Common Diseases and Procedures in Camelid

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Introduction

Lama is the term used to refer to South American camelids, including llamas, alpacas, guanacos and vicunas. Although primarily used for show and recreation in North America, llamas make great companion pets. These animals differ from true ruminants in many ways, and individuals need a good understanding of the llama to work with these animals more effectively. Llamas ingest forage, regurgitate and rechew (i.e. ruminate); however, they are not ruminants. The camelids possess a 3-compartmented stomach, easily remembered as C-1, C-2, C-3.

These notes are designed to provide a basic introduction to common diseases and procedures experienced in veterinary private practice.

Restraint

The level of restraint needed in working with llamas varies depending on the amount of handling the animal has received from the owner. The llama naturally resents having its head and neck approached unless it has been desensitized to human touch. Most llamas can be easily taught to halter lead and this should begin at an early age (4–8 months). Juvenile llamas can be restrained by either cradling them in arms or physically holding them down in lateral recumbency. Straddling these animals while in the cush position can also be an effective restraint technique. Adult llamas which have been adequately handled usually will tolerate a physical examination of the head when approached in a calm, caring fashion.

Anxious animals require the use of alternative restraint methods. There are several varieties of chutes available to physically restrain llamas that will make physical examination much more acceptable to all involved. Chemical restraint is a viable option to consider for a variety of procedures. This author routinely uses Xylazine (0.05 – 0.1 mg/kg IV) for minor sedation's and standard field procedures like fighting teeth trimming. Yohimbine at 0.125 mg/kg IV works well for reversal. Butorphanol at 0.05 – 0.01 mg/kg can be added for deeper sedation and more painful field procedures like castrations. Ear twitching is sometimes effective for brief procedures but this technique is not always acceptable by owners. The method of restraint should vary and be appropriate to offer comfort to the animal, facilitate ease in performing the procedure by personnel and the owner.

Common Procedures

A good physical examination is key to confirming and diagnosing suspected problems in the llama. Normal ranges for temperature, pulse and respiration are listed below

The Normal Llama

Resting body temperature:	37.5–38.9 C (99.5–102 F)
Heart rate:	60–90 bpm
Respiratory rate:	10–30/minute
Gastric motility:	3–4 contractions/minute (This is more rapid than with ruminants). Palpation of the first compartment is difficult and auscultation will be necessary to assess motility.
Gall bladder:	Not present

In addition to the external genitalia, male and female can be differentiated by the presence of canine teeth in the male and the thicker neck and thicker skin (0.5 inch) overlying the jugular veins of the male. This thickened skin and the wool on the neck severely complicate the process of jugular vein catheterization. Additionally, the vessel traverses differently compared to farm animals, making it very difficult to identify. These differences from other species should be kept in mind before one gets completely frustrated. The course of the vein as it passes medial to the cervical vertebral transverse processes in the mid-portion of the neck leaves less length available. The jugular may be balloted or "stroked" about 8 cm below the angle the ramus of the mandible makes with the neck. The jugular does not stand out as it does in the ruminants when occluded. Another site to try is cranial to the point of the shoulder. The skin is thinner; however, restraint is critical to prevent injury to the phlebotomist; the carotid is closer to the jugular in this area.

Llamas tend to toe out. The foot is padded but the horny nail may require trimming on a routine basis. A scent gland is located on the lateral side of the rear leg. Some people find the scent emitted to be too similar to the odor of mice. Llama erythrocytes are ellipsoids that pack into a smaller volume, resulting in a lower PCV.

Nutrition

Llamas should be encouraged to graze. They thrive on timothy type hays. All llamas should receive small quantities of llama chow (Mazuri) on a daily basis as the most complete knowledge we have about llama nutritional requirements has been formulated for delivery by that feedstuff (e.g. vitamin and mineral requirements, etc.). Don't feed llamas sweet feed or horse chow. Don't let them get too fat, as you predispose them towards heat stress and many other problems.

Vaccination

There are **currently no drugs approved for use in llamas**. This includes vaccines, anthelmintics, antibiotics, etc. Everything is extra-label use, as of this writing. I recommend using seven way clostridial, western nile and rabies as minimal vaccines. Other vaccines may need to be given based on regional disease problems.

Parasites

Many parasites affect llamas. Nematode parasites include Haemonchus, Trichostrongylus, Camelostrongylus, Nematodirus, Strongyloides, Capillaria, and Oesophagostomum. A fecal is important for identification of the problem and to estimate the parasite load. Clinical signs are similar to other species affected by these parasites.

The meningeal worm, Parelaphostrongylus tenuis, causes few problems in the natural host, the white tailed deer; however, in an aberrant host such as the llama, clinical signs are consistent with the area of migration through the spinal cord: lameness, paralysis, blindness, etc. Frequent deworming and maintaining a deer-free llama enclosure is recommended; also, avoiding areas with heavy snail or slug populations is useful. There is no antemortem procedure to definitively diagnose meningeal worm migration as the cause of neurological signs in an animal. Very few llamas have been successfully treated following infection with this parasite. The treatment protocol is costly, requires much time and patience, and a successful outcome is not guaranteed. The treatment protocol suggested by Dr. I. A. Davis (Iowa State University) is listed below.

Treatment Day	Therapy:
1	DMSO, 1 gm/kg in 2–3 liters of saline I.V. Banamine, 0.5 mg/kg I.V. q 12 hrs Ivermectin, 0.6 mg/kg i.m. or s.q. Panacure Paste, 30 mg/kg PO
2	DMSO, Banamine, Panacur as above
3	as for Day 2 Begin Prednisone Paste at 1 mg/kg PO q 12 hrs
4	Banamine, Panacur, and Prednisone as above
5	Banamine and Prednisone as above
6,7	Prednisone as above
8–12	Prednisone Paste at 1mg/kg PO q 24 hrs
13–26	Prednisone Paste at 1 mg/kg PO every other day

Tapeworms are found in llamas. Usually clinical signs are minimal. Coccidia, giardia and toxoplasma have been reported as well as sarcocystosis. The common liver fluke (Fasciola hepatica) can cause severe disease in the llama.

Anthelmintics have been used based on extrapolation from other species. Doses are available in the literature. Common sense husbandry practices such as avoiding contamination of food and water sources by llamas or carnivores (dogs, cats) and quarantining new arrivals can be important in parasite control.

Heat stress

Heat stress in llamas is a real threat, especially those kept in our area. Llamas are animals of altitude and require careful management to prevent heat-related problems. Heavy hair coats, obesity, stress from sickness, infections, and forced recumbency from injuries or fractures make llamas more susceptible to heat stress. North Carolinas' humidity is particularly difficult to tolerate. Since the llama's main area for heat loss is the thin wooled area on the ventral abdomen, any problem resulting in recumbency will predispose the llama to heat stress. Unfortunately, a severe case of heat stress will result in the animal becoming recumbent. Southern llamas commonly have the wool around their abdomens cut short in a "poodle" cut.

Animals that are reluctant or are unable to rise should be carefully examined. An elevated rectal temperature will usually be evident. Weakness, anorexia, and neurologic signs (including convulsion and respiratory arrest) may be noted. Animals may eventually lose their central thermoregulatory ability. CK will be elevated. Treatment is to correct the body temperature and support the animal physiologically. Spraying the animal with cold water may be useful but should be directed towards the ventral abdomen. If whole body wetting is attempted, make certain the droplets reach the skin surface because retention of droplets on the external surface of the wool will only make the animal feel hotter. If convulsions are occurring, ice should be applied to the back of the head. Antibiotics, selenium and anti-inflammatories are recommended in the literature. Correction of the electrolyte abnormalities and prevention of muscle damage due to recumbency is important. It may be necessary to sling or lift the animal to encourage standing.

Blood Collection

For blood collection, the most common site used is the jugular vein. This can be performed on the right or left side, but care should be taken not to traumatize vital structures (esophagus, trachea, nerves, carotid arteries). For smaller amounts of blood, an ear or tail vein may be used.
Intravenous catheterization is best performed in the right jugular vein. In older animals the fiber and skin are usually thick, making visualization and palpation very difficult. The vein is located just ventral to the lateral spinous process of the cervical vertebrae. It is necessary to make a skin incision to avoid damage to the catheter. The skin may be 1/4" thick here. There are a series of jugular valves which make catheterization even more difficult. This clinician prefers a 14-gauge 5 inch catheter for adults and 14-gauge 3 inch catheter for crias

Injections

Sites for intramuscular injections in llamas are limited due to their poor muscular tone. The caudal thighs and anterior pectoral muscles are commonly used. If frequent injections are needed, it is best to rotate muscles to prevent soreness. It is better to go subcutaneously whenever this option is available.

Oral Medications

The administering oral medication can be tricky. Llamas will commonly hold medication in their mouth and spit it out if they don't like it. Adding a flavor may improve successful treatment. Administer of larger liquid volumes may require a stomach tube. Some llamas tolerate this procedure better than others. A mouth speculum can be readily made with a 12 cc syringe case to fit crias simply by cutting off the tip. Always be sure that the tube is in proper location before administering medications.

Feet

When it comes to working on feet, most llamas accept trimming and examination under normal circumstances. However, unhandled or diseased patients may be challenging to work with, and they may attempt kicking or stomping. Many will cush to avoid having to feet lifted.

Fighting Teeth

Males fight viciously and may do severe damage with their sharp fighting teeth. For this reason these teeth should be cut down to prevent damage. This can be accomplished with a dremel tool. These teeth will continue to grow and may require retreatment.

Reproduction

Females are induced ovulators. Usually the males are re-introduced to the female about 12 days following parturition. At this time, the male usually will run to the poop pile and sniff. If any open female is present, he will immediately recognize progesterone in her urine and will unwaveringly run right to her. The female will run from the male and he will pursue her for a short time, vocalizing continuously (this sound is called an ortle). If he has made an error and she is pregnant, she will spit him off repeatedly during this process until he stops and leaves her alone. If she is not pregnant, she will allow herself to be mounted and will cush. Mating occurs in the cush position. The legs of the male squeeze tightly about the body of the female. The sound of the ortle, the cush position, and the pressure exerted by the limbs of the male are all necessary to induce ovulation. Artificial insemination (AI) has not been particularly successful in the past and this has helped to maintain the individual financial value of intact males. Current methods using

human chorionic gonadotrophin (HCG) or gonadotrophin releasing hormone (GNRH) and breeding with a vesectomized male are making AI appear feasible in the future.

Females typically carry one viable fetus and most commonly in the left horn of the uterus. Twin pregnancies can occur. Ultrasound is commonly used to diagnose pregnancy. Rectal exams can be performed by those with smaller hands.

The baby llama is commonly called a cria and weighs 25–35 lbs. Normal gestational length is 335 to 360 days. Placentation is described as diffuse and epitheliochorial, as in the mare. The cria and dam hum to each other; this vocalization begins immediately after birth and probably helps the neonate locate its mother very rapidly. In the wild, most cria are born in the daytime because they must be dried off and capable of thermo-regulating before the approach of the chill cold of night in the Andes. Like other herbivores, colostrum must be ingested to provide antibodies to the immunocompromised neonate. Goat colostrum can be substituted for orphans; llama plasma can be purchased commercially. The biggest mistake made in administering plasma to neonates is that large animal veterinarians forget the small size of the cria and may administer such large quantities that pulmonary edema results. Males are subservient to neonates and usually pose no threat to them until they begin to experience puberty.

Neonates

Constipation can occur due to meconium impaction. Diarrhea can develop from overfeeding (especially when being bottle fed). Beware of Berserk male syndrome, which occurs when male bottle-fed crias become bonded to humans. Later, at puberty, the llama will display aggressive behavior towards humans as they would otherwise normally demonstrate towards other llamas.

Berserk Male Syndrome

Llamas can kick and bite other llamas or people. An occasional animal, particularly orphaned males raised by hand, become imprinted on humans as youngsters, and demonstrate dangerous behavior towards humans. This is sometimes called the “berserk male syndrome.” These animals are extremely dangerous. Castration does not affect the behavior of “rogue” males, and owners are usually forced to euthanize the animal. Be cautious when raising orphans, especially males, or overhandling youngsters. Be very cautious if asked to work with a rogue male llama. The majority of llamas are quiet, serene animals with kind dispositions, and no more dangerous than any other animal of its size (llamas can weigh upwards of 500 lbs.). All llamas should be trained to be led by halter and all llamas should be taught to cush.

Common Problems/Diseases Encountered

Colic and C3 Ulcers

Llamas are prone to third compartment ulcers and all the other acute abdominal problems from which bovine suffer. These disease processes may cause the llama to cast itself, roll on its back, kick at its side, or lie continuously in lateral recumbency. Radiographs, electrolyte assessment, abdominal taps and rectal palpation of adults may help make a decision before or against acute abdominal accident requiring surgery. Since stress (e.g. being the lone llama on a farm, show schedules, competition for feed, etc.) can predispose to C3 ulcers, one should take into account the llama's recent past history. Acute abdominal crisis is often complicated by secondary heat stress so keep these animals as cool as possible. C3 ulcers have been reported to respond to intravenous or oral omiprazole; standard H-2 blockers are not as effective. Research has shown that injectable Lansoprazole is more effective for treating stomach ulcers in camelids. However, availability and price makes it restrictive.

Clostridial infections

All clostridial diseases can occur in camelids. Enterotoxemia types, C and D are most common in North American lamas. The clinical signs of enterotoxemia caused by types C and D are similar to the corresponding disease in ruminants. Type C is more often seen in younger animals, with type D in older animals on a high plane of nutrition. Tetanus has also been reported.

Rabies

Llamas can, and do, get rabies. Many owners do not know this so be sure to encourage them to vaccinate. It is best to use the killed vaccines.

Equine herpes virus

EHV-1 was diagnosed in a herd of llamas exposed to zebras. Owners may request vaccination. Again, there is no efficacy known for equine vaccines in the llama and care should be used. Use only killed products!

Leptospirosis

Leptospira abortion in llamas has been reported. Lepto bacterins in multiple serovar combinations have been used in llamas.

Tuberculosis

TB has been a difficult problem in the llama industry as well on the regulatory front. Tuberculin testing of the caudal tail fold is not considered reliable.The axillary region is test site of choice. Llamas are susceptible to tuberculosis and therefore may be required to be tested for transport, sale or show. Contact the state authorities for the latest update on requirements.

Johnes

Johnes disease can cause chronic wasting disease in lamas as in ruminants. Depending on the degree of illness, diarrhea may or may not be present. Supportive therapy and treatment with clofazamine may help reduce clinical signs and increase survival time with long life therapy. Further study is needed on this disease in lamas.

Conclusion

When it comes to working with llamas, the slow and easy approach usually works best. If the animal's first experience with clinical personnel is positive, it will go a long way in acceptance for future treatments. Understanding the llama's body language and responses to procedures are key to success in handling them. A happy "hum" and a nose sniff are the ultimate signs of gratitude.

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