Dealing with Common Maladies of Camelids

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Normal Physical Exam findings:

Temperature – 100- 102°F
Heart rate – 40 – 60 bpm (Cria: 80 – 120bpm)
Respiratory rate – 10 – 30 bpm

Since camelids are prey animals they show minimal signs of pain. When handling camelids "less is more"! Always take it slowly and build trust so that subsequent interactions become easier. Sedation protocols can aid handling (xylazine, butorphanol and or ketamine). In most cases 0.1 mg/kg butorphanol IV/IM or SQ will give adequate sedation for minor handling and examination.

Common Diseases

There are some common diseases that occur in alpacas that you should be aware of. Below is a short description of the diseases and clinical signs you will see with each. Please contact us if you would like to know more.

Intestinal Parasites

Some degree of gastrointestinal parasitism is always present in farm animals (refugia). The goal is to keep numbers low, allowing for optimum health of the animals. In our area of the country, gastrointestinal parasitism can be devastating. Typically, start-up herds have a "grace period" before the development of clinical parasitism. During this time parasite contamination is building up on the pasture. Camelids have not evolved to deal with parasites. In the Andes, they grazed under extensive conditions and the climate was not optimal for persistence of parasites on pastures. Their innate immunity to parasitism is therefore lower than sheep. Guard animals kept with sheep are at greater risk for parasitism and should be monitored closely. The most common parasites include *Haemonchus, Trichostrongylus, Trichuris, Nematodirus* and *Coccidia*. Clinical signs may include pale conjunctiva and other mucous membranes, weight loss, exercise intolerance, peripheral edema (bottle jaw, swollen vulva or scrotum), loose stool, weakness and down animals.

- We recommend testing fecal samples on a proportion of the herd (at least 10 animals or 10% of herd) at least every month to monitor for parasitism. Deworming should be based on burden, rather than routine, to avoid the risk of parasite resistance forming. Identify animals that repeatedly show signs of parasitism (i.e. ill thrift, weight loss, diarrhea), to assist in culling decisions.
- Manage dung piles
- Removal of these susceptible animals from the breeding herd will result in selection of animals with genetic parasite resistance.
- For *Haemonchus* infestation, monitoring mucus membrane color can assist with treatment decisions. FAMACHA charts are available that correlate the color of the membranes in the eyes with a code on the chart relative to need for anthelmintic treatment. This method is only useful for controlling the worms that suck blood and should not be used for crias or pregnant animals.

- Utilization of a single anthelmintic until it no longer works effectively in the herd for controlling parasites will delay parasite resistance development on the farm because the parasites remain naïve to the alternate anthelmintics we have available. See list of available anthelmintics below. Ensure proper use of the anthelmintic by dosing to accurate weights or at least to the heaviest animal in the cohort. Anthelmintic choices are limited so every effort needs to be made to prolong the life the those that are still effective. This can be achieved with targeted deworming, monitoring, and careful management of the environs. Resistance has already been documented to avermectin/milbemycin and benzimidazole families.
- Pasture rotation is useful for maintaining nutrient value of the pasture and reducing larval development in the field. If the pasture is kept short (<10 inches) there is greater exposure of ultraviolet light to the base of the pasture. Most of the larvae are concentrated in the bottom 2 inches of pasture. If necessary mow the pasture to maintain adequate height. Division of pasture into small paddocks allows rotational grazing. This serves two purposes: it prevents overgrazing and allows regeneration of grass but also spells pasture, giving time for parasites to desiccate or freeze between grazing. For pasture rotation to be effective, water and shelter need to be available in each paddock. Avoid overstocking of pastures. Depending on pasture type and growth rates up to 8 camelids per acre may be tolerated.

Table 2
Anthelmintics used in New World camelids

Active Ingredient	Dose/Route[a]	Spectrum
Albendazole[b]	10 mg/kg, oral	*Fasciola hepatica*, *Moniezia*, GIN, lungworms
Fenbendazole	10–20 mg/kg, oral, 3 days if whipworms present	GIN, lungworms, whipworms
	20 mg/kg, oral, 5 days	*Nematodirus*
	50 mg/kg, oral, 5 days	*Moniezia*
Mebendazole	22 mg/kg, oral, 3 days	GIN
Thiabendazole	50–100 mg/kg, oral, 1–3 days	GIN, lungworms
Pyrantel pamoate	8.5 mg/kg, oral	GIN
	18 mg/kg, oral, 3 days	Cestodes, GIN
Ivermectin	0.2 mg/kg, oral or subcutaneous	GIN, lungworms, sarcoptic mange, sucking lice
	0.4–0.6 mg/kg	Whipworms, *Cephenemyia*
Moxidectin	Not advised unless resistant nematodes are documented in the herd	
Levamisole[c]	5–8 mg/kg, oral or 6 mg/kg, subcutaneous	GIN, lungworms
Clorsulon	7 mg/kg, oral	*Fasciola hepatica*
Praziquantel	50 mg/kg, oral	*Dicrocoelium dendriticum*

Not all compounds are available in all countries.
[a] Given once, unless otherwise noted.
[b] Do not use in pregnant animals.
[c] Accurate weights are critical to proper dosing; not recommended in lactating animals.

Ballweber 2009.

Meningeal Worm

This neurologic disease is caused by the parasite *Parelaphostrongylus tenuis,* which is carried by the white-tailed deer and uses the snail as an intermediate host. Snails are accidentally ingested as the camelid grazes and the *P. tenuis* larvae are released in the stomach. From the stomach, the larvae migrate to the spinal column. Once there the larvae migrate through the spinal cord causing parasitic tracts and inflammation, resulting in clinical neurologic disease. There is no good treatment for this disease. Camelids are much more susceptible to clinical disease with *P. tenuis* than other animals. The

most common signs of disease are weakness and ataxia in one or both of the hind limbs that progresses to an inability to walk and ultimately a down animal. A meningeal worm preventative program includes administering ivermectin subcutaneously to your animals each month from July through November in high risk areas. The major concern with these programs is that they may promote gastrointestinal parasite resistance to anthelmintics because sub-therapeutic doses of anthelmintic will reach the intestinal tract from parenteral administration. In addition, preventing access of white-tail deer to the paddocks and keeping the paddocks dry to decrease the habitat suitable for snails is important.

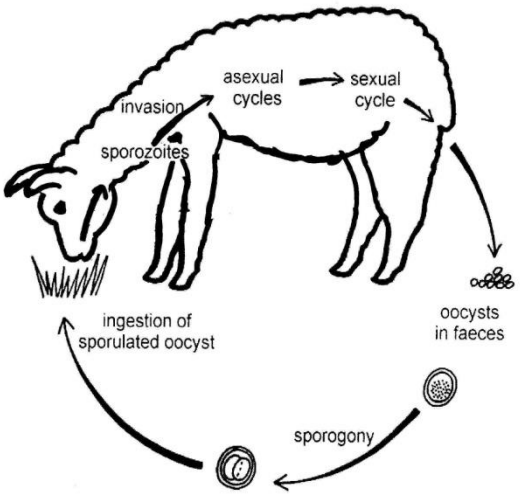
COCCIDIOSIS in Camelids

Coccidia are parasites that can cause mild to severe disease in camelids.

Coccidia are microscopic one-celled organisms that live and reproduce within the cells that line the intestinal tract. They are transmitted to other camelids by infected feces in moist environs. Coccidiosis can occasionally cause death but it is treatable. While a coccidia infection may be seen in adult camelids, younger camelids are more at risk. A healthy camelid keeps coccidia in check with its own immune system. Young camelids whose immune system is not fully developed, camelids with poor nutrition, stressed camelids, or camelids that have other diseases can all be susceptible to coccidiosis.

When a camelid's immune system is weakened, it is unable to keep coccidia in check and the organism increases its reproduction. The increased amount of coccidia causes the cells lining the intestine to rupture. When large numbers of the cells are destroyed, you will see diarrhea and dehydration. Appetite loss is possible and if the infection is severe enough, you may see bloody diarrhea.

Typically, most young animals will go through cyclic phases of oocyst shedding. Clinically it appears that a healthy animal will decrease the oocyst count naturally over time regardless of whether treatment is administered.



Life Cycle: The time from ingestion of sporulated oocysts to shedding in the feces is usually 3 weeks.

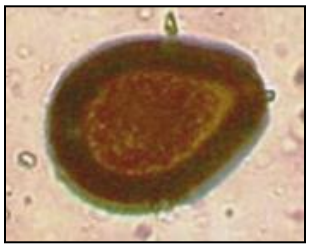
Treatment: Corid™ (Amprolium) is commonly used as a treatment and to prevent this parasite. This medication does not kill this organism. It inhibits the reproduction of coccidia. By stopping reproduction, the camelid's own immune system is allowed to develop and take care of the infection. Alternatively, some people recommend the use of Albon™ (Sulfadimethoxine) for treatment of clinical coccidiosis.

Control: Good hygiene is essential to coccidiosis control. Coccidia oocysts are resistant to environmental degradation and to most disinfectants and can even overwinter. Moisture, the correct temperature and oxygen are needed for the oocysts to sporulate to the infective stage. This can happen as quickly as three days given the right conditions.

Clean up fecal pellets before the oocysts can sporulate (refer to life cycle chart). Rake up or scrape pens and remove soiled or wet bedding every day. Do not wash down the area as this provides a source of moisture required by the coccidia.

Dry up all moist areas in pens and allow the sunlight to disinfect the area.
Segregate juveniles by age and house in small groups.
Design feeders so animals cannot climb in them and contaminate them with fecal pellets.

Eimeria macusaniensis: aka *E. Mac*



Eimeria macusaniensis is a more significant protozoal parasite in South American camelids. In the United States, it is thought to be widespread and is notable as a parasite because it affects all ages of camelids and can cause sudden death.

Life cycle: After ingestion of a sporulated oocyst the parasite undergoes asexual reproduction in the small intestine. As this process proceeds the parasite destroys the cells lining the small intestine and continues to invade new cells. Sexual reproduction then occurs and unsporulated oocysts are shed in the feces. *Eimeria macusaniensis* takes 32 to 36 days to complete its cycle in the host animals and its 39-43 days before oocysts are seen in the feces. This is 10 to 14 days longer than we expect with other coccidia species. Recent evidence suggests *E. mac* may be able to stay infective in the environment for up to six months.

Clinical signs: *Eimeria macusaniensis* is distinct from other coccidia species in that it can cause disease in all ages of camelids. Clinical signs are non-specific and are often seen before the oocysts are detectable in the feces. These signs include anorexia, weakness, weight loss, ill thrift, colic, and acute death.

Diagnosis: A definitive diagnosis can be difficult to obtain due to the animal being sick before oocysts are shed in the feces. Due to the significant damage the parasite causes in the intestines, blood work often shows a significantly low serum protein concentration.

Intestinal biopsy and microscopic examination of the tissue can help diagnose infections before shedding starts.

Fecal egg counts at weekly intervals are needed to detect *E. mac* oocysts as it does not shed large numbers of oocysts. A single oocyst of *E. mac* on a float can be significant. Typically, a centrifugation technique is required to increase the opportunity to find oocysts. My preference is the Modified Stoll's technique.

Treatment: There have been no studies to date that demonstrate efficacy of treatments for *Eimeria macusaniensis*. Amprolium (Corid), Ponazuril (Marquis) and sulfadimethoxine (Albon) appear to have some efficacy during the early stages of intestinal disease.

Table 3
Anticoccidial Compounds Used in New World camelids

	Active Ingredient	Dose/Route
Prevention	Amprolium	5 mg/kg, orally, 21 days
	Decoquinate	0.5 mg/kg, orally, 28 days
Therapy	Sulfadimethoxine	55 mg/kg, subcutaneous, day 1 22.5 mg/kg, subcutaneous, days 2–5
	Ponazuril	10–20 mg/kg, oral, once daily for 3 days
	Toltrazuril	15–20 mg/kg, oral[a]

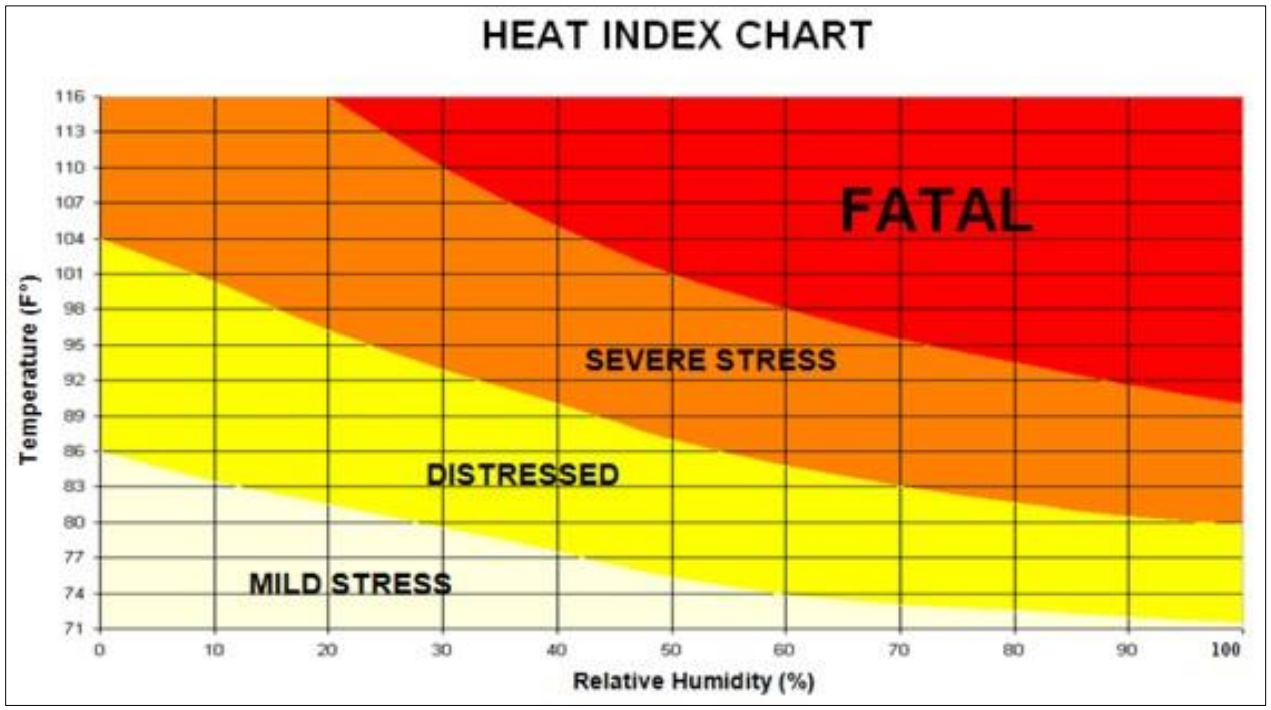
[a] Single oral dose in calves (15 mg/kg) and piglets (20 mg/kg) as preventive; no data is available on its use in treating coccidiosis in camelids.

(Ballweber 2009)

Heat Stress

Alpacas as a species are very susceptible to heat stress. It is important that animals have access to shade and water at all times. Additionally, fans or water spraying devices can be used to cool

animals. The most effective heat exchange in a camelid is from its underside. Avoid dousing the top side as the fleece tends to form an insulating layer trapping in the humidity.
Shearing in early spring is important to prevent heat stress. As a minimum fiber should be removed from the shoulders to hips and around the abdomen.



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Gastric (C3) ulcers
Stomach ulcers can frequently cause illness and even death in llamas and alpacas. Although the exact cause of these ulcers is unknown, stress (from environmental/weather challenges, social changes, metabolic) appears to be the most common predisposing factor.
Just like in other species, camelids seem to get ulcers when they are in the hospital or when they are sick for another reason. Camelids are herd animals, so if they leave the herd behind, they seem to get stressed.
The signs are teeth grinding, excessive salivating, not eating, regurgitation, laying down a lot because their stomach hurts and very black stools. Signs can be of vague colic also.
Diagnosis is difficult. A fecal occult blood may be helpful if positive but not reliable if negative. Ultrasonography of C3 showing thickening and edema of the wall is suggestive of C3 ulcers.
Unfortunately, many of the drugs commonly used to treat stomach ulcers in other species are ineffective in llamas and alpacas. Treatment and control involves reducing stress, i.e. travel with a buddy or two, and maintaining health, a protective environment, etc… Specific ulcer treatment includes gastric protectants like sucralfate and parenteral H2-receptor antagonists (ranitidine) or proton-pump inhibitors (pantoprazole). Bioavailability of oral omeprazole in camelids is very low and barely changes gastric pH. Pantoprazole is an irreversible proton pump inhibitor that accumulates in the parietal cells of the gastric mucosa and suppresses gastric acid secretion by reacting with the proton pump. One study (Smith, et al 2010) found third compartment pH would slowly increase over a 24-hour period by 1 to 1.5 pH units, peaking 6-8 hours after administration. Current recommended dose rate is 1-1.5mg/kg IV or SC daily.

Candidatus Mycoplasma haemolamae

This is globally endemic in camelids. It was first identified in 1990 in the USA. Most healthy animals mount an immune response and clear it. *M. haemolamae* is associated with mild to marked anemia and rarely death in stressed, immune-suppressed and debilitated camelids. In some herds, it has been associated with acute collapse, chronic weight loss, depression and lethargy. Disease is often precipitated by shipping or movement to a new premise. It is possible that many infected animals do not show clinical signs of infection. Studies of Peruvian and Chilean camelids suggest that there may be increased risk with increased age as no infection was seen in camelids younger than 18 months or 3.3 years respectively.

This parasite transmission is uncertain but is suspected to be transferred via blood by biting insects, needles and equipment and possibly in-utero.

Fresh blood smears need to be submitted when investigating anemia in camelids since the organisms are only lightly attached to the red blood cells resulting in missed diagnoses if the smears are made at the laboratory. PCR may be helpful in detecting lower levels of infection and carrier states.

Treatment with 20 mg/kg oxytetracycline subcutaneously every 3 days for five doses will help clinically ill animals but won't clear the infection completely (McLaughlin et al 1990).

It is useful to remember that having detectable organisms via PCR assay does not correlate closely to PCV, rectal temperature, or the presence of clinical signs (Tournquist, et al 2009).

Tooth root abscess

These can occur in animals of any age, but commonly 4-8-year olds are affected. This corresponds to when the permanent molar teeth are erupting. Feeding of coarse hay fiber hays have been associated with development of tooth root abscesses. (Anderson 2006)

The mandibular teeth are usually more commonly affected, with the premolar and molar tooth roots more frequently involved. Mandibular teeth are 15 times more likely than maxillary teeth to be affected (Niehaus 2009).

Clinical signs include hard bony swelling over the mandible with or without a draining tract. There may be soft tissue involvement. The degree of swelling is indicative of how long the disease has been present. A draining tract is present late in the disease. Typically, the camelids will eat normally but may show signs of weight loss or anorexia and sometimes will pack feed in their cheeks.

Diagnosis is usually fairly straightforward, but a thorough physical and oral examination along with radiographs will help rule out cud packing in cheek, mandibular osteomyelitis without tooth involvement, soft tissue abscess, salivary mucocoele, foreign body, facial bone fracture and neoplasia.

Treatment options include medical therapy, surgical therapy or a combination. Chronic cases typically do not resolve from medical therapy alone.

Medical therapy commonly includes florfenicol at 20mg/kg SQ every other day for 10 treatments. According to Anderson (2006) less than 40% of cases are expected to resolve with long-term antibiotics (4-6 weeks). Extensive curettage of necrotic bone along with long-term antibiotic therapy will increase treatment success. Their experience suggests a combination of surgical drainage, curettage, and long-term antibiotic therapy can be expected to resolve about 60% of tooth abscesses. Surgical removal of the infected tooth, partially or completely, is expected to be successful in approximately 90% of cases (Cebra 1996).

Trueperella and *Bacteroides* are the most commonly isolated organisms so Penicillin, Ceftiofur or Florfenicol are appropriate drugs. NSAIDs are also useful in decreasing pain and inflammation associated with the osteomyelitis.

Refractory cases may respond to isoniazid (Niehaus 2009)

Common antimicrobials and anti-inflammatory drugs used to treat tooth-root infections

Drug	Dose	Frequency	Route	Duration
Procaine Penicillin G	33,000u/kg	Once daily	IM	14 days
Ceftiofur	2mg/kg	Once daily	IM	14 days
Florfenicol	20mg/kg	Every other day	IM	3-10 treatments
Isoniazid	6-10 mg/kg	Once daily	Oral	4-6 weeks
Flunixin meglumine	1 mg/kg	Once daily	IV	As needed

(adapted from Niehaus 2009)

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