administration, too. Full restraint is necessary. Injections can be painful and may cause substantial muscle necrosis. Birds have very thin skin, and fluid may leak out of the injection site, reducing the dose.

Topical Medications

Topical medications are those applied directly to a site. This group includes eye, ear or nose drops and ointments, antiseptic or wound ointments, creams, or powders, nose drops or ointments; and skin and foot ointments or creams.

There are advantages to topical administration. First of all, application directly on a site ensures administration. Also, the application directly on a site may have an added benefit such as keeping a surface moist or dry.

Of course, there are disadvantages to topical administration. Full restraint is often necessary. Feathers may become sticky from ointments or creams. Animal may rub off or lick the medication if the site is not protected.

Methods of Administration

Per OS (Oral)

- Procedure for administering liquid medications orally
 - Obtain a syringe with a removable needle.
 - Wipe the top of the medication vial with alcohol if it has a stopper.
 - Fill the syringe with the appropriate amount of medication.
 - Remove the needle, if one is there.
 - Properly restrain the animal, with help if needed.
 - Gently open the bird's beak and hold it open.
 - Note the location of the trachea.
 - Keeping your fingers away from the plunger, insert the syringe down one side of the bird's mouth well beyond the trachea.
 - Carefully and slowly, dispense the medication, allowing the bird to swallow the liquid.
 - Slowly remove the syringe.
- Procedure for administering pills orally
 - Prepare the correct dose for the animal being treated.
 - Properly restrain the animal, with help if needed.
 - Gently open the bird's beak and hold it open.
 - Note the location of the trachea.
 - Pick up the pill with a curved hemostat.
 - Insert the hemostat and the pill down one side of the bird's mouth well beyond the trachea.
 - Carefully release pressure on the hemostat letting the pill go.
 - If the animal is eating on its own you can hide pills in its food.
 - If a large animal is not eating on its own, a pill can be put into a small piece of food. This food can then be offered from forceps (hand-fed) or put down the bird's throat (force-fed). Again, make sure it is placed well- past the trachea.
 - Small birds that are being fed worms from forceps will often take a pill in the same manner.

Parenteral (by injection)

- Procedure for subcutaneous injection
 - Obtain the appropriate needle and syringe
 - Carefully note the amount of the dose
 - Wipe the top of the medication vial with alcohol.
 - Draw up the medication, drawing past the mark.
 - Clear any air bubbles from the syringe.
 - Select the appropriate amount of medication.
 - Properly restrain the animal.
 - Select your injection site. The large breast muscles are ideal.
 - Locate the keel (breast) bone. Feel the muscle mass on either side of the keel. This is the area to give an injection. If you wish, you can apply a small amount of alcohol to the area on either side of the keel (breast) bone, so you can see the skin. Alternating the site of the injection each time will reduce soreness for the bird. Some antibiotics cause more soreness at the site than others, however, repeated injections of any kind will cause discomfort.
 - Insert the needle at an angle, almost parallel to and just under the skin.
 - Administer the medication.
 - A small bubble will appear on the skin which will be absorbed into the body.
- Procedure for intramuscular injection
 - Obtain the appropriate needle and syringe
 - Carefully note the amount of the dose
 - Wipe the top of the medication vial with alcohol.
 - Draw up the medication, drawing past the mark.
 - Clear any air bubbles from the syringe.
 - Select the appropriate amount of medication.
 - Properly restrain the animal.
 - Locate the injection site.
 - Insert the tip of the needle into the breast muscle on either side of keel.
 - Pull back lightly on the plunger of the syringe to check for blood.
 - If any blood appears in the syringe, pull the needle out of the animal, and try another site.
 - Administer the medication
 - Some animals may require both an antibiotic and a steroid (i.e. Dexamethasone®). Inject the steroid, and give the antibiotic orally if possible.

Topical Medications

- Procedure for topical administration
 - Obtain the appropriate product
 - Properly restrain the animal.
 - Identify the appropriate amount of the product
 - Apply the medication
 - When using drops, powders, or tube ointments, do not touch the animal with the tube or bottle. Hold it above the site and dispense. When using jar ointments, use a tongue depressor or swab to apply the product being careful to avoid feathers.

Abbreviations

There are several abbreviations that will be used when referring to medications and their administration.

EOD	Every other day
PRN	As needed
PO	Per os (by mouth)
SID	Once a day
BID	Twice a day
TID	Three times a day
QID	Four times a day
q24h	Every 24 hours
q72h	Every 72 hours
q7d	Every 7 days
g	Gram
gm	Alternative for gram
SQ	Subcutaneous
IM	Intramuscular
C&S	Culture and sensitivity

The Medication Schedule

A medication schedule must be completed on each animal receiving ongoing medicine. These schedules are written on bright green cards and posted on the animal's enclosure. Each schedule must contain complete information and the drug and its administration.

Preparing the schedule

A medication schedule must include:

- The species of the animal
- The log numbers
- The animal's weight
- The name, form, and sometimes concentration of the drug
- The dose
- The route of administration (delivery)
- The frequency
- Check-off boxes with dates indicating frequency and duration

Re-evaluation

Most drugs should be given at least eight-hour intervals, if given on a BID schedule and drugs should normally be continued throughout their posted duration.

However, initial medication dosages may require changes resulting from the animal's response to the treatment. The *re-evaluation* may indicate a successful treatment, the need for further duration, or indicate the use of another drug.

If re-evaluation is indicated, write the word "re-evaluate" at the end of the check-off boxes and on the medical chart.

Record-keeping

Record all information relating to medications on the animal's chart. This includes doses, frequency, start date, and duration. Check-off boxes as drugs are administered.

Lab

Exercise One • Specimens

- Identify and create a chart for your animal.
- Obtain your animal's weight.
- Draw a condition. What would you suggest for this animal?
- Draw a drug. Calculate the dose for your animal. Write up a medication schedule for each drug.
- IM Injections: Taking the dosages used in Exercise One, administer the proper medication.
 - Identify your injection site
 - Select your equipment
 - Draw up the proper medication using sterile technique.
 - Inject.
- Oral medications (pills and liquids)
 - Select medication.
 - Administer
- Applied to site
 - Draw a condition and select a medication
 - Administer.

Medical Services – Worksheet

MS5 • Medication and Dosages

Make medication schedules for each example. Write on the back of this page and use additional sheets if needed. Show your calculations.

1. Explain WDC.
2. A dove was presented that had been attacked by a cat. It had multiple punctures and an open wound of the leg. The wound on the leg was cleaned and covered to keep it moist until it was sutured. The punctures were cleaned and the animal was put on Sulfatrim. The dove weighed .25 pounds. What dose would it be given and for what frequency and duration? Would you do anything else?
3. An adult thrasher arrives with severe head tilt. Its pupils are dilated unevenly. Its mouth color and weight are good. There are no obvious fractures. Which drug might be given? The animal weighs .15 pounds. Calculate the dose.
4. A Harris' hawk is brought in with a compound fracture of the left wing. The wing was extremely swollen. After the wing is cleaned and wrapped, which drug might be given and for what reason? The animal weighed 2 pounds. Calculate the dose.
5. A barn owl was brought in with an eye that was matter-filled and seeping. What critical step must be taken before starting the bird on antibiotics? Next, what would we do?
6. A Cooper's hawk comes in that was found on the ground. Although it is not standing, it is bright, alert, and responsive and has no apparent fractures of the wings or legs. What should be done for this animal? Its weight is 380 grams. Calculate a dose if indicated.
7. A great blue heron has a compound fracture of the wing. It is not standing and its pupils are uneven but responsive to light. It weighs 4 1/2 lbs. What should be done for this animal? Show calculations.
8. A coot is brought in with an infected wound and Piperacillin is indicated by culture results. How is this antibiotic prepared? How will you ensure the drug stays sterile and maintains its potency? The animal weighs 2.57 pounds. Calculate the dose.