

Well-planned barns and pastures, and innovative use of high- and low-tech gadgets can make life on the farm much easier. If you have any helpful "husbandry hints," *Alpacas Magazine* would love to hear from you.

■ **Passive Immunity Transfer and Plasma Transfusions for Alpaca Crias**

This article was written to help alpaca owners gain a better understanding of the passive immunity transfer process, what can be managed to help insure the transfer is taking place, and what to do if failure of passive immunity transfer is noted. Procedures in this article are written in layman's terms to help alpaca owners better understand the process. Only qualified veterinarians should conduct activities such as blood draws and plasma transfusions.

Septicemia is a major cause of alpaca cria deaths in the first few months of life. Septicemia is defined as the invasion of the blood stream by virulent microorganisms from a local seat of infection.

Alpaca crias do not have antibodies from their mother at birth and do not have the ability to produce adequate amounts of IgG (immunoglobulin or antibodies) for the first six to twelve weeks of life to protect them from diseases. Instead, alpaca crias obtain their immunity to many diseases by drinking colostrum or "first mother's milk," which is absorbed in the intestines of the cria. The thick, rich, yellowish milk that is the first milk produced by an alpaca dam after giving birth is called

colostrum. The immunoglobulin (IgG) in the colostrum is absorbed through the cria's intestinal

wall before the protein is digested by the digestive system. The IgG is then circulated in the cria's blood system. This is nature's way of giving the cria the protection it needs from many diseases during the first few months of life. This process is called passive immunity transfer.

There are many reasons why the process may fail. Alpaca breeders can help insure that passive immunity transfer takes place by managing for success.

Managing for Successful Passive Immunity Transfer

- 1. Pre-birthing CD Booster.** Most veterinarians recommend giving the dam a pre-birthing booster thirty to sixty days prior to the due date. A clostridium CD&T booster will increase the dam's immunity level and help insure that the colostrum she does produce will contain higher levels of immunoglobulin antibodies to clostridium.
- 2. Temperature.** Under ideal conditions, the cria will gain body temperature to about 101° Fahrenheit. If the environmental temperature is low or the cria is hypothermic (below normal body temperature), dry it off and warm it up immediately after birthing. If the cria were to remain hypothermic, the absorption of the colostrum is greatly diminished. Warming the cria to a normal body temperature of 101°F is very important for good absorption of IgG.
- 3. Timing is Everything.** The newborn cria should nurse colostrum from the dam within two to six hours and absorb the IgG that is in the colostrum through its intestines. Information compiled by Triple J Farms shows that after twenty-four hours, virtually no IgG can be naturally absorbed through the intestinal wall. (Note: Premature crias do not follow this rule.)



Alpaca crias do not have antibodies from their mother at birth and do not have the ability to produce adequate amounts of IgG (immunoglobulin or antibodies) to protect them from diseases for the first six to twelve weeks of their life. Instead, alpaca crias obtain their immunity to many diseases by drinking colostrum or "first mother's milk" which is absorbed in the intestines of the cria.



This cria is only a few minutes old and standing for the first time. If the environmental temperature is low or the newborn cria is hypo-thermic (below normal body temperature), dry it off and warm it up immediately. Warming the cria to a normal body temperature of 101°F is very important for good absorption of IgG.

4. **Pull the Plug.** Insure the dam's teats are actually giving colostrum. Check the teats to insure the small, wax-like "plug" in the opening of each teat has come out on its own. If not, you need to remove it yourself. Check to see that each teat is able to produce milk. Do not milk out more than one or two drops from each as this is the colostrum, and you do not want to waste it. Just ensure that it is free flowing upon nursing by the cria. If the dam is not producing colostrum or milk, call your veterinarian. He/she may decide to administer a milk letdown drug such as oxytocin.
5. **Colostrum Replacement.** If the dam is not producing colostrum, for what ever reason, or if the cria is not nursing successfully, intervention is necessary. If some alpaca colostrum is available from a previous donor it should be bottle fed to the cria within two hours of birthing and completed by 12 hours after birthing. Cow or goat colostrum is a second option, although it is usually much less effective than alpaca colostrum.
6. **Mother May I?** Watch to see that the dam will accept and stand still for the cria to nurse. Also insure that the cria is able to stand, find the udder, and make a connection on the teats. One common sign that the cria is successfully nursing is to watch for the cria's tail to rise during nursing.
7. **Milk – It Does a Cria Good!** Monitor the cria's condition very closely during the first 24 hours to see that it is gaining in strength and alertness, is easily nursing on its own, and that it develops into a somewhat regular nursing pattern. The cria should nurse every few hours for two to

four minutes each nursing. If it is nursing much more frequently or does not continuously nurse for over two minutes at a time, the dam may not be producing adequate amounts of milk. If the dam is not producing milk, condensed canned goat's milk (available in large supermarkets and can be stored at home on the shelf unopened for several months) should be bottle fed to the cria. The condensed goat's milk will give the cria nourishment, but will not give it any IgG and a plasma transfusion may still be necessary.

8. Blood Donation.

Testing a blood sample for IgG can give you a good idea of the success or failure of the passive immunity transfer process. Your veterinarian should take a blood sample from the cria at eighteen to twenty-four hours after birthing. This sample is typically taken from the jugular vein. The alpaca owner can

help the veterinarian take this sample by firmly holding the cria's head during the procedure. An experienced veterinarian can usually take this sample in just a few minutes. Your veterinarian will place this sample in a red-top test tube that is spun and the serum removed. The sample should be sent to a laboratory that is able to conduct IgG testing. M & M Laboratories and Kent Laboratories both conduct this test. The sample does not have to be shipped overnight service, but it will expedite the testing and facilitate quicker reporting of the results to your veterinarian. (Some veterinarians purchase test plate kits from Triple J Farms and conduct the test themselves. However a lab can provide additional information about the blood sample.)



The cria should nurse colostrum from the dam within two to six hours and absorb the IgG that is in the colostrum through its intestines. Insure the dam's teats are actually giving colostrum. Check the teats to insure the small, wax-like "plug" in the opening of each teat has come out. If not, you need to remove it yourself by gently milking the teat.

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9. Lab Time/FAX Time. The lab will fax the results of the blood sample test back to your veterinarian, often on the same day it receives the sample for testing. Your onsite veterinarian may need to consult with the laboratory, an alpaca consulting veterinarian, or the plasma supplier on each case. Discuss the interpretation of the IgG and other blood sample data with your veterinarian.

10. General Guidelines:

a. IgG level less than 800 (eight hundred) mg/dl
Passive transfer may not have occurred at a sufficient level and a plasma transfusion should be considered. Some insurance companies now require crias younger than ninety days of age to have a minimum IgG test result of 800 (eight hundred) mg/dl.

b. IgG level greater than 800 (eight hundred) mg/dl

Passive transfer may have occurred at a sufficient level and a transfusion may not be necessary.

c. In all cases, other factors should be considered in deciding whether to perform a plasma transfusion. Will the cria remain at the same farm or be transported within the next several months? Will the cria be exposed to outside pathogens? Does the cria appear alert, healthy, and full of energy? Does the cria have any other health issues?

If the decision is made that the level of passive transfer is not adequate for the set of circumstances, a plasma transfusion should be considered.

Intravenous and Intraperitoneal Plasma Transfusions

There are two types of plasma transfusions: **Intravenous** and **Intraperitoneal**. *Both should be performed only by your veterinarian.*

Intravenous plasma transfusions are administered by your veterinarian by very slowly dripping pre-warmed plasma through an IV into the jugular vein. This process takes about one and one-half hours to three hours. Intravenous plasma transfusions should be considered when:

- A cria is in a health situation where an IV is already in use
- The cria is not able to stand on its own. (Some veterinarians have observed that a cria should be able to stand and move around freely following an IP transfusion or the IP plasma may tend to pool in the abdominal cavity and not be effective.)
- The cria has some abdominal health issues such as sour stomach or sore belly

IV transfusions may be considered to be more dangerous to the cria at the time of the transfusion than intraperitoneal transfusions because of direct infusion of the plasma into the blood stream. They are more time consuming to administer because your veterinarian must insure the IV plasma bag is elevated and stays properly connected to the cria for the entire procedure. The cria does not have to be immobilized during this time, but personnel must be in the exam room or pen with the cria the entire time. The advantage is that there is no chance for injury of internal organs or peritonitis as can occur if improper techniques are used in administering an IP transfusion.

Intraperitoneal plasma transfusions are administered by your veterinarian by making a small incision in the cria's skin on the right upper flank and infusing plasma into the peritoneal cavity. The plasma must be carefully pre-warmed to body temperature before it is introduced rapidly into the abdomen of the cria. This IP transfusion takes about ten minutes. Intraperitoneal plasma transfusions are the most common and should be considered when the cria:

- Can stand on its own and will be able to move about freely after the procedure
- Does not have any abdominal health issues such as sour stomach or sore belly
- Does not have an IV in place for other health reasons

IP transfusions also require aseptic conditions. Poor sanitation can lead to infection in the abdomen causing peritonitis and result in the death of the cria. **NOTE: It is important that a blunt-ended infusion tube or plastic IV catheter be used for insertion in the abdomen. Caution should be taken to avoid lacerations to internal organs.**

Top: Plasma is frozen in sealed bags, wrapped in bubble wrap, packed with dry ice inside a Styrofoam container, and then shipped by overnight delivery. To help protect the sealed bags of plasma from damage, leave them in the shipping container while being stored in your freezer. **Bottom:** The plasma bags will have information printed on the label as to the date that it was drawn, the number of ml in the bag, and the concentration (ml/dl) of the sample.



As with any medical procedure, your cria is at some level of risk during a plasma transfusion. But with dangerously low IgG levels, the cria's chance of dying without the transfusion may be high, especially if the cria will not be staying on the same farm. There is, however, some controversy as to which method of plasma transfusion is best. Some intravenous plasma transfusions have resulted in immediate deaths of crias, which were reported to appear to be the results of shock. Some intraperitoneal plasma transfusions have resulted in cria deaths that appeared to be the result of poor sanitary conditions or nicks in internal organs caused by using sharp needles instead of blunt-end infusion tubes.

Field veterinarians tend to prefer intraperitoneal plasma transfusions. Many field veterinarians will not perform intravenous plasma transfusions. However, some veterinarians in clinical hospitals prefer intravenous plasma transfusions. There is a controversy as to which type of plasma transfusion is best. *Alpaca owners need to work closely with their veterinarian to evaluate which transfusion method should be used in their particular case.*

Materials for Intraperitoneal Plasma Transfusions

1. Camelid Plasma: We recommend keeping two 300 ml bags of 2,500 mg/dl (high concentration) plasma on hand any time a cria is due. The plasma may be from alpacas or llamas and should be prepared by a reputable, professional supplier. The plasma is frozen in sealed bags, packed with dry ice inside a Styrofoam container and then shipped by overnight delivery. You need to make arrangements to accept the shipment and place it in a freezer as soon as it arrives. The plasma bags will have information printed on the label as to the date that it was drawn, the number of ml in the bag and the concentration (ml/dl) of the sample. Plasma will keep for about three years if kept frozen in a chest type freezer that does not have an automatic defroster and the sample is truly frozen the entire time. Plasma sells for about \$90 per bag.

2. Infusion Tube: This is a 12-gauge, blunt-end tube with two side ports and is used for intraperitoneal cavity transfusions. Your veterinarian will need to sterilize the blunt-end tube prior to use. (price: \$4). Note: Some veterinarians prefer to use plastic 16-gauge IV catheters for IP transfusions and exercise caution when in use to avoid lacerations to internal organs.

3. Administration Kit: This kit has a series of tubes, couplers, and valves and is used by your veterinarian to control the flow of plasma from the plasma bag to the infusion tube. It is a Y-type blood/solution set with a large standard blood filter. It is made by Baxter (product number 2C6714). It comes boxed as a complete set and is used only one time for a transfusion. The kit sells for about \$12.

Description of Your Veterinarian Performing Intraperitoneal Plasma Transfusion

1. If your veterinarian has determined that the cria's blood sample IgG test level and/or other factors indicate a plasma transfusion is necessary, make the necessary arrangements to transport the cria to the vet clinic. If you are not able to transport the cria, the veterinarian may have to perform the procedure at your ranch.
2. Your veterinarian will calculate the amount of plasma needed to transfuse into the cria to bring the IgG up to an acceptable level. In general, a 300 ml bag of high-level plasma will raise an alpaca cria's IgG level about 800 mg/dl. The following chart may be used for the calculation:

Example Serum IgG Calculation

For this example, calculation of the actual IgG test result from the cria's blood sample was 616 mg/dl. The cria's weight was 17 pounds and the donor IgG

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level on the bag of plasma was 3,400 mg/dl. The veterinarian wished to raise the IgG level to one thousand two hundred (1,200) mg/dl. After running the calculation, a 300 ml bag of plasma was determined to be needed for the cria.

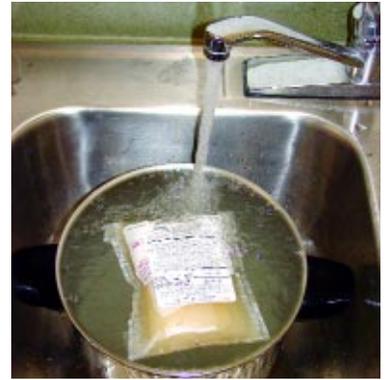
Target IgG level		1,200 milligrams (mg)/deciliter (dl)
Actual test result	-	616 mg/dl
IgG needed	=	584 mg/dl
Weight of cria		17 pounds (lbs.)
Lbs./kilo	÷	2.2 lbs./kilo
Kilos	=	7.73 kilos
Kilos		7.73 kilos
Cria blood volume	x	7%
Kilos	=	.541 kilos
Deciliters/Kilo		100 dl/kilo
Deciliters	=	5.4 dl
IgG needed	x	584 mg/dl (IgG)
mg	=	3,153 mg
Absorption factor	x	33% est. (absorption rate: 11-60% nt)
Total IgG needed	=	9,459 mg of IgG to add to cria
Donor plasma mg/dl	÷	3,400 mg/dl on plasma bag label
dl needed from bag	=	2.782 dl
ml/dl	x	100 ml/dl
ml of plasma needed =		278 ml of plasma to be transfused into cria

The recommended administration kit is a Baxter Y-type Blood/Solution Set w/Large Standard Blood Filter. It has a series of tubes, couplers and valves and is used by your veterinarian to control the flow of plasma from the plasma bag to the infusion tube.

Note: In this example case, the IgG test taken 48 hours after the transfusion showed the cria's IgG level was actually raised to 1,432 mg/dl.

3. Veterinarian needs to insure all equipment is available for the procedure
4. The bag(s) of plasma must be carefully warmed to near body temperature before it is introduced into the cria. **DO NOT WARM IN MICROWAVE** as this will damage the properties of the immunoglobulin. Carefully remove the bags of plasma from the storage containers and use caution to not crack the plastic bag material as it may be brittle. Thaw the frozen plasma by placing the sealed bag in a large pan. Continuously run warm water (no warmer than 101° F) into the pan until the bag is completely thawed. The bag will

Thaw the frozen plasma by placing the sealed bag in a large pan. Continuously run warm water into the pan until the bag is completely thawed.



need to be turned carefully in the water to slowly mix the plasma as it warms up. When the entire bag is warm to the touch of your skin (about 100° F) it is ready to transfuse. Do not try to keep the plasma warm for very long as it may parboil the blood plasma proteins.

5. Veterinarian prepares the cria for the transfusion:
 - a. Some veterinarians administer butorphanol sedation, others administer Banamine.
 - b. Hang the bag of warm plasma on an IV bag stand near the examination table.
 - c. Connect the administration kit infusion lines to the bag of plasma and follow directions on the box to insure all air has been forced out of the lines. Lock the valve.
 - d. Some veterinarians place the cria on table with the right side of the body facing up
 - e. Two assistants should hold the cria firmly on the table. It works best for one assistant to hold one hand on the tail area and their other hand on both back legs near the knee joints. The legs should be toward the veterinarian. The second assistant should hold one hand around the front legs near the knee joints and their other hand holding the head and neck down on the table. Other techniques can also be utilized.
 - f. Veterinarian locates the area between the front of the rear thigh, the last rib and the backbone, clips a two inch area down to the skin and uses tape to hold fleece away from the site. They will also avoid any obvious skin veins when locating the incision target site.
 - g. Scrub the area well.
 - h. Veterinarian injects Lidocaine in the incision site just under the skin.
 - i. Veterinarian cuts a 3 mm incision in the skin.
 - j. Next he pushes a three inch blunt-end, two port infusion tube through the incision and



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through the peritoneal wall. (Notes: Do not use a sharp tipped needle as it might cut internal organs if the cria should move around. Some veterinarians prefer to use a 16 gauge plastic IV catheter to go through the skin hole and into the abdomen. This may require “tenting up” the skin.)

- k. Connect the infusion lines from the plasma bag to the blunt-end tube.



Dr. Greg Mobley connects an administration kit infusion line to a warm bag of plasma that has been hung from an IV stand near the examination table.

- l. Run the warm plasma into the body cavity in a total time of only five to ten minutes.
- m. Shut off the valve on the plasma line as the last amount runs down to it.
- n. Remove the blunt-end tube.
- o. Glue the skin hole or suture the incision with one or two sutures.
- p. Place the cria back in the alpaca pen with the dam and monitor for 30 minutes to insure no signs of shock occur. The cria should move about freely.
- q. Cria may appear bloated and have some slight weight gain because of the added fluid in the abdomen.

- r. Take another blood draw from the cria about 48 hours after the transfusion and have the sample analyzed for IgG.
- s. Discuss the results with your veterinarian and proceed accordingly.
- t. If the expected results are not achieved, a second transfusion may be necessary.

Hopefully this article has helped alpaca owners gain a better understanding of the passive transfer process, what can be done to help insure that it takes place and what to do if failure of passive transfer is noted.

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Bill and Sherri Duey operate Southern Iowa Alpacas ranch located in the hills of Southern Iowa sixty miles southeast of Des Moines. They specialize in raising full Accoyo herd sires. They have incorporated innovative features into their alpaca ranch and conduct seminars on business planning, animal selection and ranch setup for new alpaca ranchers. They also enjoy helping existing ranchers learn about new products and techniques for fine tuning their operation. You may view their website at www.southerniowaalpacas.com or contact them directly at alpacas@southerniowaalpacas.com.