



Tikrit University
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Artificial control of cyclical reproductive activity

Subject name: Reproductive
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Lecturers link

Artificial control of cyclical reproductive activity

A. Non-hormonal methods

1. Light:

The mare and queen are stimulated to activity by a lengthening photoperiod, while in the ewe and goat it is the effect of a decreasing photoperiod that is, the stimulus.

In late pregnancy ewes are exposed to 18 hours of daylight for 1 month, followed by a sudden return to 8 hours. This results in ewes having a fertile oestrus 3 months after lambing.

2. Nutrition:

Nutrition effect on ovarian function by increasing the number of follicles that mature and ovulate. This effect is described as 'flushing,' a practice that has been used in lowland flocks of sheep for many years. By increasing the dietary intake, particularly that of energy, before ewes are tupped it is possible to increase the number of lambs that are born.

3. Ram 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 vasectomized ram 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.

B. Hormonal methods

(1) Preparations that stimulate release of anterior pituitary hormones.

(2) Preparations that replace or supplement anterior pituitary gonadotrophins.

(3) oestrogens (4) progestogens (5) prostaglandins (6) Hormone combinations (7) melatonin; (8) Androgens (9) Prolactin inhibitors.

(1) Preparations that stimulate the release of anterior pituitary.

Hormones Synthetic GnRH can be used to stimulate the release of endogenous gonadotrophins; for example, GnRH has been used to induce premature puberty in gilts following equine chorionic gonadotrophin (eCG) stimulation.

- GnRH can be used to stimulate the onset of oestrus in the postpartum cow.

(2) Preparations that replace or supplement pituitary gonadotrophins.

Three readily available substitutes are available: (1) eCG, obtained from the serum of pregnant mares, which has mainly an 'FSH-like' effect but with some 'LH-like' activity; (2) human chorionic gonadotrophin (hCG), obtained from the urine of pregnant women, which has mainly an 'LH-like' effect but with some 'FSH-like' activity; (3) human menopausal gonadotrophin (hMG) which is mainly 'FSH-like'; this is not used very much in domestic species.

- The use of eCG alone to induce oestrus in seasonally anoestrous ewes is not very successful but if progesterone is administered to the ewes before the injection of eCG then there is synchronized oestrus and ovulation.

- In the anoestrous cow, it is possible to stimulate follicular growth and ovulation with eCG treatment.

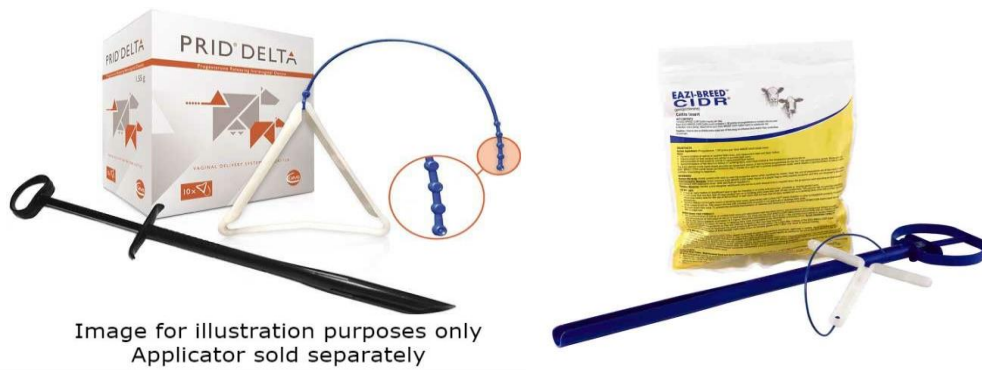
(3) Progestogens

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 cyclical. When the source of progestogen is withdrawn, or its effect declines, there is a return to cyclic activity.

1. A large number of synthetic substances have since been used and it is generally accepted that, following treatment of randomly cycling animals with these compounds for 18-21 days, there is fairly good synchronization of oestrus 4-6 days after the cessation of treatment.

2. Good synchronization and fertility following double fixed-time artificial insemination after using a synthetic progestogen (Norgestomet). The hormone was given as a subcutaneous implant at the same time as an injection of estradiol. The implant was removed after 9 days and, following two inseminations at 48 and 60 hours afterwards, conception rates were 65%.

3. Another method of administering progestogens is in the form of a progesterone-releasing intravaginal device (PRID) containing 1.55g progesterone or controlled internal drug release device (CIDR) containing 1.38g of progesterone, is placed in the vagina and progesterone is absorbed, producing concentrations in the peripheral blood comparable with the maximum levels of dioestrus. When the device is removed after 7-10 or 12 days, the cow will come into oestrus in 2-3 days. PGF_{2a} is now given 24 hours before removal to ensure the demise of the CL. Good conception rates have been obtained following two fixed-time inseminations at 48 and 72 hours after the removal of the device. very good synchronization was achieved with a pregnancy rate of 67% following fixed-time artificial insemination at 56 hours.



4. Fastback program, is used in dairy cows to assist in the early detection of oestrus in cows that fail to conceive. It is as follows: cow is inseminated at observed oestrus (day 0), a CIDR is inserted on day 14, removed on day 21 and on days 22-25 observed for oestrus if not pregnant, and re-inseminated. If the cow is pregnant, it will not adversely affect the pregnancy and cows will not return to oestrus.

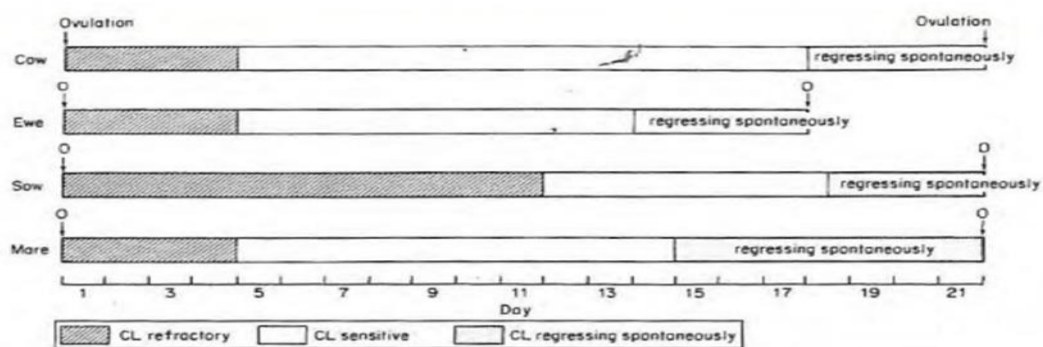
5. In ewe, Progestogens have been widely used in controlling reproduction.

They have been used to induce oestrus in the anoestrous ewe during the non-breeding season and also for synchronization of groups of ewes that are already showing cyclical activity. Most of the presentational substances are administered via the intravaginal route in the form of sponges or tampons impregnated with potent short-acting analogues; nuorogestone acetate (FGA) and medroxyprogesterone acetate (MAP). When intravaginal sponges are used outside the normal breeding season, it is necessary to use eCG as a source of gonadotrophin at the end of the progesterone priming period. The better results are obtained if eCG is injected 48 hours before sponge removal.

(4) Prostaglandins

The CLs of the cow, mare, sow, ewe and goat normally respond to the administration of exogenous prostaglandins but in the bitch and the queen the CLs are generally unresponsive unless subjected to repeated doses.

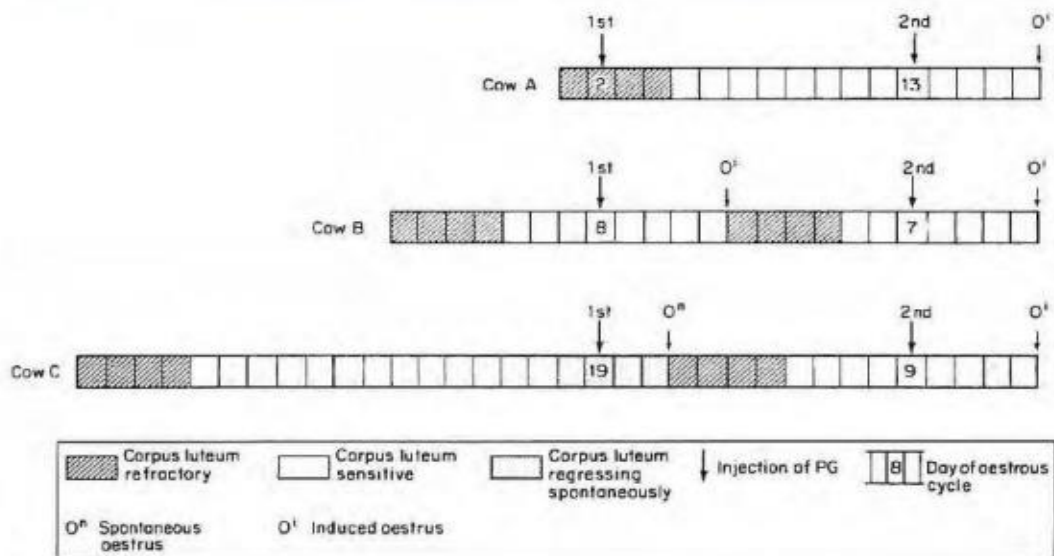
The new developing CL generally being refractory for 3-5 days after ovulation; although there is evidence that in the mare large doses of PGF_{2a} can induce luteolysis 2 days after ovulation. At the end of the oestrous cycle, the CL is unaffected by exogenous prostaglandin, since it is already regressing under the influence of its own endogenous luteolysin. Therefore in the cycles of the cow, doe goat, mare and ewe the CL is responsive for 13, 13, 10 and 9 days.



Uses in cattle

Prostaglandins have been used successfully to synchronize oestrus in groups of cows and heifers. This technique has applications in beef cows and heifers, and in dairy heifers where oestrous detection is frequently difficult, thus enabling the routine use of artificial insemination at a predetermined time.

- It has been found that, if two injections of PGF_{2a} or one of its synthetic analogues, e.g. cloprostenol, dinoprost, luprostirol, are given at an interval of 11 days to a group of cows or heifers at randomly different stages of the oestrous cycle, then 3-5 days after the second injection all the animals treated will come into oestrus and ovulate at about the same time, inseminated twice at a fixed time of 72 and 96 hours after the second injection.



The efficiency of synchronization following the double-injection regimen is usually much better in heifers than in cows. It is not known precisely why this should be so but one possible explanation is that frequently in cows (as opposed to heifers) the progesterone concentrations remain low for a much longer period of time after ovulation than normal. This phenomenon, referred to as 'long-low progesterone', has been recorded as occurring in up to 15% of cows in some herds.

(5) Hormone combinations

Uses in cattle

1. A combination that has been utilized for some time involves intravaginal progestogens, such as those applied with a PRID or CIDR, for 7-9 days, followed by the administration of PGF_{2a}, or analogue on the day before withdrawal. Such regimens will result in 95% of cows being in oestrus within 5 days.
2. 'ovsynch programme' : to attempting to control folliculogenesis and ovulation more precisely using either a GnRH analogue or estradiol. In the

former, GnRH is given on day 0, followed by PGF2a on day 7 (sometimes day 6), followed by GnRH on day 8, 9 or 10 and AI 17-24 hours later.

- The first dose of GnRH will either induce ovulation or atresia of the dominant follicle, enabling the emergence of a new follicular wave, so that subsequent ovulation and CL formation will mean that the latter will be responsive to the PGF2a when administered on day 7. Alternatively, it can extend the life span of the CL in late dioestrus so that it will still be responsive to PGF2a 7 days later.

The second injection of GnRH should ensure better synchronization of ovulation, by stimulating the preovulatory LH surge.

3. 'heatsynch programme', it's like 'ovsynch, but the studies using estradiol cypionate instead of GnRH on day 8 (24 hours after the injection of PGF2a).

4. GnRH is given at the same time as a CIDR is inserted and, 24 hours before the latter is removed at 10 days, PGF2a is injected.

(6) Prolactin inhibitors/antagonists

In bitches, the use of prolactin inhibitors such as cabergoline and bromocriptine during anoestrus can induce a fertile oestrus.

(7) Androgens

Androgens have been used to prevent bitches from returning to oestrus, when given during anoestrus and at least 30 days before the anticipated onset of pro-oestrus; they are not effective if given during prooestrus or oestrus.

Their mode of action is probably by means of a negative feedback, effected on the hypothalamic- pituitary axis.

(8) Melatonin

The hormone is administered as an implant containing 18mg of melatonin that is inserted subcutaneously at the base of the ear. Peak mating activity occurs 25- 35 days later.

