Reproduction in South American Camelids.

April 2004. Rob Löfstedt; amended from the original by GF Richardson

Introduction

In this article, you are about to see that the South American Camelids appear to be a physiological and anatomical blend between cattle, horses, pigs and cats! I will point out these similarities as the article progresses.

The South American camelids (New World camelids) include the llama (Lama glama), alpaca (Lama pacos), guanaco (Lama guanicoe) and vicuna (Vicugna [or Lama] vicugna). Of these four species, only llamas and alpacas have been extensively domesticated.

All camelids (including the Bactrian [2 humps] and Dromedary [1 hump] old world camels) have a diploid number of 74 chromosomes. Interbreeding can occur between any of these species, producing fertile offspring. In llama and alpaca are occasionally interbred, producing an animal with longer but coarser fibre length than Alpaca. These are known as Huarizo. Using artificial insemination between old and new world camelids, other crosses can be produced. In fact, cross bred llama/dromedary camels (Camas) have being bred by A.I. for experimental purposes in the United Arab Emirates.

This discussion is limited to Llamas and alpacas. Theses camelids are raised for wool production, as beasts of burden and as pets. In South America, they are also used for meat and pelt production.

In North America, individual animals can be valuable ($1000 to over $20,000 per animal) so there is considerable pressure to breed them. Reproduction is very similar in llamas and alpacas. Unless otherwise stated, the information presented on cyclicity, puberty, etc. reflects the situation in llamas and alpacas raised under common husbandry practices in Canada and the USA.

Nomenclature

A group of South American Camelids (SAC) or new world camelids is called a “herd” or “flock”. Males are referred to as “studs” and castrated males as “geldings”. Females are simply referred to as females or dams. The young are called “crias” and from weaning to adulthood are called juveniles. Parturition is called birthing, and occasionally, criation!

General information

SAC’s may live for up to 20 years. Obesity is common and may adversely affect fertility because of fat in the scrotum and lethargy. Fat tends to accumulate around the perineum and in the ventral abdominal subcutaneous region, not on the back. Palpating the back may lead owners to think that their animals are too thin and over-feed them. Instead, one
should assess body condition by palpating the ribs just caudal to the elbow, the transverse processes of the lumbar vertebrae, and areas around the shoulders.

<table>
<thead>
<tr>
<th>Item</th>
<th>Llama</th>
<th>Alpaca</th>
<th>Note:</th>
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<tbody>
<tr>
<td>Weight</td>
<td>Male</td>
<td>135-240 kg (300-530 lb)</td>
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<tr>
<td></td>
<td>Female</td>
<td>90-180 kg (200-400 lb)</td>
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<td></td>
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<td>8-18 kg (17-40 lb)</td>
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<td>Newborn</td>
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<td>60-80 kg (130-175 lb)</td>
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<td>50-60 kg (110-130 lb)</td>
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<td></td>
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<td>5.5-9 kg (12-20 lb)</td>
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<tr>
<td>Guanaco</td>
<td>Male</td>
<td>100-150 kg (220-330 lb)</td>
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<tr>
<td></td>
<td>Female</td>
<td>100-120 kg (220-264 lb)</td>
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<tr>
<td>Vicuna</td>
<td>Weight</td>
<td>40-60 kg (88-143 lb)</td>
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<td></td>
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<td>30-40 kg (66-88 lb)</td>
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Note: Hair coat may make the animal look heavier than it is. Obtain weights before calculating dosages.

Vicunas have the finest hair, llama the coarsest.

**Puberty**

Males can reach sexual maturity at 10-12 months but the penis is often not free from the preputium until 2-3 years of age! This would appear to make camelids distinctly different from other domestic animals where the frenulum breaks down far sooner, concurrent with puberty. Female llamas usually reach puberty at 10-12 months of age but this can be as late as 2-3 years of age, as age at puberty is closely correlated with body weight and thus, nutrition. Females should not be bred until they are at least 15-18 months old and at least 2/3 of their anticipated mature body weight.

**Male reproductive anatomy**

Like the tomcat, the penis and prepuce are directed caudally in their relaxed state and during sexual excitement, a strong protractor prepuce muscle pulls them cranially. The penis is fibro-elastic like that of a bull, with a pre-scrotal sigmoid flexure like that of a boar. The penis ends in a short cartilaginous process (unique!) which assists in dilation of the cervix during intromission. Semen is thought to be deposited into the uterus.

The testes are located in a non-pendulous scrotum ventral to the anus. Testicles of adult male llamas, are smaller that other domestic animals of similar size; usually 5.0-7.0 cm long and 2.5-4.0 cm wide. One is struck by this feature when first examining male camelids. Corresponding measurements for alpaca testicles are 3.5-5.0 cm long and 2.0-3.5 cm wide. Accessory sex glands include only a (trans-rectally palpable) prostate and a pair of bulbourethral glands. Again, this is like the tomcat, where the seminal vesicles are also absent.
Breeding soundness evaluation in males

The principles of breeding soundness evaluation (as discussed in other species) also apply to new world camelids.

<table>
<thead>
<tr>
<th></th>
<th>Suggested minimum testicular size</th>
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<tbody>
<tr>
<td>Llama</td>
<td>5.5 cm long x 3.0 cm wide with a scrotal width of &gt; 6.0 cm</td>
</tr>
<tr>
<td>Alpaca</td>
<td>4.0 cm long x &gt; 2.5 cm wide, with a scrotal width of &gt; 5.0 cm.</td>
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</table>

Because camelids copulate for a prolonged time (20 to 25 minutes) and because small amounts of semen dribble from the penis during copulation, a complete ejaculate is difficult to collect.

Semen has been collected with variable results using an artificial vagina, working best when it is mounted inside a "surrogate female". Real or dummy female can also be used as mount animals\(^{1,2,3,7}\). Electro-ejaculation requires anesthesia and a ram probe. Semen can also be collected using an intra-vaginal condom or sponge, or by vaginal aspiration (which may not yield much semen unless the pipette can be passed through the cervix and into the uterus).

There is considerable unexplained discrepancy in the literature on sperm cell concentration and semen quality. Semen quality is apparently better in the winter months than in the summer. The progressive motility of the spermatozoa is relatively poor; however, the viscous quality of the semen probably inhibits progressive motility. If any (elliptically-shaped) red blood cells contaminate the semen sample, they can resemble loose sperm heads.

In one study on normal fertile males, 26 ejaculates had a mean volume of 3.5 ml, a mean concentration of 840 million per ml and a total count of 2.9 billion. Sperm abnormalities were common (especially midpiece defects) and the percentage of normal sperm was only about 30%!

Female reproductive anatomy

The anatomy of the external genitalia is unremarkable and the vagina is 11-25 cm long. The cervix has 2 to 4 rings and most resembles that of a heifer. Although the uterine body is short (3.0-5.5 cm), camelids have a longer body than cattle more akin to that of a mare. The uterus is Y-shaped and again like a mare, has no obvious intercornual ligaments.

The left uterine horn is slightly larger than the right horn even if there have been no pregnancies. In mature pluriparous females, it is substantially larger. This is probably because 98% of pregnancies occur in the left horn although both ovaries are equally active. The reason for this phenomenon is unknown but it has been suggested that it may be simply be a matter of greater capacity in the left horn. One study has shown a preferential blood supply to the left horn but some researchers question its significance.
Some data has shown a local (like ruminants) and systemic luteolytic effect on the left horn and only a local effect in the right. Therefore right horn pregnancies are theoretically unable to block the system luteolytic effect, hence terminating pregnancy. However this would mean that approximately half of all pregnancies would terminate spontaneously (about half of all ovulations occur on the right ovary) and this obviously does not occur. In fact, pregnancies can even be forced to implant and go to term in the right uterine horn by ligating the entrance to the left horn. Even in the natural state, pregnancies occasionally go to term spontaneously in the right uterine horn. Therefore the luteolytic pathway in camelids is not well understood at this time.

At rest, the uterine horns are flaccid and curl ventrally like those of a cow during the luteal phase and have increased tone when there is a mature follicle present. Like mares, camelids have an obvious papilla at the uterotubal junction preventing retrograde flow up the uterine tubes. During estrus, the SA camelid uterus becomes less echogenic as one would expect from experience in cattle and mares but the decreased echogenicity is not as pronounced as it is mares.

The ovaries of SAC’s are very similar to those of cattle and measure 1.3 to 2.5 cm long X 0.5 to1.5 cm in width and 1.0 to 2.5 cm in depth (Alpaca being in the lower end of these ranges). Although an ovarian bursa is present, it is similar to that in cattle, not like the bursa in bitches where the ovary is completely covered by the bursa.

The mammary gland has four teats (like cattle) with two canals in each teat (like mares).

**Estrus, ovulation, and the maintenance and termination of pregnancy**

When fed optimally, new world camelids are non-seasonal breeders. In their natural state however, nutritional conditions may limit breeding.

Follicles develop in waves with 11-23 and 8-17 days between waves in the llama and alpaca, respectively (a little more frequent in alpacas). Follicular development alternates between ovaries about 80% of the time.

Like cats, rabbits and numerous other animals, the camelids are generally induced ovulators. The world “generally” is used because all of these animals can also ovulate spontaneously i.e. in the absence of copulation. In the camelids, up to 15% of all ovulations can be spontaneous.

The dominant follicle usually grows to about 10mm in diameter in llamas (vs. approximately 16mm in heifers) before it ovulates. If not, it regresses in size soon after reaching its maximum diameter. However some follicles may remain in the ovary for up to 10-12 days, eventually becoming atretic and regressing. Some of these non-ovulatory follicles may become oversized (> 25 mm in diameter) and hemorrhagic, several weeks to regress. A similar phenomenon occurs in old world camelids. In both types of camelid, this seems to be regarded as a normal.
Follicles usually ovulate at a minimum of 6-9 mm in diameter, if mating occurs. It is not clear if multiple mating is more effective for inducing ovulation (as it is in cats) than single matings/ This is because current evidence shows that llamas only release LH only after the first mating not subsequent matings. This subject deserves further research. At any rate, up to 90% of females will ovulate within 48 hours after a single breeding; alpacas ovulating slightly sooner after copulation than llamas.

A mature corpus luteum from a llama is smaller than that of a heifer about 10-16 mm (vs. 28mm) in diameter and like that of cattle, it also protrudes from the surface of the ovary and can be palpated easily during rectal palpation. Follicles also protrude from the surface of the ovaries. On ultrasound, these structures are very similar to those in cattle. After 9 to 13 days, the CL regresses in the non-pregnant female and sexual receptivity returns as soon as the next follicle wave matures. As one would expect this can occur almost immediately or after a couple of weeks!

Like goats, the corpus luteum is required to maintain pregnancy throughout the gestational.

**Ovulation of a mature follicle can be induced** using a single IM injection of 500 µg (micrograms) GnRH. Although it has been suggested that several injections of GnRH can be used to obtain the same effect, this is probably not true because the llama (see statement about LH release after copulation) appears to develop a refractory state to GnRH quite rapidly, similar to cattle, sheep and most other species.

Human chorionic gonadotropin (hCG) at a dose of 500-1600I.U. IM or IV has also been reported to be effective in inducing ovulation.

Prostaglandin $F_2 \alpha$ (PG $F_2 \alpha$) is luteolytic at a dose of 10 mg IM or SQ. However, hypertension, colicky reactions and deaths have been reported following the use of this drug in llamas. The same is true in other species that are highly sensitive to this native hormone (dogs and horses). In those cases, the dosage is lowered considerably in comparison to ruminants. For example, a luteolytic dose of PG $F_2 \alpha$ in mares is just 5 to 8mg vs. 25 mg in a cow. Therefore, lower doses can probably be used safely. A recent conversation with a clinician experienced in llama theriogenology supports this statement. In that practice, only 5mg of PG $F_2 \alpha$ is used to induce luteolysis, seldom with any side effects.

At this time, it is not known if luteolysis is a local function (as in the ruminants) or a systemic function (as it is in mares). This is important because animals that lack a local luteolytic pathway appear to require lower doses of prostaglandins to cause luteolysis than animals with local luteolytic pathways (ruminants).

Cloprostenol (a prostaglandin analogue) has been used at a dosage of 150 µg IM to induce luteolysis. Again, this dosage can probably be lowered as discussed above.
It is not clear how soon after ovulation the corpus luteum of camelids becomes susceptible to exogenous luteolytic treatment but pregnancies can be terminated predictably just 6 days after ovulation. Because of the short luteal phase in non-pregnant females therapeutic luteolysis is seldom a consideration.

**Abortion has been induced** in llamas between 4 and 7 months of gestation using 2 doses of 250 µg of cloprostenol IM 24 hours apart. Again, lower doses may be more appropriate. Fetal expulsion occurred in approximately 90% of treated animals by 72-96 hours after treatment and there were no adverse reactions or negative effects on fertility.14

**Parturition has been induced** in alpacas by the administration of luteolytic doses of prostaglandins within 10 days of their estimated due dates. This occurred within 24 hours.13

**Note:** Unlike the situation in cattle, dexamethasone has caused fetal death in treated animals and is consequently not recommended for inducing parturition in camelids.

**Breeding behaviour and management**

Males determine sexual receptivity by pursuing the females and attempting to mount them. Non-receptive females run away from the male and spit or kick at him. Although vulvar swelling, mucus discharge and even homosexual mounting is seen in the old world camelids, there is virtually no vulvar swelling and no mucus discharge during estrus in new world camelids. Homosexual mounting is rare and there is no hemorrhagic metestral discharge either. In these respects, they are similar to sheep and goats.

The receptive female assumes sternal recumbency (known as a “cush”) and allows the male to mount, often after a brief period of pursuit. Mating will continue in the recumbent position for 3 to 65 minutes (about 20 minutes on average) often attended by neonates, who may even try to mount the male while he in turn is mounted! Other receptive females may lie down close to a copulating pair. Altogether it is quite a lively gathering!

The male makes a guttural humming sound throughout copulation while the female remains submissive and quiet.

As in all animals, some males may dislike certain females and refuse to mate with them (or vice versa) and periodically, males will show reduced libido, especially when running with a group of females. For this reason, the males are rotated every 1-2 weeks with males that have been isolated from females. Mature males can apparently run with around 30 females (a ratio of 1:15) if males are rotated as described.

The practice of hand mating is preferable to pen mating. This involves observing individual pairs by themselves in a pen and works best if the female is brought to the
male’s paddock. If breeding does not occur, the pair should be separated for several
days before the next attempt. During hand breeding, breeders often checks to make
certain that intromission is really occurring during the mating.

**Note:** The use of multiple males in a breeding situation or contact with other males across
fences can reduce breeding activity because of aggression between males.

**Infertility**

Causes of infertility are similar to those in other species and are discussed in detail in
some of the references. The principles of investigation into the causes of infertility are the
same as in cattle. It is always important to consider both male and female aspects in any
infertility investigation.

Apparently (as is the case in mares) vaginal strictures and adhesions are relatively
common acquired defects. This leads the author to suggest that the same precautions be
taken to prevent vaginal adhesions after llama dystocia as for equine dystocia.

Follicular "cysts" are not a distinct entity as in cattle although failure of ovulation after
breeding is common, especially if the follicle becomes very large as described earlier. As
mentioned, this is sometimes treated with GnRH or hCG.

A very high embryonic mortality rate (up to 50% losses) has been reported in some areas,
e.g., in alpacas in Peru but the cause is unknown.

Another cause of infertility is damage to the penis because of entanglement in the
perineal fibre of the female. This is why the perineal areas of camelids are often clipped by
breeders. Obesity, scrotal edema, hydrocele and heat stress can also reduce fertility.
Insulation may also cause infertility in unshorn males.

**Pregnancy diagnosis**

A presumptive diagnosis of pregnancy is based on:

- Refusal to mate 15 or more days after breeding with rechecking at 30, 60, and 90
days. However, male aggressiveness and some physiological abnormalities can
result in the occasional pregnant female accepting the male, leading to a
false-negative diagnosis. Males with poor libido will also decrease the accuracy of
this test.

- Elevated serum (or milk) progesterone levels (>2 ng/ml) at 15 or more days after
breeding. However, Cl’s remaining after embryonic death or Cl’s from
spontaneous can also elevate serum progesterone levels, leading to false positive
diagnoses.
Elevated estrone sulphate concentrations peak at 21 days after breeding and at then end of gestation. Relaxin concentrations increase at 3 months of gestation to >20 ng/ml, decrease at 5 months to 5 ng/ml, then increase again from 8 months of pregnancy until parturition. Serum relaxin concentration is a better indicator of pregnancy after the second month of gestation because its concentrations are greater than basal values for a long period of pregnancy. However, both assays are so specific to limited times of gestation that neither is widely used.

Accurate diagnosis of pregnancy is based on:

Apparently, careful transrectal palpation of the uterus at 30-35 days after breeding will reveal pregnancy, but for this, the operator must feel either the embryo/fetus itself or the amnion, both potentially risky procedures. Due to the diffuse nature of the placenta, there is obviously no fetal membrane slip.

**Note:** Good restraint, a gentle approach and copious use of lubricant are recommended for transrectal examination; especially in alpacas. In fact, transrectal palpation may not be possible in some alpacas. The value of lidocaine in lubricant is debatable.

Rectal palpation is most accurate after 45 days when the amnion and the fetus itself may be felt. After 90 days of gestation, the cranial border of the uterus moves out of reach but the fetus can usually be palpated from 90 to 150 days. After 5-6 months, similar to the situation in cattle and horses, the gravid uterus is difficult to palpate because its weight pulls it deep into the abdominal cavity. However (again like cattle and horses) the fetus usually comes back into reach after 210-240 days of gestation.

Due to the shape of the fetal membranes, transrectal real-time B-mode ultrasonography can detect fetal fluids as soon as 15 days after the initial mating; not as early as in mares but still somewhat earlier than in cattle. Using a 7.5MHz transducer, the embryo itself can be seen as early as 20 days after breeding and its heartbeat a week later. In smaller animals where it is not possible to insert a hand into the rectum, the transducer can be stiffened with a guide and inserted into the rectum. This is similar to the approach used in sheep and goats. Remember however, no placentomes will be seen because camelids species have a diffuse placenta!

Trans-abdominal B-mode ultrasonography is also useful for pregnancy diagnosis but only after 45 to 50 days post breeding. A high degree of accuracy has been reported up to 90 days of gestation. To detect these pregnancies, it is recommended that the transducer be placed on the left side of the abdomen, just cranial to the mammary gland. For later stages of pregnancy, examination on the right side appears to be more accurate because the heavily pregnant uterus lies to the right of the three stomach compartments.

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1 ([c1-c3] Note that there is no true rumen in camelids and they don't suffer from grain poisoning.)
If a fetus cannot be detected on one side of the abdomen, one should obviously search for it on the opposite side as well.

**Note:** Pregnancy diagnosis by trans-abdominal ballottement is difficult and hence, inaccurate.

**Abortion**

Causes of abortion have been poorly studied and there may be many infectious causes that affect other species that have not yet been confirmed in camelids. However, thermal stress, chronic stress, leptospirosis, chlamydiosis, toxoplasmosis, *E. coli*, and salmonellosis have all been implicated as causes of abortion. Less common causes include twinning, nitrate poisoning, and pine needle toxicosis.

**Care of the dam in the last trimester**

This includes the evaluation of body condition and removal of excessive wool, especially in the perineal area and around the udder. De-worming depends upon age, previous de-worming programs, season, stocking density, degree of confinement, and pasture rotation. Products that have been safely used in the last trimester include fenbendazole (Panacur® or Safeguard®) @ 5-10 mg/kg PO for 3 days or ivermectin (Ivomec®) @ 0.2 mg/kg PO, once only.

Dams should also be vaccinated against *Clostridium perfringens C* and *D* (enterotoxemia) and *Clostridium tetani* (tetanus) about 60 days before parturition and again at 30 days prepartum. If they have been previously vaccinated against these diseases, a booster shot at 30 days prepartum is adequate. In selenium-deficient areas, the dam should be supplemented with a vitamin E-selenium injection within 4 weeks of parturition.

**Parturition and dystocia**

There is minimal abdominal enlargement and gestation lasts for 330 to 365 days (around 11.5 months). A recent record from one alpaca showed that her gestations were 351, 345 and 338 & 352 days respectively. This is very similar to the gestation length of a mare.

As mentioned earlier, placentation is diffuse and epitheliochorial (like that in horses) but unlike the horse, the amnion is adhered to the chorioallantois. That fact makes camelid placental membrane structure similar to that in cattle. It also means that neonatal suffocation is impossible (unless the chorion is prematurely expelled) because the amnion is indirectly attached to the endometrium (as in all ruminants).
Parturition nearly always occurs during daylight hours, and most often between 7:00 a.m. and mid (to late) afternoon. This is thought to be an adaptation to the harsh climate in the Andes where neonates could die if they were born at night.

The only physical signs of impending parturition may be waxing of the teats and a slight vulva relaxation. Udder development and enlargement of the teats are usually not apparent until the last week or day of gestation, or even after parturition.

During **stage 1** of parturition there is restlessness, increased humming and an increased frequency of urination. Appetite is decreased and segregation from the herd occurs. This stage usually lasts for about 1.5-3 hours. If it is longer than 6 hours, veterinary assistance may be required.

**Stage 2** should last for 10-90 minutes (more similar to the duration in cattle than horses) and although the dam may lie down and get up frequently, they usually deliver the cria while standing.

Because they are fused, both the chorion and amnion rupture when the fetus is presented at the birth canal. The amount of fetal fluid is less than one would expect if one is accustomed to the monotocous domestic species. There is a slippery fetal “epidermal membrane” that is attached at the muco-cutaneous junctions, hoof coronet, and umbilicus of the fetus. This membrane facilitates birth in the absence of copious amounts of fetal fluid. It ruptures during second stage, then dries and rubs off as the fetus struggles after delivery.

The normal presentation posture and position for camelids is; anterior longitudinal (cranial) and dorso-sacral with the forelegs extended above or below the head. This is the same as for the other large domestic species except for the fact that the forelegs should not be above the head (foot-nape posture) in those animals!

Lack of perineal bulging during early second stage labour may indicate that the fetus is not presented normally. Either the feet or nose can be presented first, but within 30 minutes both the nose and feet should be visible. The dam may cease straining for a while when the fetal shoulders pass through the pelvic canal. The thorax is a greater obstacle to birth in camelids meaning that “chest lock” is more common than “hip lock.” The pelvis of the mature llama pelvis is small; barely 200 sq cm and interestingly, its maximum diameter is not dorso-ventral as it is in cattle but diagonally. That diagonal measurement is about 15 cm (6 inches). This should be born in mind when relieving dystocia.

Assistance is probably required if the second stage of parturition lasts longer than 2 hours.

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2 Heifers have a cross-sectional pelvic area in the region of 220 cm², cows about 300 cm² and mares about 400 cm².
Dystocia is uncommon (2-5%) but occasional causes are fetal oversize in primiparous dams) abnormalities in presentation, position and especially, posture (in pluriparous dams). The latter finding is probably due to the fact that the legs and neck of a cria are very long and slender.

Torsion of the uterus appears to be one of the most common causes of dystocia. Like cattle, it usually occurs late in gestation or during parturition. Therefore the cervix is often found to be partially of fully dilated when the torsion is corrected.

Torsion is corrected by rolling as is done in cattle. The use of a plank to help stabilize the uterus should be considered. Otherwise, manual pressure on the abdomen is used. The dam is lightly tranquillized (see below) for this procedure. If this fails a cesarian section (see below) is used to deliver the cria.

Other obstetrical techniques are similar to those described for other large animal species.

Stage 3 (expulsion of the placenta) occurs between 45 minutes and 3 hours postpartum and the placenta is considered retained if not expelled by 6-8 hours.

Retained placenta (RP) is uncommon. In fact, less than 1% of females still retain their placentas by 24 hours postpartum. Therapy for RP includes oxytocin (5-10 IU IM every 20-30 minutes for 6 treatments or to effect) and warm saline lavage of the uterus as in mares. Systemic antibiotics are used if indicated.

Postpartum reproductive physiology

The uterus is usually involuted to its normal size by 21 days postpartum. A small amount of lochia may be discharged for the first 5-7 days. Females will accept the male as early as the day of birthing but conception at this stage is rare. Follicular activity resumes as early as 4-6 days after parturition and ovulation can occur as early as 2 weeks postpartum if the female is mated. Conception rates have been reported to be higher when the females were rebred at 2-4 weeks postpartum than when rebred at 2-3 months. Breeding before 14 days postpartum is accompanied by reduced fertility and increased embryonic death.

Anesthesia for Theriogenology techniques

For details on these techniques, the reader should see the IVIS article on this subject.

In essence, for epidural anesthesia, the technique is similar to that used in heifers. Injection is made at the sacro-coccygeal junction using an 18 to 20 gauge 1 to 1.5” needle. The space is larger than in heifers and the site of injection is quite shallow. The usual tests for correct placement are used. Lidocaine is used at a dose of 0.22mg/kg for 60 to 90 minutes of anesthesia. Epidural anesthesia using 10% xylazine (0.17mg/kg) diluted in
saline for a final volume of 2ml is also used. The onset of anesthesia occurs within 20 minutes and last for about 2 hours.

For cesarian section:

An extract from a letter written by a fellow diplomate in private practice:

“We use BKX (butrophanol + ketamine + xylazine) - also described the IVIS article on this subject - It works well as an injectable anesthetic and we follow with line block over linea alba. We also used low doses of butorphanol and xylazine to add additional time for surgery. The doses used are as follows: xylazine 0.1 - 0.2 mg/kg IM and butorphanol 0.05 - 0.1 mg/kg IM. Wait for effect (5 - 15 minutes) then give ketamine 2 - 4 mg/kg IM.

We place the dam in dorsal recumbency with her head rotated to one side and her mouth down slightly, to allow saliva to drain. The crias come out very active and vigorous, so we have not used any reversal agents. The total time for preparation and surgery time is approximately 1 hour.

To correct uterine torsion by rolling, we use just butorphanol and xylazine (same doses as above)* just enough to relax them. Their abdomens seem relaxed and we can feel the fetus move as we roll the dam.”

*An alternate approach is to use xylazine alone at a dose of 0.15mg/kg IV

**Care of the cria.**

The dam will hum and nuzzle the cria (but will not lick it!). Other herd members occasionally gather around and hum at the new cria. The navel should be dipped in iodine or chlorhexidine (3 to 4 repeated treatments in the first 24 hours of life).

Normal values for a newborn cria are as follows. HR: 60 to 100 beats/min. RR: 10 to 30/min. Temp: 37.7-39.2°C.

The cria usually stands within 15 to 60 minutes and nurses within 60 to 90 minutes of birth.

**Note:** Partial or complete choanal atresia is a relatively common heritable defect in camellids. In these animals, the caudal nares do not open during development. This causes difficult breathing and the cria chokes or gags when it nurses. Unless the condition is treated surgically, the cria will develop aspiration pneumonia.

If nursing has not occurred by 3 hours, tube or bottle feeding may be required. Crias will nurse every 1 to 2 hours like foals and calves; at episodes of 1 to 3 minutes. Colostrum intake during the first 24 hours after birth should be at least 10% of body weight. If
colostrum is administered by stomach tube, it should be fed at a rate of 150 to 200 ml every 2 hours.

Dysgalactia is a common postpartum problem in camelids. In such cases, cow, sheep or goat colostrum (approx. 20% of body weight) can be used instead. In fact, cow, sheep and goat milk have all been used successfully to raise crias.

Neonatal problems and care of neonates is discussed in depth on the IVIS site: Neonatal Care in Camelids by Tibary and Anouassi.

In selenium deficient areas, 0.5 or 1.0 ml Bo-Se can be administered at birth to alpaca and llama crias, respectively.

Llama crias should gain up to 0.5 kg/day (alpacas somewhat less) for the first 2-3 months of life. They usually begin to eat solid food by 2 or 3 weeks of age, and start to “ruminate” by about a month of age. Crias, like foals are usually weaned at about 6 months of age.

References


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