CAMELID MEDICINE CABINET

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The camelid population is continuing to grow in the United States increasing the need for current, scientifically based information about proper dosage for medications in camelids. There is ongoing research in many institutions to try to find answers for these questions. The lack of complete information represents a challenge for veterinarians and camelid owners when determining a course of treatment for their camelid patients. As camelid owners it is important to work with your local veterinarian to plan treatment protocols for your llamas and alpacas. There are many factors to take into consideration when determining which drugs and what dosage to use in different situations. The information provided here is a basic guideline; specific treatments should be started only with the guidance of your veterinarian.

Due to the expense of scientific research, there is a lack of complete information for treating alpacas/llamas, so the dosages used in camelids are frequently taken from dosages used in sheep, goats, cattle, and horses. However, several differences between camelids and other livestock have already been discovered. For example, antibiotics, as a general rule, appear to have a longer time of action in camelids compared to domestic ruminants. There also seems to be a difference in dosing between llamas and alpacas. These differences can be dangerous and result in fatal over-dosages if the drug mechanism is not understood, for example Panacur and Valbazen doses. The choice of which drug to use in certain situations is a complicated decision and should not be decided upon in a "cookie cutter" manner. The age, sex, pregnancy status and general health of the alpaca/llama should be taken into consideration when deciding which drug to use. The following information is on drugs commonly used in alpacas and llamas.

Abbreviations used in this document:

PO – orally or given by mouth
SID – given once per day
BID – given twice per day
TID – given three times per day
QID – given four times per day
EOD – given every other day
ETD – given every third day
IU – international unit (a measure of concentration)
SC (frequently seen as SQ) – subcutaneous, injected just under the skin
IM – intramuscular, injected in the muscle
IV – intravenous, injected directly into a vein
mg – milligram, a measure of concentration of drug
cc – cubic centimeter, a measure for liquids
mL – milliliter, the same as a cc, a measure for liquids

How to calculate how many mL (same as cc) to administer:

Animal's weight: 100 lb
Drug concentration: 50 mg/mL
Dose of drug: 2 mg/lb

100 lb X 2 mg/lb = 200 mg of drug needed
200 mg ÷ 50 mg/mL = 4 mL of drug to administer

Antibiotics

A. **Aminoglycosides** – Gentamicin (100 mg/mL), Amikacin (50 & 250 mg/mL) should only be used with extreme caution as they can cause death due to kidney failure if given for prolonged periods (>5 days in a row) by IV, IM or SC route. Kidney function should be monitored closely, and the animal should only be given this drug class while supplemented with IV fluids. They can be used as part of an intrauterine lavage without risk of toxicity. **Amikacin** – is considered to be the safer of the two drugs in other species. Regardless of form used, a maximum 5 day, once daily dosing is recommended.

Dose: 2 – 3 mg/lb, SC, IV, SID, for 5 days ONLY

B. Baytril 100 (Enrofloxacin – 100 mg/mL) – commonly used to treat neonatal sepsis, upper respiratory infection, pneumonia, and uterine infections in camelids. It is labeled for treatment of respiratory disease in beef cattle. It is considered to be a "big gun" and should not be used as a first-choice antibiotic. In puppies (< 8 months), use of this drug is associated with cartilage damage in joints; it is unknown if the same is true for camelid crias. Use of this drug in cats has been associated with blindness with high doses and long-term use; the same has been reported in a Guanaco after 26 days of therapy. Research has looked at oral absorption of this drug in camelids using double the injectable dose. There is absorption at 4.5 mg/lb, PO, SID but it is still preferred to give Baytril either SC or IV. It is considered to be a broad-spectrum antibiotic, but does not work against *Streptococci, Enterococci, Actinomyces, Pseudomonas* bacteria or anaerobic infections.

Dose: 2.3 mg/lb, SC, IV, SID to BID (IV route) (0.6 mL/25 lb, 2.3 mL/100 lb)

C. Biomycin 200, LA 200, Noromycin 300, Duramycin 300 (Oxytetracycline) – used mainly for the treatment of *Mycoplasma haemolamae* ("Epe") in camelids. It is a very irritating drug and should not be used IM. SC placement needs to be done carefully, alternating injection sites and thoroughly rubbing flat the drug under the skin (best done over the rib area). The brands **Biomycin 200, Noromycin 300 or Duramycin 300 are** much less irritating and are the **preferred** products (do not use LA200). It is labeled for every other day use in cattle, but the researcher at Oregon State University recommends it be given every three days (ETD) for 5 treatments. In some cases of *M. haemolamae* it may take more than 5 treatments if the animal remains anemic. If it is used IV, it must be given SID. I recommend 3 treatments SC, 3 days apart, as follow up for IV treatment.

Dose: Biomycin 200, Noromycin 200 – 9 mg/lb, SC, ETD for 5 treatments (4.5 mL/100 lb)
Noromycin 300, Duramycin 300 – 9 mg/lb, SC, ETD for 5 treatments (3.0 mL/100 lb)

D. Draxxin® (Tulathromycin – 100 mg/mL or 25 mg/mL) – labeled for treating respiratory disease in many species. It is also considered a "big gun" as it is a newer antibiotic on the market. With this in mind, it should only be used when other, more commonly used antibiotics have failed. It can be used with tooth root infections for 6 – 9 total injections (given weekly) in combination with Isoniazid. It is more expensive than other choices, but has long duration of activity in other species, (undetermined in camelids). The dose used is the same as in other species.

Dose: 1.1 mg/lb, SC, can be repeated in 7 days if no improvement. (1.1 mL/100 lb if 100 mg/mL concentration used OR 4.4 mL/100 lb if use the 25 mg/mL concentration)

E. Nuflor® (Florfenicol – 300 mg/mL) – commonly used to treat upper respiratory infection, pneumonia, and tooth root infections in camelids. It is a broad-spectrum antibiotic that is labeled to treat respiratory infections in cattle and is given every other day (EOD). Based on information from a study done on alpacas at Ohio State University, the best regimen is daily dosing IM. Due to how the drug is metabolized (by the liver), it should not be given to young crias (less than 3 months old). Contraindicated to use with any other antibiotics. Can occasionally cause them to lose their appetite. Studies are to be conducted at Ohio State to look at proper dosing in llamas.

Dose: 9 mg/lb, IM or SC, SID to BID (1 mL/35 lbs, 3 mL/100 lb)

F. Penicillins – considered to be a very safe class of drugs that can be used at very high dosages if needed.

1. **Ampicillin** – comes as a SC form (Polyflex®) and an IV form (Ampicillin sodium). Considered reasonably safe in most species. The IV form has a short duration in the blood and must be dosed several times a day.

Dose: Polyflex®: 10 mg/lb, SC, BID
Dose: Ampicillin sodium: 5 mg/lb, IV, TID to QID for Listeriosis

2. **Excede® (Ceftiofur Crystalline Free Acid – 200 mg/mL) –** a product labeled for respiratory infection in cattle and swine. It is intended to be administered as a one-time treatment SC at the base of the ear in cattle and IM at the base of the ear in swine. Due to this unique location of delivery of the drug, and the unique physiology of camelids, absorption may be unpredictable, and no research has been done in camelids. Regardless of this, Excede has been used by many veterinarians in camelids with apparent success. When administered, it is important to confirm the needle is not in a vein (pull back on plunger to check for blood) as this drug will kill instantly if given IV. Excede is probably best reserved for use in animals that cannot be given injections every day. If needed, an additional dose can be repeated on day 4 if your veterinarian has determined it is appropriate.

   Dose: 3 mg/lb, SC, can repeated on Day 4 (1.5 mL/100 lbs)

3. **Naxcel®, Excenel® (Ceftiofur – 50 mg/mL)** – commonly used to treat neonatal sepsis, upper respiratory infection, pneumonia, retained placenta and uterine infections. Naxcel can be used IV or SC. If used IV, it must be given BID. With severe infections and SC usage, it can also be used BID. Excenel has the same parent drug as Naxcel, just a different carrier that allows it to be kept at room temperature, with a longer expiration date; it should only be given SC, never IV. I recommend for septic crias to give BID for 3 days and SID for 3 days.

   Dose: 2 mg/lb, SC, IV, SID to BID (1.0 mL/25 lb, 4 mL/100 lb)
   4 mg/lb can be used with severe infections (safe at higher doses)

4. **Procaine Penicillin G (300,000 IU/mL)** – This is the BEST concentration for use (do not use the Benzathine form). Commonly used to treat tooth root infections, skin infections/wounds, infected foot pads, umbilical infections and follow up treatment for Listeriosis (bacterial infection in the brain). Best choice to use if Clostridium infection is suspected. Not a good choice for Upper Respiratory Infection or Pneumonia. Anaphylactic shock (respiratory failure and collapse) can occur on occasion and must be treated immediately with Epinephrine (1 mL/100 lb, IM) to prevent death. If this happens, do not use this drug again in that animal. Also very safe to use at higher doses.

   Dose: 10,000 IU/lb, SC, BID (0.8 mL/ 25 lb, 3.5 mL/100 lb)

OR ** **Dose: 20,000 IU/lb, SC, SID (1.6 mL/25 lbs, 7 mL/100 lb)**

G. Sulfa drugs – The **ONLY** use for Sulfa drugs in camelids is for the treatment of intestinal coccidia. The use of Sulfa drugs must be used with caution as a potentially fatal complication called Polioencephalomalacia can occur. Polioencephalomalacia is a condition where there is a sudden lack of Vitamin B1 in the first compartment (C1) and causes subsequent softening of the brain. This results in neurologic signs – most notably blindness. Normally this condition can be treated by administering Thiamine (Vitamin B1), but when the condition is caused by Sulfa drugs, it is non-thiamine responsive and is usually fatal.

1. **Albon® (Sulfadimethoxine)** – comes in different concentrations which will determine the amount to be given. (See how to calculate dosages located at the beginning of this document).

   Dose: Day 1: 25 mg/lb, PO, SID Day 2-5: 13 mg/lb, PO, SID

2. **SMZ, TMS, TMP (Trimethoprim-sulfamethoxazole/Sulfadiazine)** – is **NOT** effective orally in adults and ruminating crias (> 30-45 days), this has been proven conclusively by two scientific studies.

   Dose: 13 mg/lb, PO, BID (Dose base on the Sulfamethoxazole portion)

Anti-inflammatory, Analgesics (pain management)

A. **Banamine® (Flunixin meglumine – 50 mg/mL)** – this is a non-steroidal anti-inflammatory drug used to treat pain, inflammation and endotoxemia (toxins in the blood from bacterial infections). It does not have properties to directly cause calmness, except what would be expected from the relief of pain. If used for long term, it may lead to ulcers in the third compartment (true stomach). It should also be used with caution in dehydrated camelids as it can damage the kidneys. In dehydrated animals, use one-half dose until the animal is fully hydrated. Depending on the reason it is being used, once a day seems to be clinically adequate. If the animal becomes painful again after 12 hours, an additional dose can be given for short term use. To avoid severe side effects, it is best if the animal is fully hydrated (possibly on IV fluids). It is not known if it is effective if used orally. Other ruminants need a very high dose orally for pain relief, and even then, not it is not very effective. Use Meloxicam (see below) for oral pain relief.

   Dose: 0.23 mg/lb – 0.5 mg/lb, IV, IM, SC, SID to BID (0.5 – 1 mL/100 lb)

B. **Etogesic (Etodolac® – 300 mg tablets)** – this is an oral non-steroidal anti-inflammatory drug primarily used to treat bone pain. It is used mainly in dogs. I have used it after repairing a bone injury if the animal is still painful and having a hard time getting around. It can be used if there is a non-specific lameness, once it has been determined by X-rays that there is not a repairable injury present. As we do not know if it causes ulcers, I recommend using it SID for 7 days, then EOD for another 2 to 3 weeks if needed. If the pain seems controlled on EOD, then reduce to two times a week. **Meloxicam has replaced this drug.**

   Dose: 4.5 mg/lb, PO, SID for 7 days, then decrease to EOD

C. **Ketoprofen (Ketofen®)** – this is a non-steroidal anti-inflammatory drug used mainly in horses and dogs. Minimal research has been done on camelids and it is used very little clinically. It has a very short duration of action. As there are other, effective anti-inflammatory drugs available (Meloxicam), it probably is not a good choice to use unless your veterinarian has experience with the drug.

   Dose: 0.9 mg/lb, IV, IM, SC

D. **Meloxicam® (7.5 & 15 mg tablets) –** a drug used in small animals and horses for pain management. Recent research in llamas has provided data to indicate its usefulness in camelids. Many veterinarians have been using it in the field based on experience with other animals. The data indicates the drug stays in the blood for 3 days. More studies will have to be done to confirm if pain control will last that long. I recommend a "loading dose" of daily for 3 days, then EOD if pain control is still effective at EOD.

   Dose: 0.5 mg/lb, PO, q 2 days Can be used daily if indicated

E. **Phenylbutazone "Bute"** – based on research, probably not useful in camelids

Anti-Ulcer Medications (in order of importance)

A. **Protonix® (Pantoprazole)** – a human drug that has been studied in alpacas that blocks the cells that produce acid in the third compartment (true stomach). This makes the pH higher and helps ulcerative tissue heal. Can be given IV or SC and the action of the drug will last for 24 hours. It comes in 40 mg vials that must be rehydrated with sterile saline before use. **Due to the known effectiveness and only once a day dosing it is a good choice to use if gastric ulcers are suspected.** Over the last few years, the cost of this drug has come down and is more reasonable. Once a vial is mixed, it is stable for 96 hours (keep refrigerated, researcher comment).

   Dose: 0.5 – 1 mg/lb, IV or SC every 24 hours

B. **Carafate® (Sucralfate – 1 gram tablets)** – a drug that works in an acid environment to bind to ulcerated tissue in the third compartment. Can be given BID to QID. If it is used in combination with Cimetidine, the Carafate must be given 1 to 2 hours BEFORE the Cimetidine. The clinical impression is that it "seems to help". Useful in stressed crias at shows and at weaning.

   Dose: 1 gram/50 lb, PO, BID to QID

C. **Cimetidine® HCl injection** – blocks the cells that produce acid in the third compartment (true stomach) and makes the pH higher which helps ulcerative tissue heal. Can be given IV or SC. Must be given 1 to 2 hours AFTER Carafate is administered. It has a short duration of action and can be given BID to QID. May need to be specially mixed by a pharmacist due to limited availability. Not a good choice for treatment of ulcers. **Protonix has replaced this drug**.

Dose: 4.5 mg/lb, IV, SC (1.5 mL/ 50 lbs)

D. **Gastroguard® (Omeprazole) – DOES NOT WORK orally in camelids that are old enough to chew their cuds!!** For young crias, can use 1 to 2 clicks, twice a day. It is effective if given IV, however it is not available commercially and your veterinarian would have to have it specially mixed by a pharmacist.

Dose: 0.2 – 0.4 mg/lb, IV, QID

De-worming drugs

A. **Antiprotozoal –** products used in camelids to treat protozoal parasites such as Coccidia, *Cryptosporidium* spp, Giardia, *Balantidium coli*.

NEW DOSE

1. **Baycox® (Toltrazuril 50 mg/mL)**, the parent drug to Ponazuril, is not approved for use by Veterinarians in the United States. It has however been used for many years by camelid owners for the treatment of E.mac. Information provided to the author by Bayer demonstrated good absorption in cattle with only one dose. Suggesting this drug, made for piglets, would also work to treat E.mac. Recent research has shown a higher dose (13 mg/lb) to be more effective in treatment of the large coccidia like E. mac.

   Dose: 13 mg/lb – 2.6 mL/10 lb, PO, Once

2. **Corid® (Amprolium) –** used as individual and group medication for treatment and prevention of coccidia in camelids. Keep in mind that it is normal to find some regular coccidia in adult feces. Only treat adults if they are having clinical disease (severe diarrhea) to regular coccidia. Over-dosage and prolonged use of this drug can also induce Polioencephalomalacia, however this form is Thiamine responsive. When treating a group, must be the only source of water available. Is **not** a suitable treatment in the water for young crias, as they do not drink enough water to medicate themselves. Follow label directions, do not keep adding drug to remaining water, for you will change the concentration of the drug and therefor the dosage. Pour out remaining water and mix fresh daily. As a general rule this medication is not very often recommended.

   Dose: 1 oz/5 gallon water 4 oz/25 gallon water 8 oz/50 gallon water

   Individual dosing (using the 9.6% concentrate): add 1.5 oz of drug concentrate to 4 oz of water, give 7.5 mL/100 lbs of the mixture. Can add flavoring. It should be made up it fresh every day, give daily for 5 days.

3. **Humatin® (Paromomycin Sulfate – 250 mg capsules)** – used to treat Cryptosporidium diarrhea in young crias. If a severe case, use double dose and double the days of treatment. It comes in capsule form that will need to be taken apart and the powder mixed with water in a syringe. This is a human drug and expensive, but it is the most effective treatment for Cryptosporidium diarrhea. May be available to your veterinarian at Cornerstone Pharmacy ((859)-873-3007/5768).

   Dose: 11 – 22 mg/lb, PO, BID, for 5 to 10 days (1 capsule/20 lb)

NEW DOSE

4. **Marquis® (Ponazuril – 150 mg/mL)** – used to treat *Eimeria macusaniensis* (E. mac) and other coccidia infections in camelids. No research has been done yet on the efficacy of Ponazuril on E. mac in camelids. However, research has been done to demonstrate that it is well absorbed in

llamas. Because camelids are smaller than horses and do not consume an entire tube, there have been concerns about the distribution of the medication within the paste in the dosing syringe. The researchers did not look at the absorption in smaller camelids using small doses straight from the tube, but felt that the variability would more likely be due to inconsistent absorption from the first compartment rather than the distribution of the drug within the tube (personal communication). Boehringer, now owners of Marquis, said that no studies have been done to determine the distribution of the product in the tube, but commented that because one tube is a multi-day regimen for horses it should be adequate. It is also effective on regular coccidia and is the preferred drug of choice (or Baycox®) to use in adults with coccidia. There is clinical evidence that this drug may also work against Cryptosporidium diarrhea in crias. If you choose to dilute Marquis, the recipe for dilution is to take 40 mL of the drug and add 20 mL of distilled water, mix well. This makes a 100 mg/mL suspension. Mix the whole tube up at once to ensure all the drug is well distributed. One tube makes 3 dilutions. For larger animals, it can be used straight from the tube, only one dose needed. See Baycox® above for new information on the increased dosing.

Dose: Dilution 100 mg/mL: 13 mg/lb, PO, SID for 3 days (13 mL of dilution/100 lb)
Undiluted 150 mg/mL: 13 mg/lb, PO, Once (26 mL of paste/300 lb)

5. **Metronidazole (Flagyl®)** – used to treat Giardia diarrhea in young crias, should not be used in crias > 2 months of age.

   Dose: 23 mg/lb, PO, BID for 5 to 8 days

B. Avermectins – the two most common in this class are Ivermectin and Dectomax, they are not effective on Nematodirus, Whipworms, Capillaria and Tapeworms. May still work on some farms with simple Strongyle type infections, but unlikely. Best when used to prevent Meningeal worm infection. Should always be given SC, and they are not effective as Meningeal worm prevention if given orally or topically. Limited effectiveness with Chorioptic mange infection as the mite lives on the surface of the skin, will work on Sarcoptic mange. These drugs can be started in crias that are actively grazing (2 to 4 months) as prevention of Meningeal worm infection. Newer in this class is Cydectin® (see below).

1. **Cydectin® (Moxidectin 1mg/mL)** – is a milbemycin de-wormer. It binds with specific chloride ion channels in the nerve and muscle cells of the parasite resulting in paralysis and elimination of the parasite. Cydectin comes in three forms: oral, injectable, and topical. Research has shown the topical form does NOT work with camelids. The oral sheep drench is the recommended form to use in camelids using double the amount on the dosing chart for sheep. This drug should be reserved for use on farms that have Benzimidazole (SafeGuard) resistant Strongyle type parasites. Just like any other de-wormer, over or inappropriate use of this drug will result in development of resistance. It has a moderate degree of safety and can cause seizures with a 2X label overdose that may not resolve. It is labeled for sheep 4 months and older, which until more information is known in camelids, should be followed with crias. Reproductive safety has not been determined yet in the US, but is used frequently with pregnant sheep and camelids. For llamas, can consider using the equine product (Quest® gel). Keep in mind that one tube of gel is enough to treat an 1150 lb horse. Make sure the dialing ring is locked to avoid overdosing. Best to squirt the desired dose into another syringe for dosing the correct amount. **Both products can cause coughing after administered**

   Cydectin®: 0.18 mg/lb, PO, Once (10 mL/55 lb, 18 mL/100 lb of sheep drench)
   Double the dose on chart on Sheep drench
   Quest® gel: 0.18 mg/lb, PO, Once (2.7 mL/300 lb) (Use only in adult llamas, too concentrated for safe use in alpacas)

2. **Dectomax (10 mg/mL)** – longer duration of action, need to use higher dose, stings so change needle after drawing up the drug. I usually give the average adult alpaca (150 lb) ~4 mL, average adult llamas (300 lb) ~9 mL

   Dose: 2.5 mL/100 lb, SC, every 45–60 days for Meningeal worm prevention

3. **Ivermectin (10 mg/mL)** – shorter duration of action, stings so change needle after drawing up the drug. Dosage 0.2 mg/lbs. I usually give the average adult alpaca ~3 mL, adult llamas ~8 mL.

   Dose: 1.8 mL/100 lb, SC, every 30–45 days for Meningeal worm prevention

C. **Benzimidazoles** – some products have been in use for a long time and in some parts of the country have lost efficacy. Also, there is a wide range of safety, see below for specifics.

1. **Panacur®/Safe-guard® (Fenbendazole – 100 mg/mL)** – has the widest range of safety, can be used at very high doses. May not always be effective in all animals and in some parts of the country. To make it more effective, give at the high dose, remove feed the night before AND/OR **give BID**. Can also be used at 23 mg/lb, PO, for 5 days for the treatment of Tapeworms and Giardia diarrhea in crias. Use at 23 mg/lb, PO, for 5 days (or BID for 3 days) for Whipworms and Capillaria. Is very safe to use in pregnant females. With such widespread parasite resistance, use the **high end of the dose (23 mg/lb) and BID for 3 days as a routine for all parasites**. Will generally still work for Nematodirus when no longer works with other Strongyle type. Will always be effective as treatment for Meningeal worm infection (23 mg/lb, PO, for 5 to 10 days). **If using Safe-guard paste** for horses, etc, it is the same drug. It has added a non-drug carrier to make it a paste. Figure out how many mg of drug needed, i.e. 150 lbs X 20mg/lb = 3000 mg of drug NOT of the actual paste. Each gram of product in the tube has 100 mg of drug. So a 92 g tube would have 9200 mg of drug, so would have 3000 mg ÷ 9200 mg = 1/3 of the tube needed to give animal. Frequently under-dosing occurs when using the paste as large volume needed.

   Dose: 9 – 23 mg/lb, PO, SID to BID for 3 to 5 days (9 to 23 mL/100 lb)

2. **Valbazen® (Albendazole – 113.6 mg/mL)** – has a very narrow margin of safety, should not be used in young crias (< 6 months old) as it can cause fatalities due to liver failure. DO NOT USE in pregnant females, can cause facial deformities in crias. Due to toxicities with overdosing, you MUST always obtain an accurate body weight and should never use Valbazen in the same animal on consecutive days.

   Dose: 9 mg/lb, PO, Once and repeat in 5 – 7 days if needed in severe infections (8.0 mL/100 lb)

D. **Levamisole – Prohibit® powder)** – works by paralyzing the parasite, which is then expelled alive. It has been used in cattle, sheep and goats for many stomach and intestinal worms, although not effective with *Trichuris* spp (*Capillaria*??) and Lungworms. If used as the injectable form or a high dose orally, there may be neurologic side effects. It has a narrow margin of safety and should not be used in debilitated animals unless the benefit outweighs the risk. It is generally considered to be safe to use in pregnant animals, again taking into consideration the benefit versus the risk. This drug should be used **ONLY** as a last resort, only after more commonly used drugs (Panacur, Valbazen, Cydectin) have failed. An exception would be in very anemic (white or pale pink mucous membranes) animals.

Dose: Prohibit® powder - weigh out 3 g powder and add 60 mL of water. This is 44.7 mg/mL concentration: 10 lb = 0.8 mL, 50 lb = 4 mL, 150 lb =12 mL, 250 lb=20 mL Stable for 90 days, at room temperature. Credit: UGA Pharmacy

Should be repeated in 7 to 10 days to get the newly emerged adults as the drug does not kill the existing larvae already in the animal. Can cause coughing after administered. Can mix with applesauce.

E. Pyrantel pamoate suspension (50 mg/mL), Strongid Paste®) – works by paralyzing the parasite and is effective in horses, cattle, sheep, goats and swine against many parasites. There is minimal research done in camelids but has been used clinically and seems to be effective (Strongyle type). Since it is not frequently used, this drug should be held in reserve for when other, more commonly used drugs no longer work. The suspension is safer to use as it can be dosed more accurately. It has a moderate margin of safety, and should not be used at the same time as Levamisole.

Dose: Suspension: 6 - 8 mg/lb, PO, Once (12 - 16 mL/100 lb)
Paste: 5 mL paste/100 lb [180 mg pyrantel base/mL].
Should be repeated in 7 to 10 days to get the newly emerged adults as the drug does not kill the existing larvae already in the animal.

Miscellaneous Drugs/Supplements

A. Bo-Se (Vitamin E & Selenium 1 mg/mL) – used in crias as a prevention of white muscle disease (Selenium deficiency) and to stimulate the immune system. Also, can be used as a general supplement in underweight and geriatric camelids. Research has shown that Selenium absorption was rapid after injection and did not stay in the system very long. No information about use during pregnancy is available; however, it is routinely used in pregnant cattle. Be very careful only to use the Bo-Se product as Selenium overdoses occur and can be toxic. Anaphylactic reactions have been known to occur, so the animal should be monitored for respiratory failure and collapse after administration. Can be repeated every week for 4 weeks in underweight and geriatric camelids.

Dose: 0.025 mg/lb (1 cc/40 lb of Bo-Se), SC

B. Clostridium type C, D & T toxoid (CD&T injection) – most commonly used vaccine in camelids. Mainly used to prevent tetanus. Unless a specific problem in your area, the "8-way vaccine" is not recommended. Many different protocols exist, no research on best way! This is what I recommend:

Crias: Day 2-3: 2 mL, SC Days 30, 60, 6 months, yearly: 3 mL, SC
Dams: 3 mL, SC 2-3 days after giving birth Maidens before breeding: 3 mL, SQ

C. Epinephrine 1:1000 (1 mg/mL, Large animal form) – animals can have anaphylactic and allergic responses to drugs and insects bites the same as humans. Any drug can be responsible, and animals should be monitored for 20 to 30 minutes for signs of adverse response after any injection are given. Signs such as staggering, difficulty breathing, hives developing around the injection site, collapse. Penicillin, as in humans, is a common culprit, but vaccines and even vitamin injections can cause reactions. **The first thing to do if you find an animal showing any suspicious signs is to call your veterinarian**. Tell them you have Epinephrine on the farm, and they will instruct you further. If your veterinarian is not available, then administer **1 mL/100 lb, IM** and monitor their breathing. If after 15 minutes there is no improvement, then give one additional dose IM. During this time keep trying to contact your local veterinarian and keep the animal in cush position. If oxygen is available, administer it.

D. Imodium – to help control severe diarrhea in crias and adults, to be used with Kaolin. These are estimated doses, each animal needs to be monitored for what works for them.

Dose: Young crias – 3 mL, SID to BID as needed
Older crias – 4 to 5 mL, SID to BID as needed
Yearlings – 5 to 7 mL, SID to BID as needed
Adults – 7 to 10 mL, SID to BID as needed

You can mix Kaolin and Imodium together in one container (3 parts Kaolin: 1 part Imodium) for convenience. Use the Kaolin dose amounts listed below.

E. Iron Dextran – for use with anemic camelids, can be used in conjunction with Vitamin B_{12}. Iron is very irritating and will cause lameness if given IM, so **only inject SC**. To make the injection less irritating, the iron can be diluted using equal parts sterile saline. Iron can cross the placenta, so unless the life of the dam is at risk, should not be used in pregnant camelids. Iron is not readily eliminated from the body, so overdosing can be toxic. Oral iron supplementation alone is not effective in the treatment of iron deficiency anemia in ruminants. On occasion anaphylactic reactions can occur. No research has been done on the correct dose in camelids. The dose listed was obtained from a published article about treatment of iron deficient llamas. Also, this dose has been used clinically without apparent problems.

Dose: 300 mg (alpaca adult), 500 mg (llama adult) SC, every 3 days for 5 total treatments

F. Isoniazid (300 mg tablets) – for use in combination with antibiotics (i.e. Nuflor OR Penicillin G OR Draxxin) for chronic infections. Most commonly used to treat tooth root abscesses, inner ear infections or lumpy jaw. Helps antibiotics penetrate the abscess capsule. Needs to be used long term for best results. May be special order.

Dose: 9 mg/lb, PO, SID for 30 – 60 days (3 tablets/100 lb)

G. Kaolin Pectin 4 – to help control moderate diarrhea in crias and adults. These are estimated doses, each animal needs to be monitored for what works for them. Best to not routinely use the human version as it contains aspirin, which can be damaging in some situations. Check labels for only Kaolin & Pectin.

Dose: Young crias – 5 to 7 mL, SID to BID as needed
Older crias – 7 to 10 mL, SID to BID as needed
Yearlings – 12 to 15 mL, SID to BID as needed
Adults – 20 to 30 mL, SID to BID as needed

NOTE: it is important to determine the cause of diarrhea and not just stop the diarrhea

H. Colostrum supplement/feeding – there are many occasions that crias will need to be fed either supplemental colostrum or a full course of colostrum if the dam does not have adequate supply, the dam dies or the cria is too weak or unable to nurse its dam. The minimum amount to feed is 10% of their body weight in the first 12 hours. Most crias will readily nurse a bottle if not, they can be tube fed to get the colostrum into them. For example, 10% of a 16 lb cria results in about 26 oz of colostrum being fed (20 lb, 32 oz colostrum), divided into several feedings. The average size cria can be fed ~3 – 4 oz every 2 – 3 hours, adjusting as needed for size. Colostrum (~12 oz) can be frozen in Zip-lock freezer bags laid flat to store. It can be either Cow or goat, making sure to check with the farm for BVDV status and other contagious diseases. It is best to only keep the Colostrum in the freezer for one cria season as the valuable IgG proteins will break down over time (1 year). Powdered Colostral supplements can also be fed. Make sure to mix according to the directions for goat kids. Also, most commercially available products are only supplements and it relies on the newborn obtaining additional Colostrum from its dam. There are few products that are actual Colostrum replacer, one such is Bovine IgG Calf's Choice Total® Gold made by The Saskatoon Colostrum Company available from your Veterinarian. There may be newer products coming on the market as this is an important component for raising calves.

NEW

I. Equidone Gel (Domperidone) – is a product used in horses to stimulate milk production in mares that have what is termed Fescue toxicity which causes them to have low milk production when they give birth. Equidone is also used in Camelids to encourage milk production after the cria is born. There are few side effects, but on rare occasion may cause some indigestion in some as it stimulates gut motility.

NEW

Dose: Alpaca: 5 mL, orally, twice daily. Give for 5 - 10 days
Llama: 5-7 mL, orally, twice daily. Give for 5 - 10 days

J. Oral supplements – there are many, many oral vitamin and mineral supplements. Few if any have been researched in camelids, even the ones labeled for camelids. Be careful of the products that contain Copper as they can be toxic/accumulative over time, like Red Cell. The products labeled for sheep and goats are probably safe to use in camelids. Some products claim to help with weight gain, and in non-ruminants, they may be correct, but products high in fat will not help camelids as they do not digest fats in the same way as simple stomach animals. One product, Alpaca and Llama Nutri-Drench by Bovidor Laboratories (and Goat drench) seems to be a safe product and although will not specifically help them gain weight it has vitamins and minerals that many debilitated animals may be lacking. Follow the manufacturer's directions.

K. Thiamine (Vitamin B_1) – used for the treatment of Polioencephalomalacia and any neurologic disease. Should only be used with direction from your veterinarian. Concentrations vary with different products, so calculate amount to be administered carefully. Can cause neurologic signs if too much is administered IV rapidly. Must be used with extreme caution if given IV as it can cause seizures. Start with lower dose, increase only if the animal is not responding (still depressed, blind).

Dose: 9 – 18 mg/lb, SC, SID to QID

L. Vitamin A & D – used routinely in crias to help prevent rickets and leg angulation. Do not overdose as can cause organ failure. Injectable form is more consistently absorbed than oral form, but either form is effective. Repeat injectable form every 60 days, repeat oral form every two weeks. DO NOT use both forms! There are many products available, so the dose needs to be calculated carefully based on the product used. Always ask your Veterinarian if you have questions prior to dosing. The dosage needs to be calculated based on the Vitamin D concentration in the product. Dose until 1 to 2 years old.

Dose: 1,000 IU/lb, SC, every 60 days OR
33,000 IU, PO, every 2 weeks

M. Vitamin B_{12} – for use with anemic camelids. Can be used in conjunction with Iron Dextran as Vit B_{12} helps the body absorb iron. Concentrations vary with different products. As with many medications in camelids, there is no labeled dose, however it has been used clinically for many years in camelids with no apparent problems. As a comment, it is a bright red liquid. At the end of the treatment, recheck the Packed cell volume (PCV) to confirm improvement of anemia.

Dose: 3,000 mcg (alpaca adult), 5,000 (llama adult), SC, daily for 7 days, then three times a week for 3 weeks

There are **three drugs** I recommend for every farm to have readily available: **Banamine, Thiamine and Epinephrine.** As with all medications, they should NOT be stored in the barn unless you have a temperature-controlled area. Medications that undergo freezing or extreme heat are more likely to cause problems and/or not be effective. Frequently you will not use the majority of the medications before they expire. With that in mind, do not have a pharmacy of everything, just the ones most commonly used.

In conclusion, as stated above, I have provided this information to be a helpful guideline only. It is NOT meant to replace your local veterinarian. Many of the drugs listed, even the nonprescription ones can have fatal consequences if used inappropriately. The information is correct to the extent that information is available. Please share this information with your veterinarians. If you have any questions, please ask your local veterinarian or contact Dr. Walker at 419 – 306 – 9522 or pamwalker@hotmail.com.

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Dr. Pam Walker, personal observation

Introducing the Fourth Edition of Dr. Fowler's Medicine and Surgery of Camelids, edited by our own Dr. Niehaus