

ALPACA GENERAL MEDICINE LECTURE

PEACEFUL HEART ALPACAS
May 28, 2016



Healing Springs Animal Hospital

107 Nuckolls Curve Rd Galax, VA 24333

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About Dr. Jenkins:

Education & Academic Achievement

- Obtained her bachelor's degree from St. Andrews Presbyterian College where she graduated Magna Cum Laude.
- Earned her doctorate at Virginia Tech (Virginia Maryland Regional College of Veterinary Medicine) in 1998. At Virginia Tech, Heather was the recipient of the Dr. Robert F. Fernbaugh Memorial Scholarship based on academic and achievement merit while at Virginia Tech, and she was the recipient of the veterinary college's most prestigious scholarship, the Clarence Gertrude Leach Memorial Scholarship, based on academic achievement during her doctorate education.



Certified Veterinary Acupuncturist

Dr. Jenkins obtained her certification in veterinary acupuncture from the Chi Institute in Reddick, Florida. This involved exams, a peer reviewed written case report, and a year of completing courses in small animal acupuncture, equine acupuncture, mixed practice veterinary acupuncture, and European veterinary acupuncture. In 2014 she completed an Advanced Acupuncture class. Dr. Jenkins now offers veterinary acupuncture to clients to compliment the modern western medicine techniques that she uses primarily. She has found veterinary acupuncture particularly useful in cases that have a neurological component.

Therapy Dog Work and Dog Training

Dr. Jenkins enjoys volunteering as a therapy dog handler at nursing homes, Special Olympics, Operation Purple, and crisis shelters. She has dogs registered with Pet Partners and with Hope Animal-Assisted Crisis Response. Dr. Jenkins is an evaluator for Pet Partners and for Hope - testing therapy dog-handler teams - evaluating them for readiness for dog-therapy work or crisis response therapy work.

Dr. Jenkins has competed and placed in both UKC and AKC obedience and rally competitions. Dr. Jenkins teaches dog training at Healing Springs Animal Hospital.

Camelid Veterinary Medicine

Dr. Jenkins has done considerable post-graduate work in camelid medicine (llamas and alpacas). Most recently, she volunteered at an alpaca research facility high in the mountains of Peru. There she had the opportunity to do more camelid reproductive work than most American vets do in a lifetime. In particular, the research station is gathering information to develop protocols for the care of pregnant and newborn camelid.

Wildlife Rehabilitation

Dr. Jenkins is certified with the United States Department of Agriculture as a wild life rehabilitator with a specialty in turtles. Law prohibits wildlife rehabilitation from taking place as a paid veterinary service. In her personal time, Heather takes turtles that have been hit by cars or suffering other maladies, rehabilitates them, and returns them to their natural habitat.

Areas of Practice:

Dr. Jenkins is the owner and doctor in charge at Healing Springs Animal Hospital in Galax, VA. Heather's favorite areas of veterinary practice are internal medicine, diagnostics, chemotherapy, acupuncture, equine reproduction / horse breeding, alpacas, and llamas.

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THE BASICS:

One of the most vital things Alpaca owners can do is learn the basics of a physical exam. This ensures that one can have a precise conversation with a veterinarian while discussing the care of the animal. These skills are not meant to replace a veterinary exam but help one have a discussion about what may warrant a visit or what may be managed over the phone.

Temperature: Temperature is the easiest way to gauge the health of your alpaca. A thermometer is inserted rectally. Normal for adults and crias runs about 99.5-102 degrees. Temperatures should be taken if an alpaca is off feed, straying from the rest of the herd, coughing, or showing any signs of sickness. Ideally, a cria's temperature should be taken daily to gauge for signs of sepsis or illness. Temperatures for crias run the same as an adult's. Keep in mind that direct sun, ambient temperatures, and colors of the fleece play a role in the animal's body temperature.

Heart rate: This has to be accomplished by using a stethoscope. There are no pulses to feel and palpating through the chest wall is not ideal in alpacas. Heart rate should be 60-90 beats per minute. Heart rates will be elevated during episodes of colic, uterine torsions, pain, dehydration, sepsis, and fevers.

Respiratory rate: This is determined by watching the animal breath. Normal respirations are 10-30 breaths per minute. There is a wide range based on the animal's response to environmental factors and stressors. In addition to rate, one must look at character of the breath. Is it labored, fast, slow, with nostrils flaring or any respiratory noises, etc. Alpacas are obligate nasal breathers. They do not do well with open mouth breathing.

Gum Color: Looking at the mucus membranes in the mouth is another great way to assess health. If the gums are not pigmented black, one can use the gums to assess circulation and estimate pack cell volume. Gums should be pink in color and moist. Pale gums are a sign of stress or anemia. Red gums are an indication of heat stress, sepsis, or dehydration.

Scleral Color: By gently pushing the globe of the eye into the socket one can see the sclera. The sclera is the supportive structure of the eye. It should be a pinkish white color. Blood vessels should be readily visible in the sclera. If the sclera is pale, that could indicate an overwhelming parasite infection. If the sclera is red and inflamed, that could indicate a severe infection or sepsis.

Fecal Output: All feces from an alpaca should be pelleted and fall freely on a dung pile. Causes for concern are clumping of the stool, diarrhea, or an alpaca that stands consistently at the dung pile.

IMMUNIZATIONS:

Vaccines are very important in any alpaca herd management. The most important vaccines we are going to use on the east coast are Clostridium Perfringens C and D, Clostridium Tetani and Rabies. There are other vaccines that can be used in alpacas for diseases such as leptospirosis and E. coli. Equine Eastern Encephalitis and West Nile Vaccines can provide antibodies to your alpacas after three doses of vaccines three weeks apart. For this area, the only vaccines of concern are Clostridium C, D and T and Rabies vaccine. Other vaccines can be included in your herd management if deemed appropriate.

Crias: If dam was vaccinated 30-60 days prior to birth, the cria should receive:

- 12 weeks C, D and T
- 16 weeks C, D and T and Rabies (Imrab by Merial)
- Then booster on a yearly schedule

Crias: If dam was **not** vaccinated 30-60 days prior to birth, the cria should receive:

- 4 weeks C, D and T
- 8 weeks C, D and T
- 16 weeks C, D and T and Rabies (Imrab by Merial)
- 20 weeks C, D and T

Adults: Adults should be vaccinated yearly with C, D and T and Rabies.

Pre-Parturition: There are two schools of thought on pre-parturition vaccines. One comes from Dr. Evans and is derived from the horse industry. That is to vaccinate the dam with C, D and T 30 days prior to parturition.

The Dr's from Oregon State University, Drs. Smith, Timm, and Long, recommend vaccinating the dam 60 days prior to parturition with C, D and T. The reasoning behind their recommendation is they are concerned about the chances of increased abortion due to the stress of being restrained and vaccinated.

It is important to remember that all vaccines should go under the skin over the ribs, on the chest wall behind the elbow, or on the back of the rear legs. Use a 21-22 gauge needle. Once the needle is through the skin, always draw back with the plunger looking for blood before depressing the plunger. Even though we have been using these vaccines for many years, they are still considered extra-label use.

The only time I would recommend an 8-way Clostridial vaccine is if you are in a snake bite prone area. The 8-way contains extra antigens to diseases that alpacas do not experience. The 8-way vaccine has also been shown to cause abortions due to the severe inflammatory response the vaccine creates. There is no reason to have all that extra antigen stimulating the immune system.

There is work being done in Peru on Clostridium Perfringens A. Dr. Walter Bravo believes that Clostridium Perfringens A is responsible for neonatal deaths in Peru. To date there is no vaccine available in the United States. Australia has developed a Haemonchus Contortus vaccine, Barbervax, approved for use in sheep. The vaccine dosing is complicated, but has proven to be protective. The company responsible for the vaccine development is only looking for a sheep label. Barbervax usage in goats and alpacas will be off label use. In sheep the vaccine is started at three weeks of age. The



vaccine regimen is three injections every 3-4 weeks then a booster every 6 weeks. For this vaccine to be effective the whole herd has to be vaccinated. The vaccine causes the adult worm to starve to death.

VITAMIN D SUPPLEMENTATION IN NORTH AMERICAN ALPACAS

Camelids in North America do not live at the high elevations like their South American relatives. The lack of elevation reduces their exposure to UV light. Darker fleeced animals seem to struggle to absorb UV radiation as well as lighter fleeced animals. This lack of exposure can create a vitamin D deficiency otherwise known as Rickets. Vitamin D is responsible for the uptake of dietary calcium and phosphorus, re-uptake of calcium from the urine, white blood cell immune function, and mineralization of bones. Alpacas have a four-month delay between peak solar radiation and peak blood vitamin D concentration.

Alpacas with low vitamin D levels can experience lameness, angular limb deformities, limb fractures, poor growth, surgical implant failure, neurologic impairment, chronic disease, ill-thrift, loss of appetite and death. Pregnant females, crias, and juveniles are more susceptible to vitamin D deficiency than adults. Vitamin D does not cross the placenta well. Cria's vitamin D source is through the colostrum and milk. If a dam is deficient in vitamin D, crias can be born with angular limb deformities most commonly carpal valgus or develop angular limb deformities by 3 to 4 months of age. The severity of the angular limb deformity will vary. Some angular limb deformities will resolve with age, more severe cases need vitamin D supplementation, pain medications and potentially surgery to correct the deformity.

We can measure vitamin D levels as well as calcium and phosphorus levels in at risk animals to measure our supportive therapy or diagnose a vitamin D deficiency. Normal vitamin D levels are 75-200 nmol/l. If vitamin D level is < 30 nmol/l, the animal is often clinically sick. A vitamin D level of <50 nmol/l is a strong suspect case. Normal phosphorus levels for crias are 5.1-11.5 mg/dl. If a cria has a phosphorus level <8 mg/dl, we need to supplement with vitamin D. A normal calcium to phosphorus ratio in a growing cria is >1.5. Alpaca's theoretically can develop an excess of vitamin D resulting in dystrophic and renal calcification.

Vitamin D is supplemented in good camelid feeds and minerals. The dietary requirement of Vitamin D is 30-40 IU/kg/day. Feeding an appropriate camelid feed and mineral will help offset the risk of vitamin D deficiency. Maximizing an alpaca's exposure to the sun and decreasing barn confinement will help with vitamin D absorption. We also need to supplement vitamin D in the winter months/ low light seasons. A vitamin D3 gel can be used at 30,000IU every 2-3 weeks or Vitacharge Paste from Biozyme at 5cc/50lbs every 14 days. Injectable Vital A, D and E can be given at 22,000IU/kg every 1-3 months. Injectable Vital A, D and E has been known to cause injection site reactions and anaphylaxis.

INTERNAL PARASITES:

Parelaphostrongylus tenuis: Meningeal worm or brain worm. P. Tenuis is an aberrant migration of a normal gastrointestinal parasite in white tailed deer. Since alpacas are not this worm's normal host, the worms have a tendency to migrate to the spinal cord and brain of the alpacas - resulting in many or few neurologic deficits in the affected animal.

P. tenuis is a threat to an alpaca herd year round. In Virginia we see an increase in P. Tenuis during the fall. The infected larvae stage is highly resistant to temperature extremes and can winter quite well in a slug or a snail. Deer control is not a solution that warrants discontinuing the ivermectin injections.

Alpacas should be started on ivermectin at one month of age. Ivermectin is still considered safe at any stage of pregnancy.

The interval between injections should never be more than **35 days**. This is the time it takes the worm to migrate from the intestines to the spinal cord. The worm is protected from the ivermectin while it is in the stomach and when it gets to the spinal cord. A good management tip is to do your herd health work on the first Saturday or Sunday of every month. This will help you stay under the 35 day interval.

There is no risk of P. Tenuis developing a resistance to ivermectin. The eggs never hatch if they are successfully laid, so there is never a risk of resistance.

Dosage chart for ivermectin:

Pounds	ML/CC
20	0.25
40	0.5
80	1.0
120	1.5
160	2.0
200	2.5

Source: Dr. Stephen Hull, PhD

Treatment for P. Tenuis

- Fenbendazole (Panacur or Safeguard) at 50 mg/kg body weight orally daily for 5 days
- Flunixin (Banamine) 1 mg/kg body weight subQ, twice daily for 3 days, once daily for 3 days
- DMSO given in the vein or by mouth may act as a potent anti-inflammatory. Use up to three days.
- Vitamin E supplement 500 to 1000 units orally daily for 14 days
- Ivermectin 1cc/75lbs every other day or every day for three treatments. There is some discussion about the value of ivermectin because it cannot cross the blood-brain barrier thus rendering it ineffective.



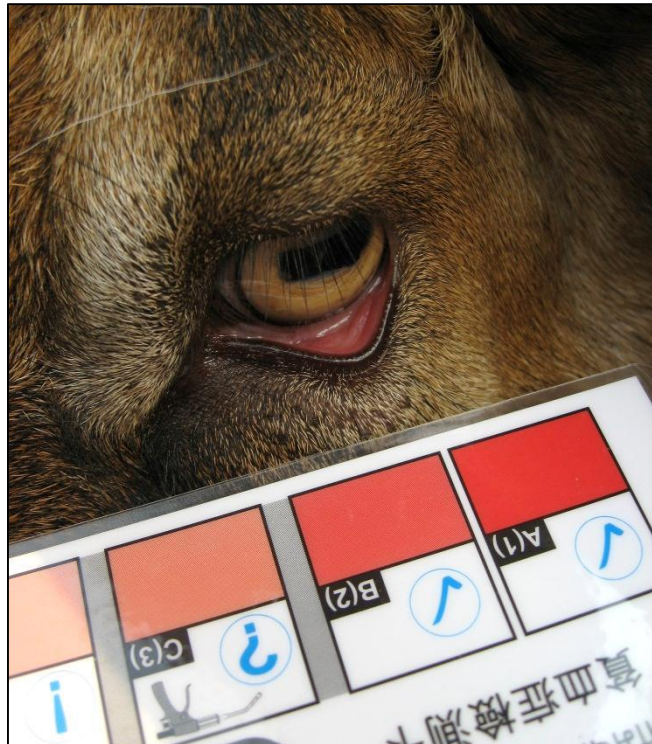
The best defense is a good offense. Devote one day a month to ivermectin administration to prevent meningeal worm.

Haemonchus: Internal Parasites are now a big concern for alpaca owners. What has made intestinal parasites such a threat to our industry is the amount of resistance we are experiencing with Haemonchus. Haemonchus contortus is a very prolific parasite laying >100,000 eggs per day. Their life cycle is short - about two weeks. Haemonchus is especially prolific in warm, moist environments. The eggs of Haemonchus are very hardy. They can overwinter easily.

Parasite control has been a hot topic for many years. We have to be creative in our parasite management. There are several ways to help manage parasite numbers without the use of anthelmintics.

- Feed hay and grain off the ground. Move feeding troughs and water troughs daily.
- Clean pastures daily.
- Rotate pastures after mowing for hay.
- Control stocking densities by limiting the number of animals per field.
- Use Guinea hens or chickens to control egg dispersion.
- Deworm any alpaca that scores high on a FAMACHA System.
- Avoid whole herd dewormings.
- Use fecals as a diagnostic tool to help determine who needs to be dewormed or not.
- Co-graze with Equine. The Equine will eat the parasite eggs which will die in the horse's stomach.
- Don't mix age groups.

The development of the FAMACHA system started in South Africa by Dr. Francois Malan. He developed a system that coordinated the relationship between hematocrit and lower eyelid color. He developed this for sheep in 2001 and it has been used in small ruminant species since. Much research has been done in the United States demonstrating a correlation between eye color, hematocrit, and fecal egg counts. Dr. Lisa Williamson has done research projects on Haemonchus using the FAMACHA system while studying the effectiveness of different dewormers. The FAMACHA system only works on Haemonchus contortus. It does not give a firm conclusion about other parasite infestations.



(Photo Credit: Susan Schoenian, University of Maryland Extension Sheep and Goat Specialist.)

The highlights of Dr. Williamson's research project are 20% of the animals on your farm are generating 80% of the eggs. Mortality is rarely seen until the egg counts reach >1000-3000eggs/gram. Alpacas can still walk around with a pack cell volume of 17% or less but will crash at a PCV of 5%. An alpaca with a high FAMACHA score will also have a low body condition score. Parasite resistance to newer

anthelmintics on the market (which are very few to none) will happen within a year. By deworming selective animals in the herd we are hoping to create a refugia of naïve parasites that are not developing a resistance leading to a population of “stupid” worms to dilute out the “smart” worms. These are the population of worms that are in egg or larvae form on pastures or in non-dewormed animals that are not genetically creating a resistant parasite.

	FAMACHA SCORE	PACK CELL VOLUME	FECAL EGG COUNT
RED	1	31%	139 eggs/gram
	2	28%	284 eggs/gram
	3	27%	567 eggs/gram
	4	22%	1238 eggs/gram
PALE	5	16%	4047 eggs/gram

Dr. Williamson's recommendations are to treat alpacas with a FAMACHA score of 4 and 5. Animals that score a 3 should be treated on a herd by herd basis. Her recommendations are to check each animal every 2 weeks during warm and moist periods and less frequently when risk of transmission is low.

The list of anthelmintics that are effective against *Haemonchus* is getting smaller. Right now the recommendations are to use Panacur/Safeguard or Moxidectin orally. The ivermectin family has not been useful for years now. Pyrantel Pamoate has an abysmal fecal egg count reduction rate. Panacur/Safeguard is rapidly becoming ineffective at decreasing egg counts. The moxidectin dose that is most effective is 0.4mg/kg. It is very safe, and the sheep drench works very well. Do not use the injectable form of Moxidectin. Using a combination of anthelmintics together may help delay resistance.

Monepantel (Zolvix) is a new dewormer that is sitting on the FDA's desk. This drug has been available in New Zealand for several years. After 2 years of non-selective use there is already anthelmintic resistance.

Long Range Eprinomectin. As of now not for use in Camelids.

Haemonchus contortus resistance can be measured with a heritability estimate for fecal egg counts and FAMACHA score. The heritability score is a 0.25. This means one can breed in or out parasite susceptibility and resistance. To capitalize on this heritable component one should keep good records on body condition scores, body weight, FAMACHA scores and number of times each animal had to be treated. Upon review of these records, cull the poor doers and the light weight offspring. Your herd will see a benefit in two years and you will have a major impact in alpaca parasite resistance in 5-6 years.

Nematodirus: *Nematodirus* is a nasty, big parasite that is 33% larger than any other worm egg. It can live through the winter making it a very easily transmissible worm that is hard to kill. This parasite infestation wreaks havoc on the gastrointestinal system, causing severe irritation and diarrhea leading to profound weight loss, unthriftiness, and anemia. The good news is this parasite is normally treated with a regimen of Panacur/Safeguard, Valbazen, or Synanthic 22.5%. I treat the affected alpacas with a dose of Panacur/Safeguard dewormer for three consecutive days. In some cases, when alpacas have lost a fair amount of weight, have diarrhea, and are inappetent I will prescribe Protonix, an injectable antacid.

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Dosages are:

Panacur/Safeguard 50mg/kg, 35cc/150lb alpaca

Valbazen 6cc/100lbs

Synanthic 22.5% 4cc/100lbs

Levamisole drench(Prohibit) 8mg/kg....very useful if available for resistant Nematodirus

Eimeria macusaniensis and coccidiosis in alpacas: Coccidiosis is a disease of all ages. It affects crias and adults. In Peru they have found E.mac passing through crias that are only 5 days old. The problem with coccidia is the one celled organism tears up the gut causing mucosal damage leading to diarrhea, colic and death. E. mac is of particular concern since the organism likes to hide deep in the mucosa layer of the gut and does not shed till the damage is done. E. mac can be in the body from 31-90 days before shedding. Further work on coccidiosis and E. mac has led to conclusions that damage in the small intestines is allowing for excessive clostridial overgrowth creating disease. Those farms that work to control coccidiosis have lower neonatal death rates to Clostridium A.

E. mac doesn't like to float. It needs sheather's solution (1 lb of sugar dissolved in 1 liter of water with one drop of formalin) with a very dense specific gravity. Centrifugation of the feces is a must for detecting E. mac. A PCR test is being developed to diagnosis E. mac in feces. A PCR test will allow us to detect shedding DNA in the feces before we see eggs on fecals. This will help with early treatment of the disease allowing us to minimize the damage to the intestinal lining.

As for treatment, there are a couple of options. According to Dr. Cebra from Oregon State University CVM, the mainstay of treatment is still Corid (Amprolium). He recommends a dose of 10mg/kg by mouth once daily for 5 days. A new potential Corid protocol is to give Corid once daily for 5 days, take 5 days off then repeat once daily for 5 days. E. mac will still shed for 3 weeks after kill. He does not recommend that we put Corid in the drinking water.

Ponazuril/Marque is another possibility. It is very expensive. A single dose is effective in healthy animals. Ponazuril does not interfere with the alpaca developing an immunity to coccidia, but it may cause some facial deformities in crias. New research has shown that a single dose of 20 mg/kg is effective, or can be used up to three days for treatment. The drug is still detectable in the alpaca's system 42 days after administration.

Baycox/toltrazuril is showing promise. It is a product out of New Zealand. Along with Ponazuril, these drugs can affect later stages of the parasite and cause a more rapid decrease in oocyst shedding.



Sarcoptic Mange



EXTERNAL PARASITES

Mites are the most common skin parasites in alpacas. There are three kinds of mites that can afflict alpacas. These are Sarcoptic, Chorioptic and Psoroptic. We are going to talk about Chorioptic mites. Sarcoptic is no longer as common and is easily treated using ivermectin. Psoroptic is a reportable disease and very rarely seen. Chorioptic mites are very superficial mites that feed on dead cells and dander. Their common locations are between the interdigital spaces of the toes. They can be found at the elbows, belly, groin and ears. They are not as itchy as Sarcoptes, nor are they contagious to humans. However they are easily transmitted from one alpaca to another. There seem to be a fair number of carriers in a herd. More often than not, the carriers have no lesions or very few. The ones that are the most sensitive to the mite will start with crusty lesions between the toes and work its way up the leg. These crusty lesions are usually harboring a yeast or bacterial overgrowth as well making this a multifactorial problem. If left untreated, the damage to the fleece can be permanent.

The way to diagnose Chorioptic mites is to take a skin scraping from multiple animals in a herd. The best place to skin scrape is on the medial surface of the lateral toe. The skin scrapings have to be deep. It is best to keep scraping until there is a "strawberry" present. The best scrapes will happen in animals with very few lesions in their interdigital space. Badly affected animals do not seem to be terribly diagnostic on skin scrape.

The best course of treatment is Frontline Spray. A farm has to spray the whole herd to get rid of the mite. If there are any animals left untreated, the problem will return. Treat all animals on the farm over two weeks old once every 3 weeks for 4 treatments. Apply the Frontline spray liberally to all 4 feet from the fetlock down to the toes. If there are any visible hair-loss lesions on the alpaca, treat those as well. On the asymptomatic alpacas, you only have to treat the feet.

A permethrin 2 premise spray has been suggested for use in the barn to treat the surfaces. Adult mites can survive for 70 days off the host in the environment. Unfortunately, since these mites are surface dwellers, it is easy for them to fall off the animal.

If necessary, treat all bacterial and fungal secondary problems with the appropriate medication such as Naxcel. Other topical treatments that have been helpful are Solva-ker-gel from VetriMax in Midland, Tx. This treatment is used on the really crusty, hard areas of the skin (hyperkeratotic). Derma-clens cream from Zoetis is used once normal pink skin appears. Vitamin E cream can be used to help the skin heal.

Follow up is necessary to make sure the problem has resolved. Skin scrapes need to be done on 10% of the herd 1-2 months after the last treatment. Carry Frontline spray with you to shows. Make sure you spray down your equipment and spray all the feet of new, leaving and returning animals. All feet need to be sprayed before a stressful event. There is a correlation to clinical signs of Chorioptic mange developing 2-4 months after a stressful event. Take random skin scrapings every 6 months if this is an on-going problem or a heavily traveled group.

Unfortunately there is some concern that perhaps Chorioptic mange is a normal alpaca mite which overgrows during stressful events and sickness.

Source: Dr. Ed McCaslin, Promised Land Farms

TEETH

The canines are considered formidable weapons in the intact males. They develop when a surge of testosterone causes the male to reach puberty. Males will develop fighting teeth between 22-24 months of age. These canines rarely occur in females. These weapons were created to help adult males fight. These teeth should be removed using gigli wire. These teeth have a long curve root making complete extraction difficult. The canines/fighting teeth should be checked on all intact males at shearing. Usually geldings do not grow fighting teeth once the first set has been removed.



This is a male alpaca with no canines/fighting teeth.

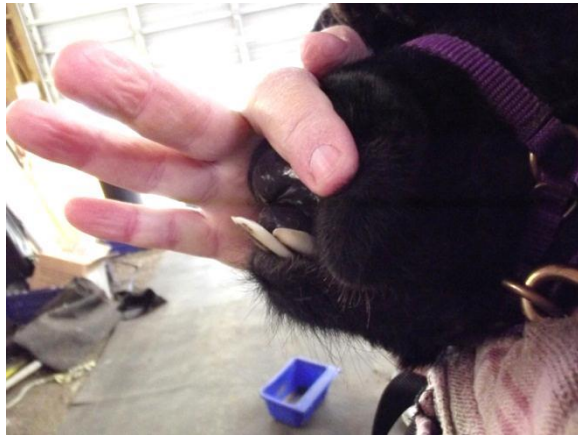
There is a new method to help incisors meet the dental pad of the upper jaw without trimming them straight across the top. We are giving Dr. Daniel Mora credit for developing this method. He lectured on his method at the International Camelid Health Conference for Veterinarians 2012. We are seeing more alpacas with improper dental alignment in the incisors. This decreases their ability to graze. The incisors are meant to meet the dental pad of the upper jaw. This correct alignment allows the teeth to grow normally with the alpaca. The dental pad of the upper jaw keeps the teeth at the correct length. The picture above has good incisor and dental pad alignment. When the 3rd incisor pushes on the 2nd incisor, the 2nd incisor pushes on the first incisor pushing it away from the dental pad and out through the upper lips. When the animal tries to graze, the teeth are not effective at tearing the grass.

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The Mora Method allows for separation of the 3 incisors. This stops the incisors from pushing each other forward and out of the mouth. We also will trim the top of the incisor and put a 45 degree angle on the teeth to allow the dental pad of the upper jaw to exert its downward pressure keeping the teeth the proper length. This downward pressure also helps the pulp recede so we can improve alignment if needed in the future.

He recommends avoiding juveniles and waiting for all the adult incisors to be in place. It may take a couple of tries to get the teeth where they need to be. It takes about 3 months for the gaps in the teeth to close. If the teeth are not aligned properly the procedure can be repeated. Once the teeth are corrected they typically stay corrected.

PRE-PURCHASE EXAMS

Pre-purchase exams of the males are very important. Males should start breeding at 3 years old. During an exam we look at the male's conformation, teeth, fiber, testicles and penis. Testicles in males should be present at birth. 8% of males only have one testicle present. This is a heritable problem and the male should not breed. The male will have to have the testicle removed from its abdomen laparoscopically. It is a good idea to measure the scrotum. Increase in scrotal size is directly linked to increase in pregnancy rates. At puberty, roughly 2 years old, a breeding male alpaca should have a scrotal



Pre-Breeding Soundness Exam on a Male.

size of 3.3 by 2.2 cm. However puberty is highly variable in males. The adhesions to the penis break down with sexual maturity and allow the penis to be extended. This should happen by two years of age. The testicles can also be ultrasounded to look for cysts in the testicles and scar tissue that would decrease fertility rates. Infertility in males is due to small testicles or cyst in the testicles. Rete testis cysts are found in 18.5% of males. The reason for these cysts is unknown. However the cysts replace normal testicular tissue resulting in decreased sperm production. If one has serious questions about a male's fertility, we can also do a semen collection and look at motility and morphology. The spermatogenesis cycle of an alpaca is two months. If there was a fever, sickness, heat stress event less than two months prior to a BSE, the sperm count will be diminished. If there is inadequate sperm production, some male alpacas have responded to Adequan injections to improve spermatogenesis and fertility.

Pubertal alpacas between the ages of 9-14 months can experience an increase in testosterone that creates a transient increase in prostate size. The prostate will measure greater than 2cm. Prostate size increase decreases the diameter of the urethra causing the alpaca to strain to urinate. The problem is usually self-limiting.



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A pre breeding exam of the female.

Pre-breeding and pre-purchase exams of the females are very important. It is important for the perspective buyer to look at the reproductive organs of the female one is about to purchase or for the owner to decide which maiden female they want to add to the breeding herd. The exam consists of a vaginal speculum exam to determine if the hymen is gone, if the cervix is red and inflamed indicating an infection, and if there is any discharge coming from the cervix. If there is a persistent hymen, it should be removed by the evaluator. The uterus and ovaries should be examined to determine if there are any abnormalities (for example: missing uterine horns, small ovaries, fluid in the uterus, etc). The mammary gland should be examined. There should be four teats of normal size. There should be no extra teats, evidence of skin disease, or large teats. As always, a physical exam is important to look at conformation, teeth, and fiber characteristics.



BREEDING

Female alpacas reach breeding age at 15-18 months when they are greater than 90 pounds. Most female alpacas start breeding at 2 years old. Alpacas experience follicular waves that are in constant motion. As one wave is ending, another wave is starting. Alpacas are induced ovulators. A female will only ovulate if there is a mature follicle and sexual activity. Ovulation in an alpaca requires penile stimulation of the cervix, a chemical secreted by the semen, and the orging of the male to release a hormone (LH) from the brain. In alpacas, ovulation usually occurs 24 hours after mating. Unlike most mammalian species, alpacas are receptive to males as long as there are follicles present. This allows us a unique way to gauge if an alpaca is pregnant or not.

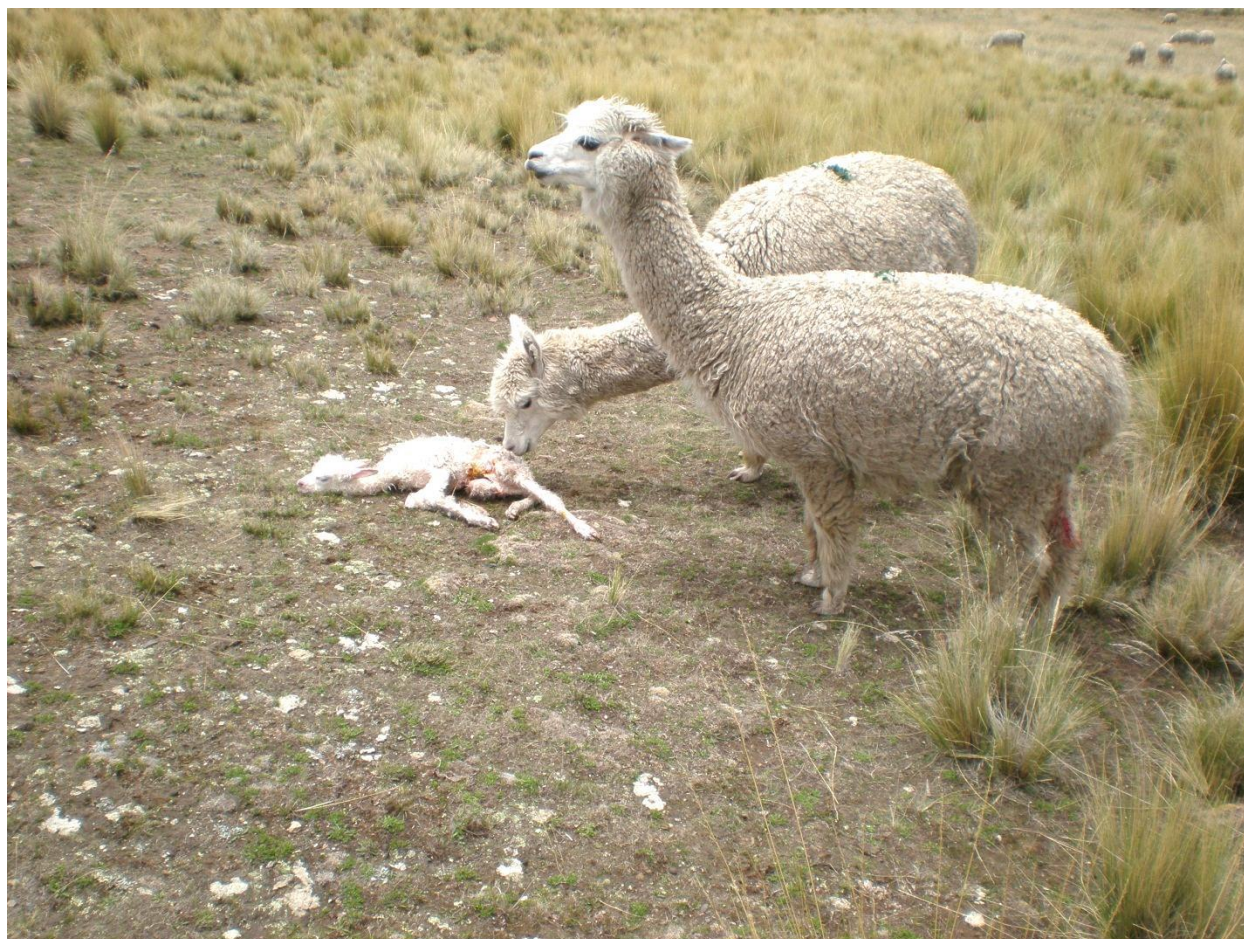
Pregnancy in an alpaca can be determined in three ways: a spit test, progesterone test, or an ultrasound. Once a follicle has ovulated, the estrogen levels in the female will reduce, leading to progesterone production. Progesterone tells the female that she is pregnant. This renders her nonreceptive to the male. Her defense for the males' advances is to spit at the male. Since females are induced ovulators and essentially "always" in heat. The spit test is a good first start to determine pregnancy and to check pregnancy status through the gestation period.

Progesterone tests are another way to determine pregnancy. This is a blood test usually sent to BET labs. This test measures the level of progesterone in the female's blood. Progesterone levels >1 ng/ml are consistent with pregnancy, <1 ng/ml the female is not pregnant, and > 2.5 ng/ml the female is considered very pregnant. This test is best done 15-20 days after removal of the male. We can use this test if we suspect an undesired mating had occurred. This test has a $>95\%$ accuracy rate. The disadvantages are expense, blood collection, and time to get results. At this time there is no need to provide progesterone supplementation to alpacas. There is no research proving that these animals can be progesterone deficient. Exogenous progesterone usage can cause fetal retention after fetal death, a mummified fetus, a macerated embryo, and failure of cervical dilation. Bottom-line; do not use Regumate to support pregnancy in a sub fertile alpaca female.

Ultrasonography is a good, immediate pregnancy determination that can be done 28-60 days after removal of the male. Rectal ultrasound is a quick way to determine if the female is pregnant. Another advantage of ultrasound is to look for twins. However twins are very rare.

Dr. Purdy's work in Peru with the Nunoa Project has shown that alpacas are incredibly fertile with a $>90\%$ fertilization rate. Pregnancy in alpacas will always be in the left horn. Pregnancy losses in alpacas are roughly 7-12%. Alpacas can experience early embryonic death, which is a loss of pregnancy in less than 40 days. If ultrasounds to determine pregnancy are done early, it is a good idea to repeat the ultrasound later (around 60 days) to check development of the fetus or spit test the alpaca every couple of months to make sure she is still pregnant. If there is any interest in the male the pregnancy status needs to be reevaluated with an ultrasound.

Gestation for alpacas and llamas is roughly 335-355days. Some alpacas have carried their babies for a full year. There is never really any reason to induce a camelid to give birth. Camelids know what they are doing and will give birth when ready.



BIRTHING

The good news about alpaca birthing is that 95% of camelids complete the process on their own with little help from us. Most alpacas have their babies from first thing in the morning until about 2pm. An evening birth may indicate an at risk cria. There are three stages of labor in an alpaca. Unfortunately, there are no reliable signs to help a producer know that their perspective mom is about to give birth. The first stage of labor is the preparatory phase. This can last 1-6 hours. This is when the fetus is sending signals to the mom's uterus to start cervical dilation and preparing for delivery. The second stage of labor is the expulsion stage. This is when the fetus is presenting itself through the pelvic canal. This is typically when the producer knows their moms are in labor by the presentation of feet and a nose. This stage should be completed in less than 60 minutes. Ideally, the fetus will be out in less than 30 minutes. The last stage is the placental expulsion. That can happen quickly or take up to 4-6 hours.

The equipment that a client should have on hand is clean water, ivory liquid soap to clean the perineal area, sterile lubricant (such as KY jelly), tail wrap using rolled gauze, towels to help dry the baby, and sterile sleeves or gloves. Exam gloves will work as well. The exam gloves are not sterile but will help decrease any potential infections.

The normal presentation of a cria should be two extended feet and a nose. Usually, if a producer sees this presentation, the process will continue without problems. Occasionally, the shoulders will get stuck in the birth canal and a little manipulation of the front legs by moving one leg forward and then the other leg forward in a "Nordic track motion" will help the shoulders pass through the birth canal by decreasing the diameter of the shoulders. This can be accomplished without entering the birth canal and causing any risk of infection.

Other common dystocias are the legs not fully extended or the elbows locked. These presentations are usually corrected by the "Nordic track motion" described above. Once the legs are extended, the shoulders should pass easily. This move also does not require one to enter the birth canal - minimizing the risk of infection.

A leg back scenario is when a producer can only count one leg and a nose. This means that the leg is back in the birth canal. The leg could be deep in the birth canal anywhere against the cria. The leg has to be corrected and pulled into the birth canal so that the cria can be delivered vaginally. This procedure can be difficult given the length of the cria's legs. The leg has to be manipulated in the uterus increasing the risk of infection and trauma to the cervix and uterus. Care must be taken to reposition the leg without damaging the uterus.

A breech is when only the hindquarters of the baby are coming through the birth canal with the legs tucked against the body. This presentation usually results with a female in labor for a long time and getting into trouble. Since alpacas don't give reliable signs of impending labor one has to pick up on the alpaca being in labor. Unlike cattle that have long tails, the tail of a cria is not long enough to pass through the birth canal and through the lips of the vulva. The breech presentation requires veterinary intervention. It is very difficult to correct this presentation. The cria will always be delivered rear first, which does lead to some respiratory problems. A breech presentation can also be with the rear legs extended. The cria can be pulled with the rear legs extended. Care has to be given to ensure a speedy delivery to prevent respiratory problems. Some crias can be delivered backwards without assistance.

A neck back presentation is also a very difficult presentation that will require veterinary assistance. If a producer only sees two feet without a nose, do not pull on the front legs. The nose has to be sitting on the front legs for there to be a green light that a producer gets to assist with the birthing process. If the neck is back and the front legs are pulled, the neck bends further back into the uterus making it more difficult to get the head and neck repositioned. This presentation is fixed by pushing the feet and legs back into the uterus to open up some space in the birth canal. The head is then found and brought up into the birth canal (easier said than done). Once the head is in the birth canal, the legs are brought into the birth canal, and the baby is delivered vaginally. This requires a large amount of manipulation of the cervix and uterus. Care has to be taken to protect the dam's uterus so she maintains her reproductive status.

Uterine torsions are not very common. The alpaca presents with colic like signs in the last two months of her gestation. Unlike cattle who can maintain a uterine torsion until they go into labor without any pain, alpacas will be very painful, and torsions must be corrected immediately. This is accomplished in one of two ways: reducing the torsion without surgery by rolling the animal or surgically detorsing the uterus.

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Once the uterus is detorsed, it rarely twists again. It is very rare that uterine torsions happen with labor in alpacas.

As a general rule, alpaca producers have 15 minutes to correct a bad position. Give thought to your veterinarian's location and schedule when attempting to correct a mal-position. You may want to give your vet a head's up to the potential problem before you start your manipulations. Your vet may be able to walk you through repositioning on the phone or make plans to head your way.

General guidelines for correcting dystocias are:

- Wash hands and alpaca's perineal area with ivory soap. Kissable clean!!!
- Use lots of lubricant
- Move whatever body part is taking the most space and impeding any repositioning
- Cover the toes with your hands to protect the uterus
- Fully extend the limbs to narrow the shoulders
- Rotate the cria to a 45 degree angle to maximize the pelvic diameter
- Pull down and back
- Manipulate baby between contractions
- Pull gently with contractions and rest when she is not contracting

A placenta is considered retained when it has not been expelled from the uterus 24 hours after birth. This problem requires veterinary assistance. Do not pull on the placenta because one can actually evert the uterus if too much pressure is exerted on the placenta.



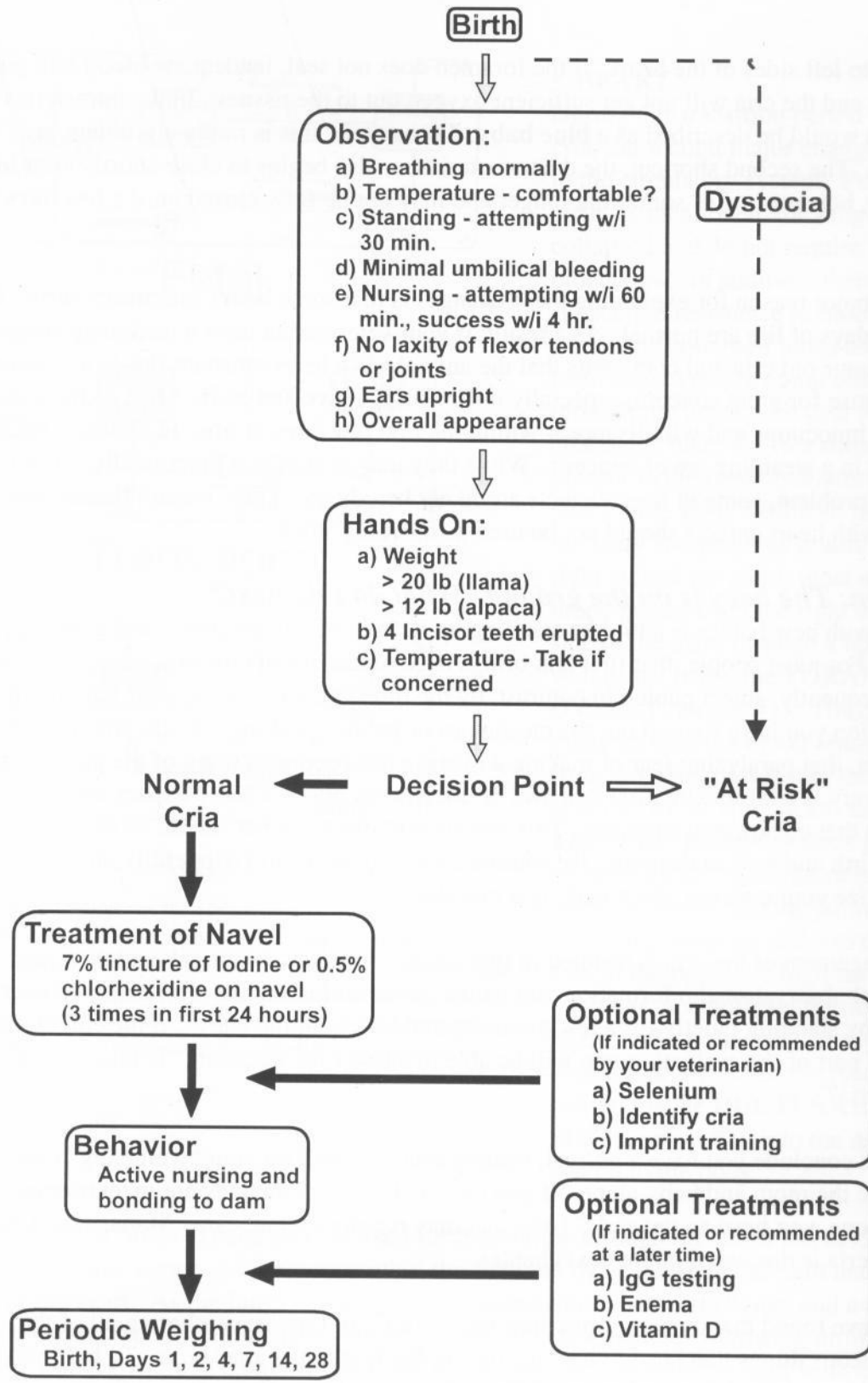
NEONATAL CARE



My name is Monday. I was born to a mom with no milk.

The best summary for an evaluation of a cria comes from [Llama and Alpaca Neonatal Care](#), B. Smith, K. Timm, and P. Long Pg 62. Bixby Press Inc. 1996.

The following chart is reprinted with permission from Dr. Long.



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The first 24 hours of life are always the hardest and the most difficult especially for the first time producer. The best approach is to take a deep breath and let nature take its course. The most important things to remember to do are to dip the navel and watch for the passage of meconium.

Crias are born with <100mg/dl of IgG. The cria must nurse soon after standing at hour 2. The cria actually does not produce its own immune system until 3 months of age. The mom is actually producing IgG in their milk for 7 months post-partum. The colostrum has a large amount of antibodies in it and then a lower level is produced over the next nine months. Dr. Walter Bravo has discovered that crias nurse every half hour for the first 2 hours after standing then at hour 4 of life they nurse every hour for 9 hours. After day one, the average cria suckles 10 times a day from 7am till the evening. This is a pattern that lasts for the first 12 days of life. In Peru, the alpacas will sleep over night and do not allow their babies to nurse. This information helps us by giving us a plan to supplement nutrition in babies that are unable to suckle on their own or are orphaned. Rules for colostrum supplementation are 20-30 mls every half hour for the first 2 hours after standing then 20-30 mls every hour after hour 4 for 9 hours. This actually helps in antibody absorption. Crias that are given large amounts of colostrum at once do not absorb well. A lot of the antibodies will pass in the meconium.

IgG levels are important and should be measured 24 hours after birth. The magic level is 800mg/dl. We use the horse industry as a standard when we picked that level. A large number of crias with good producing moms will have IgG levels of >2000mg/dl. The ability to produce good immunity is hereditary and should be considered when picking breeding stock.

Colostrum supplements are available. Many people use goats as a decent source of colostrum. It has been reported that crias can only absorb 8% of the IgG in cow colostrum. When using cow colostrum it must be purchased from a BVD certified negative herd. If a cria is fed colostrum that has BVD in it, the cria will have a positive BVD test creating a BVDV positive herd. No studies have been done on goat colostrum. If a dam has no milk and there is some alternative species colostrum available, go ahead and use those sources. However, a plasma transfusion will be required, especially if it is a valuable animal.

Plasma transfusions generally are done in the first week of life. We use plasma shipped from Triple J Farms. Our typical approach is to pre-medicate the cria with a little Bana mine. We push a catheter through the right side of the cria at the paralumbar fossa and let the plasma gravity feed into the peritoneal cavity (belly). IgG is a single chained antibody that has great solubility. It can distribute into the tissues rapidly from peritoneal administration.

If needed, there are several options for milk replacement in crias. Many commercial milk replacers have been used that are for cattle, sheep and goats. **Wombaroo Milk Replacers** - www.wombaroo.com.au Wombaroo is a company that makes milk replacer specifically for alpacas as well as other exotic species. Canned goat's milk or goat milk mixed 50:50 with water share camelid milk characteristics. One can use homogenized milk fortified with vitamin A and D. Norm Evans would suggest adding 1 oz of live culture yogurt daily. Peru has success with feeding straight unpasteurized Brown Swiss milk. We have tried feeding orphaned crias Brown Swiss milk here in the states, and they seem to do very well on it. Powdered milk replacers are a cause for concern. There are a number of crias that have developed spiral colon blockages after being fed powdered milk replacers. For alpacas, powdered milk replacers are usually mixed more dilute, for example goat milk replacer is mixed 1:4 with water to help prevent

spiral colon blockage. Always add 1 oz of live culture yogurt to one feeding when using milk supplements.

Weight gain is very important to assess the health of a cria. The average alpaca should gain between 0.25-0.5 lbs per day. This growth rate should continue for the next 60-90 days. Recommended days to weigh crias are day 1, 2, 4, 7, 14 and 28 days of age. One should expect the cria to be double its birth weight by day 30. If one notices stagnation in weight gain or a weight loss, a physical exam should be done to determine the malady.

The most common problems in neonatal crias that I see is failure of passive transfer secondary to prematurity and an inability to stand. At birth, a cria is hypoglycemic and needs to eat rapidly. Every effort should be made to get the cria's body temperature around 98-100 degrees F. Once the temperature is within normal limits we can start feeding the cria. We can use a bottle or a feeding tube to get nutrition into the cria. If the cria hasn't nurse, by hour 3 post-partum, we should start feeding the baby.

There are some common genetic defects such as a cleft palate, choanal atresia, atresia ani, heart murmurs and umbilical hernias that can be diagnosed at the cria health check when collecting blood for the IgG. The first three congenital abnormalities are life threatening and fatal. The type and degree of heart murmurs can be diagnosed with a small animal echocardiogram. Once a diagnosis is made, a surgical plan can be formulated for correction. A patent ductus arteriosus (PDA) can be repaired using an Amplatz Canine Duct Occluder device. An umbilical hernia, which is a separation of the belly wall at the umbilicus, will usually close with age. If the umbilical hernia is greater than 3 fingers we can try to use a belly band to assist in closing the hernia.

Meconium impactions are fairly rare but easily fixed or prevented. A cria with a meconium impaction will not suckle in a timely fashion or may attempt to suckle but "falls off the teat" rapidly. If a producer notices a cria straining to defecate or a cria that has not produced any meconium, then they need to give an enema. I would avoid chemical enemas in favor of a warm water enema with a drop or two of lubricant and ivory soap. The warm water enema seems to produce the same results without the absorption of extra phosphorous. I recommend that at-risk crias be given an 8 to 10ml warm water enema when they first stand. Be sure to lubricate the tip of the syringe well and depress the plunger slowly. The rectal tissue is very fragile; so be careful.

Once the baby is on the ground and standing, we need to look at the dam. It is very important that she pass her placenta. Again, if the placenta is still in the uterus at 24 hours, veterinary intervention is warranted. The producer needs to catch the female after the cria is out. He/she needs to check all four teats of the mammary gland. They are going to dislodge any waxy plugs in the teat ends and check for colostrum. Not having to remove a waxy plug will help the cria drink its first meal easier. The first milk needs to be thick, sticky and yellow in color.



The placenta and Dr. Walter Bravo

The placenta should be laid out on the ground. He/she is looking for tears in the placenta, and abnormalities in the placenta such as bruising, plaques, discoloration. This will help us determine if we need to address any uterine abnormalities in the dam to facilitate her breeding back or if the cria may be at risk.

The vulva needs to be inspected. One is looking for tears, excessive bruising, or any excessive bleeding that may require veterinary intervention. Most vulva tears will be managed medically and will not be sutured until they have a chance to develop some granulation tissue. Any excessive bruising or bleeding may help us determine if there are any complications to be addressed prior to breeding. A speculum exam may be required before rebreeding if there were any complications with the birth or any changes to the placenta or vulva to head off any problems and aid in conception. Alpacas have a phenomenal ability to involute their uterus and return their perineal areas to normal rapidly after birth. Very few need assistance. Within 10-14 days post birth, owners may notice a mucoid plug or pool of mucus on the ground. This is a normal occurrence. It is a final cleansing of the uterus preparing it for the next cria.



Thank you for attending Alpaca General Medicine Lecture

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