



Estrus Cycle in Equine and Camels, Anestrus and its Treatment



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Estrous Cycle of Mare

Terminology

- "**Estrous**" or **Ostrous** → refers to the entire cycle.
- "**Estrus**" or Oestrus → refers to the "heat" stage of that cycle when the mare is receptive to the stallion
- "**Diestrus**" (dioestrus) → Period in between the estrus phases when the mare is not receptive to the stallion
- "**Anestrus**" (anoestrus) → Complete absence of estrus.

Long Day Breeder

- The mare is a "**seasonally polyestrus**" animal → undergoes regular estrus cycles during a portion of the year (**late spring, summer and early fall**) → Not in winter.
- This is nature's way of preventing the arrival of a foal during bad weather.

Signs of Estrus

- Vulva become large and swollen, scarlet or orange colour, wet, glossy, covered with mucous.
- Labial folds → Loose
- Vaginal mucosa → highly vascular
- Tail raised.
- Urine expelled in small amount frequently
- Clitoris is exposed by prolonged rhythmic contraction → Known as **Winking of clitoris**
- Ovulatory Cycle → 21 days
- Luteal phase = 14 days
- Follicular or estrous phase = 7 days

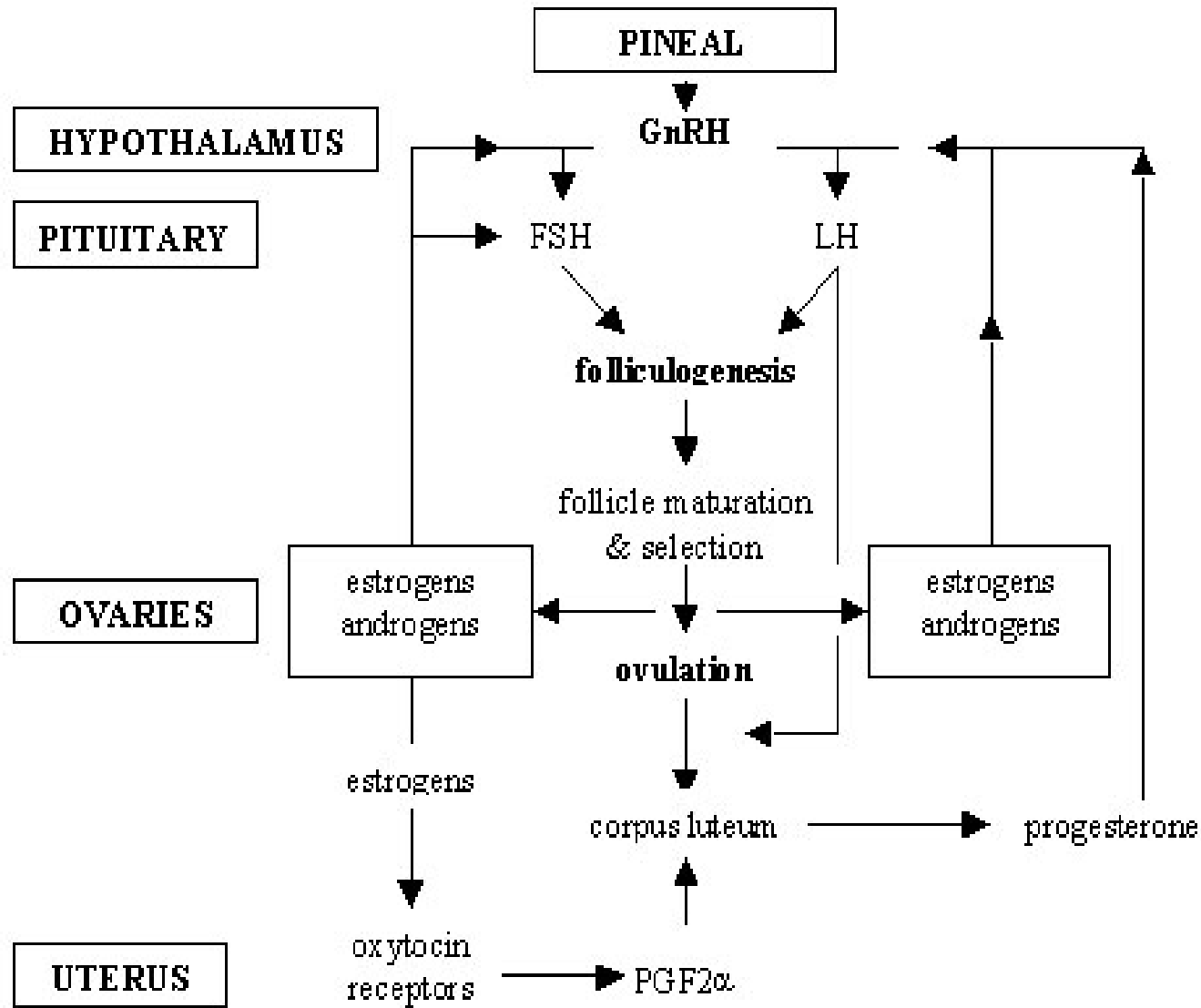
Long Duration Estrus in Mare

It may be due to

- ✓ Ovary surrounded by **serous coat** and takes longer time for migration of follicles to reach the ovulation fossa to rupture.
- ✓ Preovulatory follicle requires longer time to reach maximal size (**due to less sensitiveness of ovary with exogenous FSH**)
- ✓ Low level of LH → delays ovulation

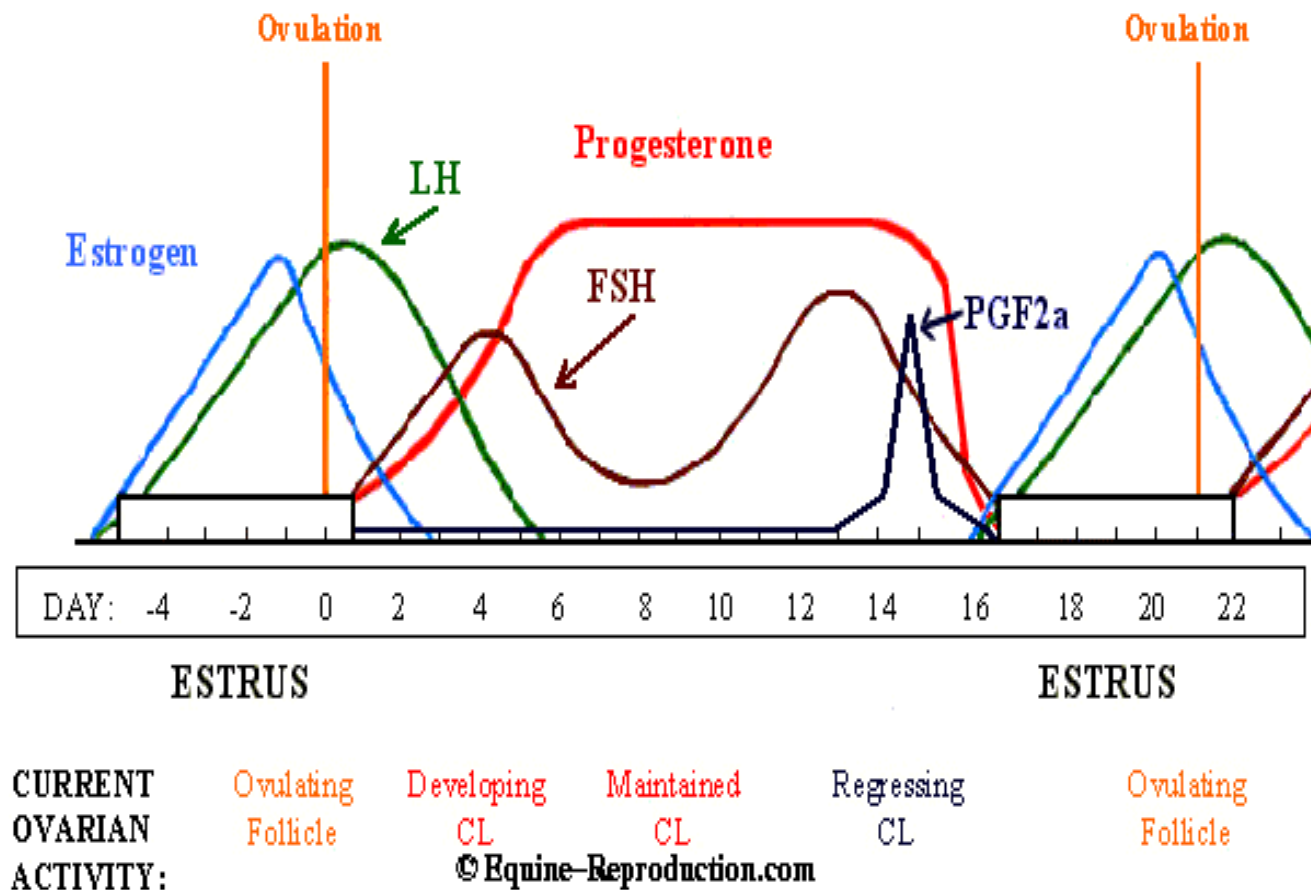
Ovulation

- Most ovulations → days 3, 4, or 5 of estrus, **24 to 48 hours before the end of behavioral estrus**
- **Time of ovulation is more closely related to the end than to the onset of estrus.**
- CL maximum size = 14th day
- Fertilized ova transported in the uterus
- **Unfertilized ova trapped in the isthmus of oviduct for several months.**
- **Unfertilized eggs may be retained in the oviduct of pregnant and non pregnant mares up to 7 months**



Hormones Active during the Estrous Cycle of the Mare:

A Brief Sequential Overview of the Regular Estrous Cycle



Gonadotropin Releasing Hormone (GnRH)

- Secreted by the hypothalamus of the brain.
- **Light (natural or artificial)** → Stimulation of the pineal gland → reduction of melatonin secretion → allows GnRH secretion by the hypothalamus → FSH, LH secretion.
- The exact mechanism of decreased melatonin production and increased GnRH level is not known.
- In anestrus mares GnRH is released in a pulsatile manner with long period between secretions, → undetectable blood level.
- Estrous mares secretion is continuous.

Follicle stimulating hormone (FSH) and Luteinizing hormone (LH)

- LH → lowest during the mid-luteal phase of estrous, rising only a few days before the onset of estrus to a peak usually on the day of, or shortly after ovulation.
- Duration of secretion of LH in the mare and its associated ovulatory surge → longer than in most other animals.
- FSH is in contrast to LH, thought to follow a bi-modal secretion pattern.
- **Twin-peak effect** is seen only during spring and early summer; and that it adopts a single-peak effect in later summer and fall.

Estrogens

- There are several forms of estrogen occurring in the mare.
- Non-pregnant mare estradiol is the most active;
- Pregnant mare → estrone sulphate.
- Estradiol in the estrus mare → behavioural displays
- Estradiol → relaxation of the cervix during estrus
- Estrogen → impact negative on FSH, positive on LH.
- In the pregnant mare estrone sulphate is secreted by the fetoplacental unit (FPU). Levels rise gradually until about day 70 to 210, start to slowly drop shortly before foaling.
- Estrone sulphate in blood from about day 70 of pregnancy onwards can be used as a reliable indicator of fetal viability as its levels drop rapidly following fetal failure.

Progesterone

- Secreted by the Corpus Luteum (CL)
- Luteal Progesterone has a positive impact on FSH and a negative impact on LH.

Prostaglandin

- Pulsatile secretion of Prostaglandin F₂α by the lining of the uterus commences if pregnancy is not detected at about day 14 post-ovulation.
- The presence of PGF₂α causes the "lycing" of the CL and an almost immediate drop in circulating levels of progesterone, which permits the mare to start displaying estrus.
- PGF₂α also causes a contraction of smooth muscle - which includes the uterus.

Important points

- EC length = 21 days
- 5 days after ovulation → CL is fully functional and secreting progesterone.
- FSH action early in diestrus may produce a mid-cycle follicle that will sometimes ovulate, but more usually regresses
- Around day 13 post-ovulation the endometrium of the uterus secretes $\text{PGF2}\alpha$ → destruction ("lycing") of CL → onset of estrus behaviour.
- The mare will display receptive behaviour (estrus) towards the stallion for 5-7 days and will ovulate in the last 24-48 hours of that display period.

Treatment of Anestrus in Mare

- Mares are a seasonally poly-estrus with ovarian activity being related to long days. Their reproductive activity was experienced between May and October
- The regular pattern of estrus cycles relies on the delicate balance among hormones produced by the pineal gland, hypothalamus, pituitary gland, the two ovaries and endometrium.

Treatment of Anestrus in Mare

- **Use of GnRH:**

- Injection GnRH 5 ml (20 mcg) to 10 ml (40 mcg) IM

- showed estrus behavior within 10 – 15 days of injection

- showed estrus behavior within 15 – 21 days of injection of GnRH.

- Highest response occurs in breeding season

Treatment of Anestrus in Mare

Saline Infusion:

- Intrauterine saline infusion (intra-uterine wash with 1000 ml normal saline 0.9%.) has been routinely used to induce estrus in anestrus mares.
- Anestrus mares are only affected near the beginning and end of breeding season when anovulatory heat are induced.
- Diestrus mares : Infusion between 5 & 9 days
- return to heat 4 days earlier than expected and ovulation occurs.
- Highest response occurs in breeding season

Reproductive Cycle of Camel

Estrous cycle in camel

- **Estrous cycle** → No luteal phase.
- During the **cycle** of 27days the ovarian activity was strictly follicular.
- Follicles matured in six days, maintained their size for 13 days and regressed in eight days.
- The waves of follicular growth, maturation and atresia occur throughout the breeding season.

Puberty

- Time in adolescence when female gonads are capable of releasing ova.
- Age at puberty 2-3 years.
- There are many factors which are responsible for age of onset of puberty such as
 - nutrition
 - breed of camel

Sexual Activity

- Sexual activity has been reported to start as early as 2-3 years of age.
- But they are not usually bred until 4-5 years old.
- sexual activity can continue until 20 years of age.

Breeding Season

- Seasonal breeder
- Short day breeder or short breeding season
- Late September to March
- Both male and female are seasonal breeder
- Mating during rainy or cold season
- Outside of breeding season mating activity ceases and the ovary are inactive or only have a few, small follicles.

Female Reproductive Cycle

- Female camel is a seasonal polyestrous animal
- Induced ovulator
- Estrous cycle 23-27 days
- Estrus duration 4-7 days
- Diesrtus 15-20 days

- Estrus cycle did not have a luteal phase
- During the cycle of 27 days ovarian activity → strictly follicular
- Follicle matured in 6 days, maintain their size for 13 days and regressed in 8 days
- The waves of follicular growth, maturation and atresia occur throughout the breeding season
- Signs of Estrus:
 - ✓ Aggressiveness
 - ✓ General restlessness
 - ✓ Straddling the hind legs
 - ✓ Swelling and discharge from the vulva

- Peripheral plasma concentration of progesterone remained < 1 ng/ml throughout the estrus cycle
- Level of estrogen and testosterone increased in parallel as the follicle grew in size.
- level of estrogen 20pg/ml and 50 pg/ml testosterone/ml when small growing follicle, increased steadily to reach a plateau level of > 80 pg/ml estrogen/ml and 100 pg/ml testosterone/ml
- The plateau level of hormones maintained for 15 days and then decreased steadily as the follicle regressed.

- LH concentration remains very low ($<1\text{ng/ml}$) and no peaks were observed throughout the estrous cycle.
- the peak of LH begins 2 hours after copulation.
- by 4 hours after insemination, peak value of $6.9 \pm 1 \text{ ng/ml}$ occur.
- plasma progesterone level increased to reach $2.4 \pm 0.86 \text{ ng/ml}$ at 7 days after ovulation.

- The absence of LH surge and low progesterone level during the estrus cycle are related to the failure of ovulation and subsequent absence of a true luteal phase.
- Well developed corpora lutea only occur after successful mating

Ovulation

- Ovulation was non spontaneous and required the stimulus of coitus.
- Ovulation occurs 30-48 hours following copulation.
- Without pregnancy there is no formation of CL.

Treatment of anestrus In Camel

- If CL persist Give Prostaglandins injection @ 500 mcg.
- Injection GnRH given @ 5 ml (20 mcg) Intramuscular.
- Ov-synch protocols may also used to induce estrus in anestrus she camels.



THANK YOU