

# A Beginner's Guide to LAP AI

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## Introduction

Goats and sheep are extremely fertile animals! The ewe and doe have very high reproductive potential. However, it must be remembered that “sex is a luxury” metabolically speaking. The ewe or doe must be healthy and on a good plane of nutrition before maximum fertility is attained.

## Reproductive cycle

Reproduction function in does and ewes is dominated by 2 distinct, superimposed rhythms, seasonality and estrous. Estrous remains consistent at approximately 21 days in the doe and 17 days in the ewe. The variability comes into play due to the effect the time of year has on their respective cycles. Cycling in fall and winter (breeding season) and ceasing in the spring and summer (anestrus) ensures “babies” are born in spring when environment (food, sunlight) is favorable. Other factors that can affect cycle length are breed, location and feed availability. Does usually achieve puberty at 6-8 months depending on when they were born and should not be considered for breeding until they are 60 to 70% of mature body weight. They usually have 4 follicular waves/cycle and it has been shown that improved nutrition improves ovulation rate. Estrus can last 24 to 72 hours but on average is around 36 hours. Signs of does in estrus can consist of restless behavior, flagging tails (spread pheromones), vocalizing, a swollen vulva with clear mucus, and increased urination frequency. Ovulation occurs 12-36 h after onset of estrus and they usually have 2-3 ovulations/cycle. Ewes are similar but not the same. Estrus lasts for 15-45 hours on average approximately 30 hours and does require progesterone priming for 12 days prior. The ewe stands still with head lowered, wags tail, looks for and seeks ram, allows mounting multiple times. Estrus periods are shorter if cycling outside of natural breeding season and during transition periods due to luteal failure and if it is the first ovulation, sometimes called a “silent estrus” due to no P4 priming.

## General guidelines

Neither the doe nor ewe is going to exhibit signs of estrus if the buck/ram is not present. Pheromones have been identified in wax from the hair and anteorbital gland secretion of males has stimulated both estrus and ovulation in the females. Since seasonal breeders, one method often implemented is the use teaser males prior to breeding season to stimulate cyclicity. A teaser male is a vasectomized male who still has his hormones but cannot fertilize a female. Besides the use of a teaser, some other general guidelines regarding breeding management are to have planned breeding seasons. By leaving a male in year-round it is hard to know parturition dates and can lead to improper prenatal care in the female. This is also a good way to check on the fertility of the male. Keep in mind that in large commercial settings where you may use 2-3 males it is always better to use an odd number of males so if 2 fight to establish dominance, the third can breed the females.

## Buck/ram effect

As stated earlier, this can be useful for estrus induction during transition period. The most successful way to use this technique is to introduce a novel male. This is not always possible so keep the male away (miles) with no contact for 3-4 weeks prior should bring about cyclicity in 5-7 days. Highly fertile males work best, but fence line contact is adequate or can use vasectomized males. They will simulate them to ovulate, but again with no progesterone priming, it will be silent. If you do not have access to a male but can capture their scent on a rag, placing that rag in a jar and not opening it again until you are ready to transition your females has also worked to stimulate their cycle.

## Control of estrus cycle

Once we familiarize ourselves with the natural cycle of the females, we can look for ways to manipulate and control it. A few reasons for this are to have a continuous lamb crop in ewes and a continuous milk supply in dairy goats, but whatever your reason, you have to know the cycle before you can try to influence it. There are many ways to manipulate the estrous cycle in small ruminants and a lot depend on the time of year you are attempting it. The further you are away from the natural breeding season, the more effort and drugs you are going to need.

## Drug box

- **Progesterone:** A CIDR continually releases progesterone into the circulation until removed
- **Prostaglandins (PGF-2 $\alpha$ ):** Lyse the corpora luteum to allow for a new follicle to develop
- **PG600:** Stimulates the ovary to release a multiple mature ova
- **GNRH:** Stimulates ovulation

Goats can be bred based on signs of heat and the buck is going to be the best at identifying the goats that are in heat. Signs of heat in a doe can consist of a swollen, reddened, moist vulva, tail flagging, restlessness, increased urination and vocalization. The most obvious change is when the vaginal mucous changes from clear to cloudy, this is an excellent indication that the doe is ready to be bred. Keep in mind you may need a speculum to see this. Initially, at the beginning of heat, very little mucus is present. As the heat progresses, mucus is transparent and found on floor of vagina but towards the end of heat the mucus is cloudy and this is the best time to breed. At the end of the heat the mucous becomes thickened and white and the opportunity to breed has passed.

## Artificial insemination (AI)

**Pros:** Eliminate or reduce the cost and bother of maintaining males. Increase the rate of genetic improvement through maximal use of superior sires. Increase the number of females to which a female could be bred. Reduced disease transmission. Estrous synchronization allows several females to be bred the same day.

**Cons:** Costs for equipment and liquid nitrogen. Increased labor for estrus detection and insemination. Lack of standard protocols for packaging and quality control. Potential for spread of undesirable traits.

## AI kits

What you need in your kit:

- Liquid nitrogen tank
- Speculum (25 x 175 mm for doelings or 25 x 200 mm for does)
- A.I. light
- Straw tweezers
- Sterile lubricant (non-spermicidal)
- Insemination gun (for straws)
- Breeding stand or facilities to restrain the doe
- Thaw box
- Paper towels
- Straw cutter
- Thermometer

## Artificial insemination (doe)

Insert vaginal speculum, attached light to speculum to visually locate the cervix. The cervix should have a red-purple color and cloudy mucus will be present if the doe is in heat and at the proper stage for insemination. Press speculum against cervix a cervical deposition of the semen is better than a vaginal deposit when using AI to breed. Once up against the cervix, place the AI pipette into cervix and slowly inject the semen. The uterus is a perceived space and needs time to equilibrate to the fluid. Withdraw the speculum and you are done. Traditional AI is a challenge in ewes due to their cervix. The anatomy of the sheep cervix is highly variable between animals and may explain the differing success of transcervical AI between individuals. Other options available for artificial insemination are laparoscopic and transcervical approaches what are improving all the time. The advent of these techniques helps pass the convoluted cervical rings of the small ruminant cervix. It also enables the direct intra-uterine deposition of poor-quality semen and can provide higher pregnancy rates than other conventional methods using frozen semen.

## Endoscopic transcervical insemination (TCI)

TCI is a technique in which a rigid endoscope is used to locate the cervix and pass a catheter through it for intrauterine insemination of frozen semen without the need for surgery. A hysteroscope is passed up the vaginal canal of a doe to the cervix. We are able to watch the positioning of the catheter on a monitor. The actual insemination can be visualized, ensuring that the deposition of semen is in the uterus and that minimal back flush occurs. This allows us to visualize the cervix quickly and deposit the semen sample in the uterus. Most animals can be inseminated in minutes and we can use less volume semen since our site of deposit is the uterus.

## Laparoscopic artificial insemination (LAI)

LAI is a surgical technique which is more invasive than TCI and requires specialized equipment. The female is placed into a "cradle", surgically prepped and a skin block with lidocaine is administered. Light sedation is recommended but may not be

necessary in every case. Once prepared the cradle is lifted to a 45° angle to achieve Trendelenburg position. Two small incisions are made, trocars are inserted, the abdomen is insufflated with CO<sub>2</sub>, and a camera is used to visualize the uterus. The uterus can be assessed at this point to gauge heat based on color and tone. A laparoscopic AI gun and needle apparatus are used to inject semen intra-uterine at the level of the mid-horn along the greater curvature. This is a very brief explanation of this procedure and not meant to be anything more than a brief summary. Further detailed information regarding this topic can be found in a recent paper "Laparoscopic Artificial Insemination Technique in Small Ruminants—A Procedure Review," see references below.

## Closing

Advanced reproductive techniques are endlessly being explored and improved in small ruminants. The goal remains to find a reliable means of inseminating goats with frozen thawed semen would be advantageous, not only for commercial breeders interested in genetic improvement of their stock, but also for smaller producers who cannot afford or want a breeding buck of their own.

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