

Estrus synchronization in small ruminants

In the management of livestock, or in dealing with companion animals, there are many times when the manipulation of normal cyclic activity ensures optimum production or is convenient for the owner.

In the case of seasonal breeders the ability to produce offspring out of season or to advance the time of onset of cyclic activity has advantages.

In these and in other species, the ability to ensure that an individual or group of animals does not come into oestrus, or is in oestrus at the same time, has attractions.

The methods that are available can be divided into two main groups: firstly, those which do not involve the use of hormones and, secondly, those that do.

Non-hormonal methods

- i. *Light* : The onset of cyclical activity in the mare, ewe, goat and cat is dependent upon changes in the hours of daylight. The mare and queen are stimulated to activity by a lengthening photoperiod, whilst in the ewe and goat it is the effect of a decreasing photoperiod which is the stimulus.

In ewes, the provision of housing with controlled lighting enables the breeding season to change from the autumn and winter, to spring and summer. Furthermore, by subjecting the ewes to a lighting regimen which does not have any change in duration it is possible to ensure breeding throughout the year, as is the case in equatorial climates. Because the length of the day determines breeding in goats, light treatment to alter this photoperiod response is a well-known method to help get a doe to come in heat for breeding during the non-breeding season, especially in the dairy goat industry. Artificial lighting is used to mimic a long day (16 hours of either sunlight or artificial light) followed by eight hours of darkness. Then, the does are exposed to 8 hours of day and 16 hours of dark. It takes quite a long time to get the animals cycling using this protocol and a light-proof barn with adequate lighting is needed to house the goats. Time and housing constraints may be impractical for commercial meat goat producers.

If mares are stabled at the end of December in the northern hemisphere, and are subjected to artificial light, preferably of increasing duration, then it is possible to advance the onset of normal cyclical activity so that there is oestrus and ovulation.

ii. *Nutrition*

The effect of nutrition in initiating reproductive activity in seasonally breeding species is not clear. There is some evidence that the stabling of mares and the provision of good feeding assist in stimulating the onset of cyclic activity in early spring.

iii. Male effect :

The presence of a male animal can exert its effect upon the cyclical activity of the female. This is well demonstrated in sheep, where the introduction of a vasectomised tup at the start of the breeding season will stimulate the onset of oestrous cycles in the majority of ewes and can also bring about some degree of synchronization of cyclical patterns.

Exposure to males after a period of isolation -- at least three weeks and one mile away -- can be used for induction and synchronization of estrus during the breeding and non-breeding season without additional treatments in goats. The physiological basis for this response is due in part to smell and sight, with neither stimulus completely accounting for the response. It is not effective if the males and females are together all the time and sudden placement of male with females induces an LH surge and ovulation in days.

Hormonal methods

1- **Progestogens:** Progesterone and progestational compounds have been used extensively in most domestic species as a method of controlling the oestrous cycle, particularly synchronisation within groups of females. In general, the principle behind their use is that the exogenous progestogens act in the same way as a CL, resulting in a negative feedback effect upon the anterior pituitary and a suppression of cyclic activity initiated by the release of gonadotrophins. When the source of progestogen is withdrawn, or its effect declines, there is a return to cyclic activity.

A progesterone-releasing intravaginal device (PRID) consists of micronized progesterone distributed homogeneously in an inert silicone rubber coated onto a cylindrical stainless spiral coil. The PRID is maintained in the vagina for 7 days, and a luteolytic dose of $\text{PGF}_{2\alpha}$ is administered 1 day before or at "pull-out" day. There are no milk or meat withdrawal requirements. In noncycling animals, an injection of equine chorionic gonadotropin (eCG) is administered when the PRID is removed.

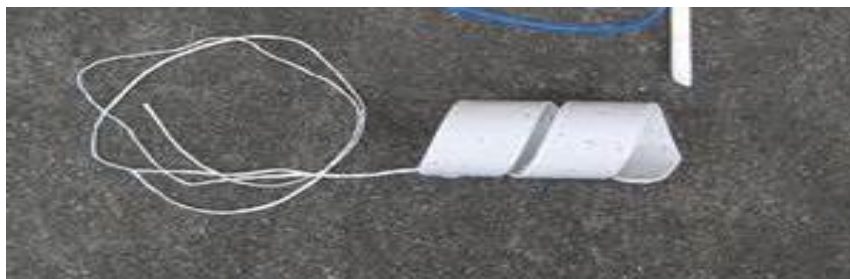
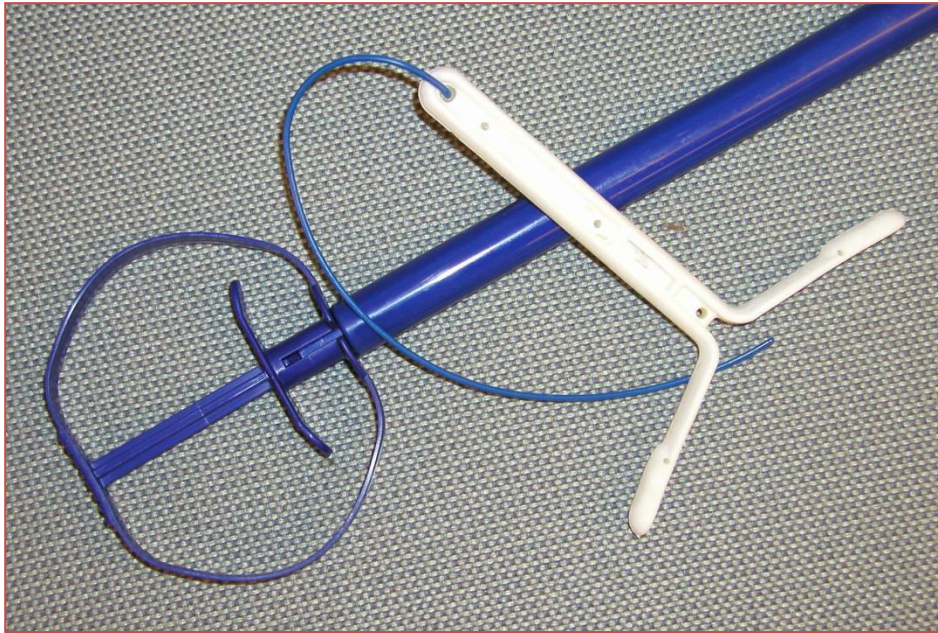


Fig. 1. PRID

B- A controlled intravaginal drug-release (CIDR) device may also be used for estrus synchronization. A CIDR is an intravaginal device constructed of a progesterone-impregnated medical silicone elastomere molded into a T-shape. It is labeled for estrus synchronization in beef and dairy cattle. Cows are administered GnRH, and concomitantly a CIDR is inserted and maintained for 7 days. At the time of removal, cows receive an injection of $\text{PGF}_{2\alpha}$. Cows can be inseminated, with or without another GnRH injection, 48–72 hr after $\text{PGF}_{2\alpha}$ injection. The

most effective synchronization treatment, an IM injection of a combination of 5 mg estradiol valerate and 3 mg norgestomet, with an ear implant of 3 mg norgestomet left in for 9 days, is no longer commercially available in the USA because of the ban on the use of estrogens in food animals.

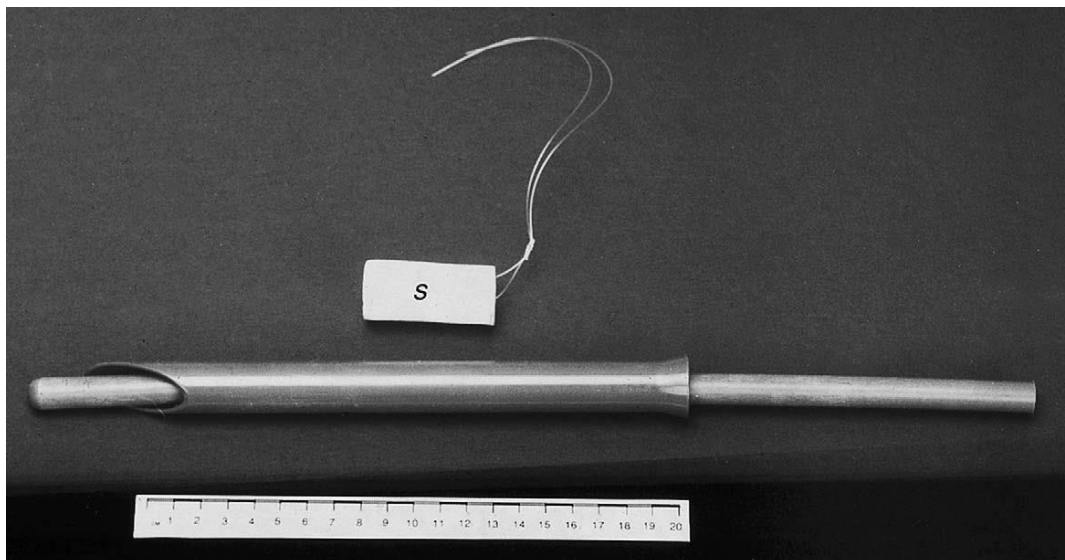


C- Melengestrol acetate (MGA) is a steroidal progestagen used as a feed additive to promote growth and suppress estrus in heifers. MGA is used at a dosage of 0.5 mg/head/day for 14 days for estrus synchronization. Fertility after this treatment is low, and females should not be bred. This protocol could be improved by administering $\text{PGF}_{2\alpha}$ 17 days after the last feed containing MGA. The fertility of this estrus is reestablished.

D- The SYNCRO-MATE-B system differs significantly from the MGA-prostaglandin method, although producers can enjoy just as successful results. It involves using both a subcutaneous implant inserted in the female's ear for nine days, plus an intramuscular injection administered at the time of implant insertion. The SMB treatment of

cycling heifers is usually followed by a high incidence of estrus during the five days following implant removal. The SMB treatment works best (results approach 100%) when administered after day nine of the estrous cycle, explains Beal. However, "when a heifer happens to be on day three or day four of the estrous cycle when she starts on SYNCRO-MATE-B, her chances of showing a synchronized estrus drop to less than 66 percent," says Beal. Beal points out that these three most common approaches of synchronization vary greatly, and he offers several tips on what works best in the following scenarios.

E- Intra vaginal sponge :in small ruminant the most of the progestational substances are administered via the intravaginal route in the form of impregnated sponges or tampons



2- Prostaglandins:

Since the length of the interoestrus interval in most domesticated species is controlled by the duration of the life span of the CL, premature lysis, induced by the administration of $\text{PGF}_{2\alpha}$ or its analogues, can be used to manipulate the normal pattern of cyclic activity.

Two Injection PGF Programs The two injection programs for synchronization with PGF are designed to increase the proportion of females with a CL that is responsive to regression with PGF. Traditionally, the

recommendation was that two injections of PGF be administered 11 days apart, but recent data suggest that a 14-day interval is more effective. With the first PGF injection, ~70% of the cyclic cows would be expected to display heat (those on Day 6 or greater of the cycle at injection) during the next four to five days. Those animals that were not responsive to the first injection (i.e., on Days 1 to 5 of the cycle at the first injection) would respond to the second injection. Also, cows in heat after the first injection would be on Day 6 or greater of their next estrous cycle and would be expected to show heat a second time, following the second PGF injection.

3- Melatonin

The pineal gland controls reproductive activity in seasonal breeding species such as sheep, goats, horses and cats by the secretion of melatonin.

Perhaps not surprisingly, it cannot be used to modify seasonal activity in the mare because it would be necessary to inhibit the secretion of melatonin or neutralise its effect to advance the time of onset. However, in the ewe and doe, which are short-day breeders, it has been used commercially to advance the timing of the onset of the breeding season. The hormone is administered as an implant containing 18 mg of melatonin which is inserted subcutaneously at the base of the ear.

It is critical that rams (and bucks) should be separated from the ewes so that they are out of sight, sound and smell at least 7 days before the insertion of the implant. They must remain separated for at least 30 days and not more than 40 days, when rams (or bucks) should then be reintroduced. Peak mating activity occurs 25–35 days later. Melatonin should not be used in ewe lambs.