

Prof G N Purohit

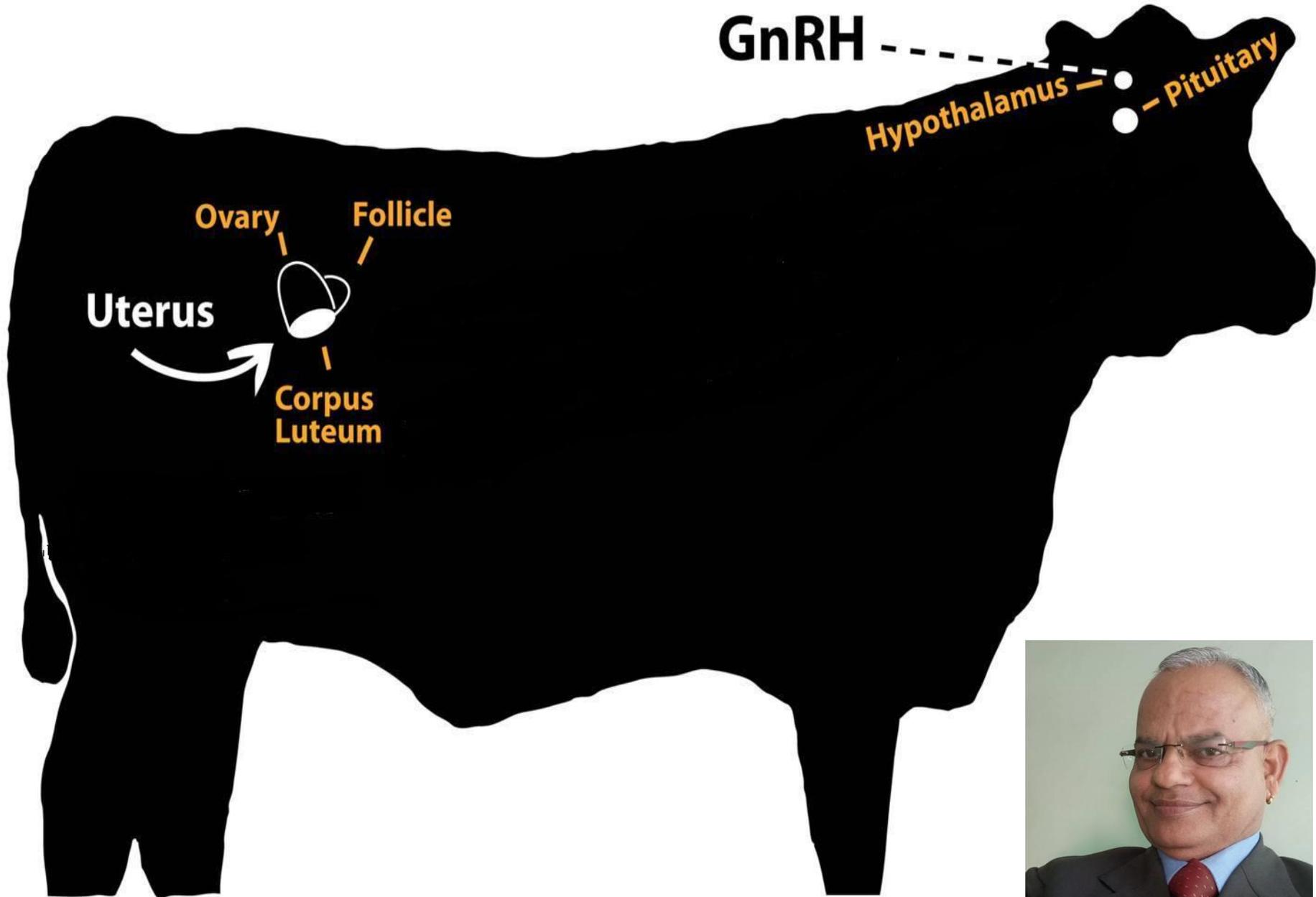
Estrous Cycle and estrus
signs in domestic animals



Rhythmic expression of sexual
receptivity (estrus) at periodic
intervals (every 21 days)

Estrous cycles are classified as:

- **Polyestrous continuous**, such as cows and sows,
- **Seasonally polyestrous**, including mares, queens, ewes and nanny-goats
- **Monoestrus**, such as bitches, show one or at the most two heats per year.

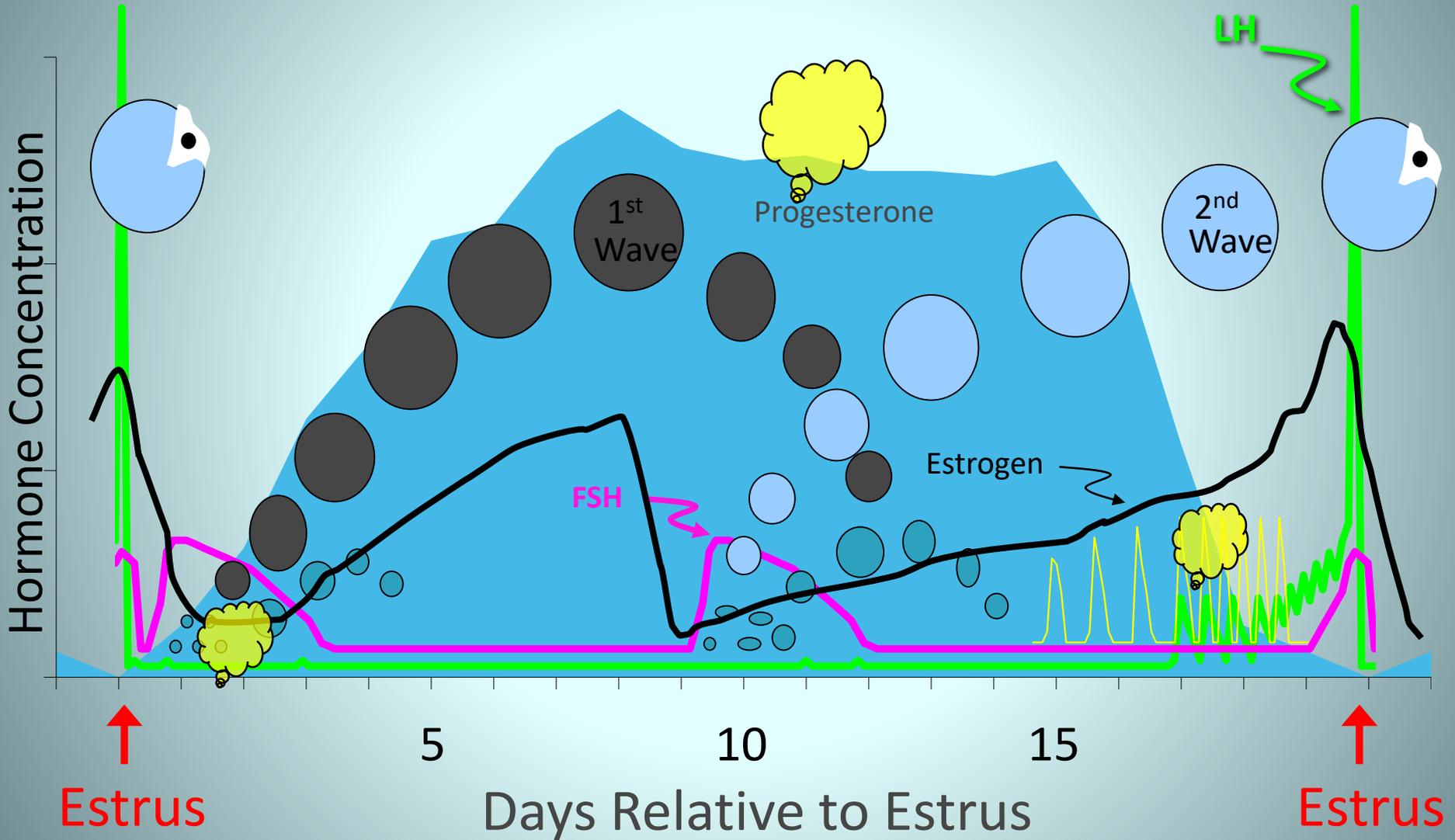


The estrous cycle is under hormonal control.



The oestrous cycle is also influenced by external factors.

The Estrous Cycle in Cattle



- The estrous cycle can be divided into four stages: **proestrus, estrus, metestrus, and diestrus.**
- Ovulation usually occurs during estrus (cows and buffaloes ovulate during metestrus).
- Proestrus and estrus comprise the **follicular phase.** Corpora lutea develop during metestrus and function at optimum during diestrus.
- Metestrus and diestrus make up the **luteal phase.**

Follicular Phase

Follicles the dominate ovarian structure

Estrogen the dominate hormone

Luteal Phase

Corpora lutea the dominate ovarian structure

Progesterone the dominate hormone

The 4 Stages of the Estrous Cycle

Proestrus

follicle enlarges

estrogen increases

vasularity of the female reproductive tract increases

endometrial glands begin to grow

estrogen levels peak

Estrus

allows male to mount

estrogen decreases towards the end

LH surge occurs

ovulation 24-48 hr after surge of LH

uterine motility high with

contractions moving toward oviduct

sperm transport is optimal

cervical mucus volume increases

Metestrus

estrogen low

corpus hemorrhagicum present

Ovulation occurs in cow and buffalo
uterus

contractions subside

endometrial glands continue to
grow and become coiled

in cattle bleeding occurs

FSH increases, triggering growth of
follicles

Diestrus

progesterone high

FSH low but increases at some point to cause growth of pre-ovulatory follicle

Uterus

secretes fluid but the volume of fluid decreases over time

contraction stop

corpus luteum regresses at the end of this period if female is not pregnant

	Cow	Ewe	Sow	Mare
Estrous cycle (d)	21	17	21	21
Proestrus (d)	3-4	2-3	3-4	2-3
Estrus (hr)	12-18	24-36	48-72	4-8
Metestrus (d)	3-4	2-3	2-3	2-3
Diestrus (d)	10-14	10-12	11-13	10-12

Estrous Cycles in the Dog

Dog

Anestrus - has an FSH increase that triggers follicular growth

Proestrus - estradiol increase and peaks at end, also bloody discharge begins

Estrus - estradiol declines, LH surge, ovulation, progesterone increases even before ovulation

Metestrus I - 20 days, progesterone high, increase in estradiol

Metestrus II - 70 days, progesterone declines, estradiol declines, prolactin increases and then declines

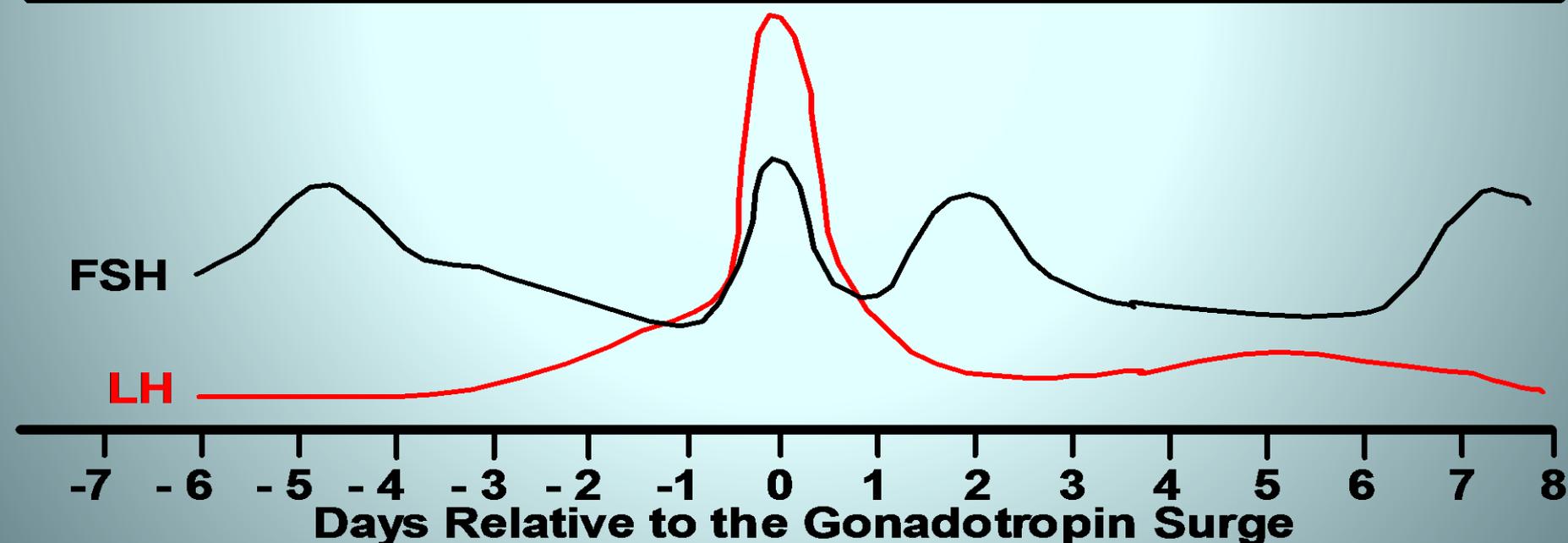
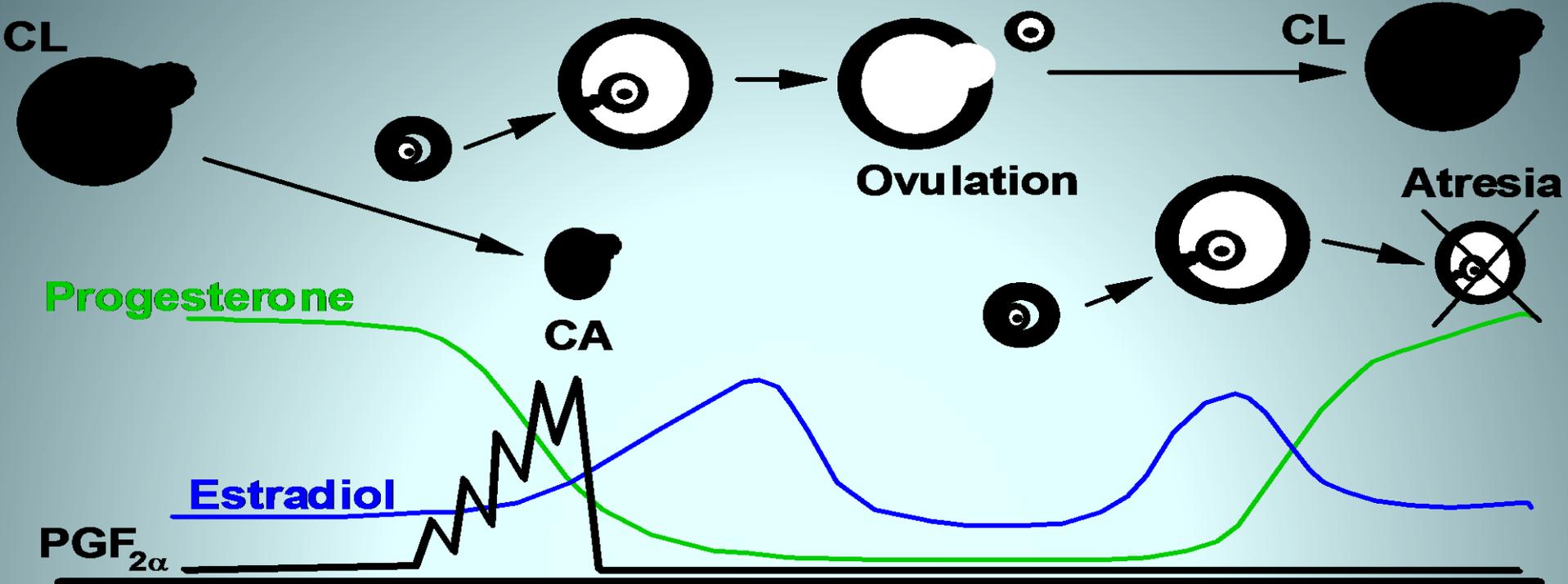
Patterns the same in pregnant and non-pregnant bitch

Pseudo-pregnancy occurs in non-pregnant bitch because of increases in prolactin.

Cat

Estrus 9 days, Proestrus 8 days, repeats until mating occurs, estrus when estradiol present, progesterone is low throughout

After mating, LH surge induced, progesterone increases then decreases, estrus returns after parturition when progesterone goes back down.

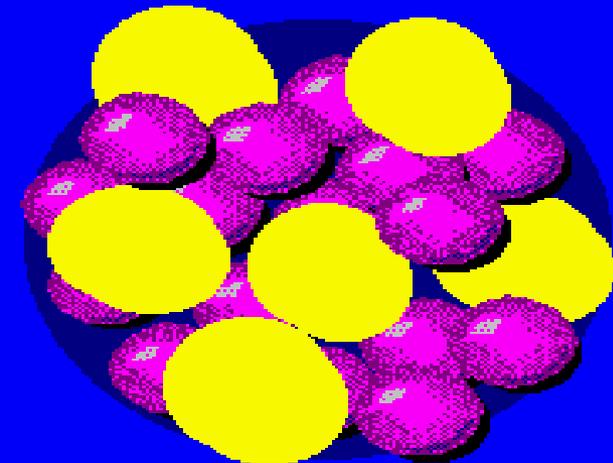


Diestrus	Proestrus	Estrus	Metestrus	Diestrus
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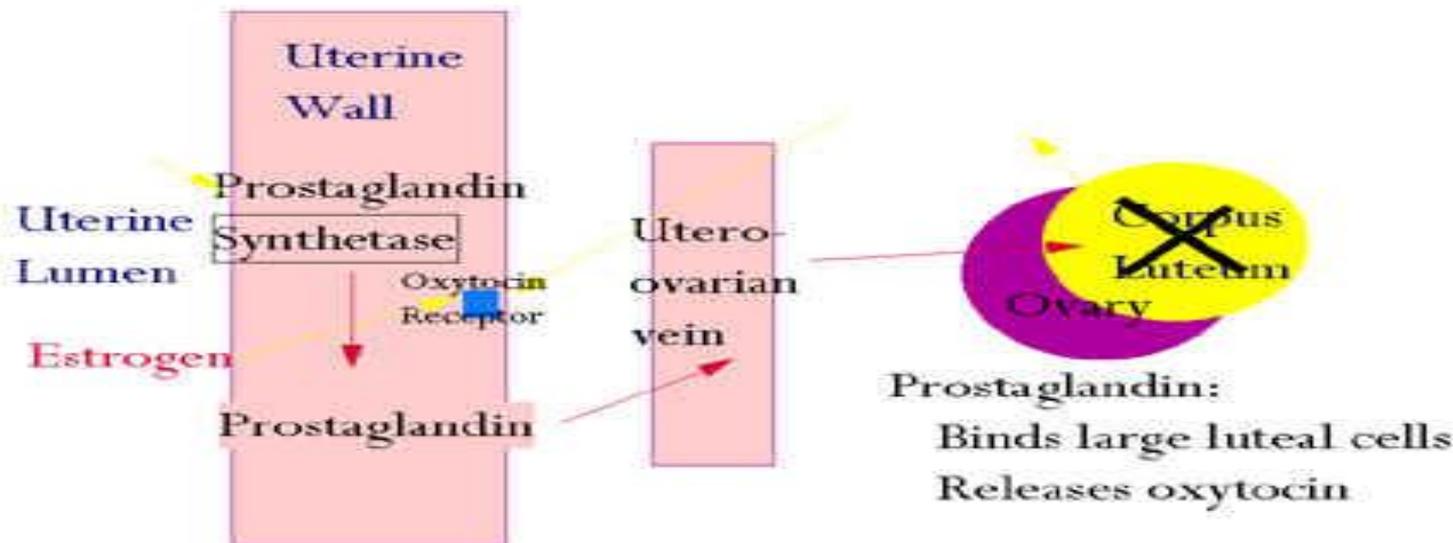


Corpus Luteum

- **Large luteal cells** 
 - (Granulosa cells)
 - PGF receptors
 - 85 % of progesterone
 - Not LH responsive
- **Small Luteal cells** 
 - (Thecal cells)
 - No PGF receptors
 - 15% of progesterone
 - LH responsive



Luteolysis



Average Reproductive Cycles

Species	Length of Estrous Cycle Pregnancy	Length of Estrus	Ovulation	Length of
cow	21 days polyestrus	12-18 hr	8-12 hr after end estrus	282 days
ewe	17 days seasonal (fall)	29 hr	near end of estrus	148 days
sow	21 days polyestrus	48-72 hr	35-45 hr after start estrus	115 days
mare	21 days seasonal (spring) polyestrus	4-8 days	3-6 day of (1-2 days before end of estrus)	335 days estrus

Variation in Cycle Types

Example	Type of Cycle	Follicular Development	Ovulation & CL Formation	CL Function
Cow, ewe, sow, mare	Long	Spontaneous	Spontaneous	Spontaneous
Rats, mice, hamsters	Short (4 days)	Spontaneous	Spontaneous	Induced (prolactin)
Rabbit, cat, mink, ferret, Camel, otter	Induced	Spontaneous	Induced (LH surge)	Induced

Reproductive organ changes at estrus in ruminants

- Increased uterine and oviductal motility (Tone)
- Dilation and opening of os externus of cervix
- Increased vascularity of the uterus
- Discharge of mucus from the vagina and cervix
- Edema of the vulvar mucus membranes
- Bloody discharge at proestrus in bitches and cats and at metestrus in cows.

Signs of estrus

- Vocalization: cows, goat, some buffaloes
- Mounting other herd-mates- cows
- Frequent urination
- Decrease in milk yield and appetite

Cervico-vaginal discharge

Mounting other cows in proestrus and standing to be mounted at estrus

Increased physical activity



Estrus in buffaloes

- Buffaloes show no mounting, a slight discharge usually seen when the animal sits, many buffaloes are in silent estrus without bellowing and temporary teat engorgement (sudden let down of milk in teats 1-3 days before estrus onset, called doki) is shown by buffaloes.
- Estrus signs are marked during late evening and early morning. Tail switching is seen



Standing estrus



Switching tail to one side

Estrus in a bitch



- Dogs are monoestrus with interestrus intervals ranging from 4.5 – 13 months Av. 7 months

PROESTRUS BLEEDING -Av. 9 days

Attracts Male but no mating vulvar edema

ESTRUS - Av. 9 days Sexual receptivity

Bitch Deviate tail and the vulvar edema disappears Estrogen↓ and Progesterone↑

Breeding management of the bitch

Peak Fertility from day of LH surge to 6 days post LH surge
ie 2 days before ovulation to 4 days after ovulation
2 breeding 2 days apart are suggested

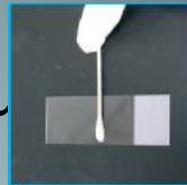


Figure 2 demonstrates the process of spreading the cells on a glass slide.

Optimal time to breed can be determined by LH surge/clinical methods

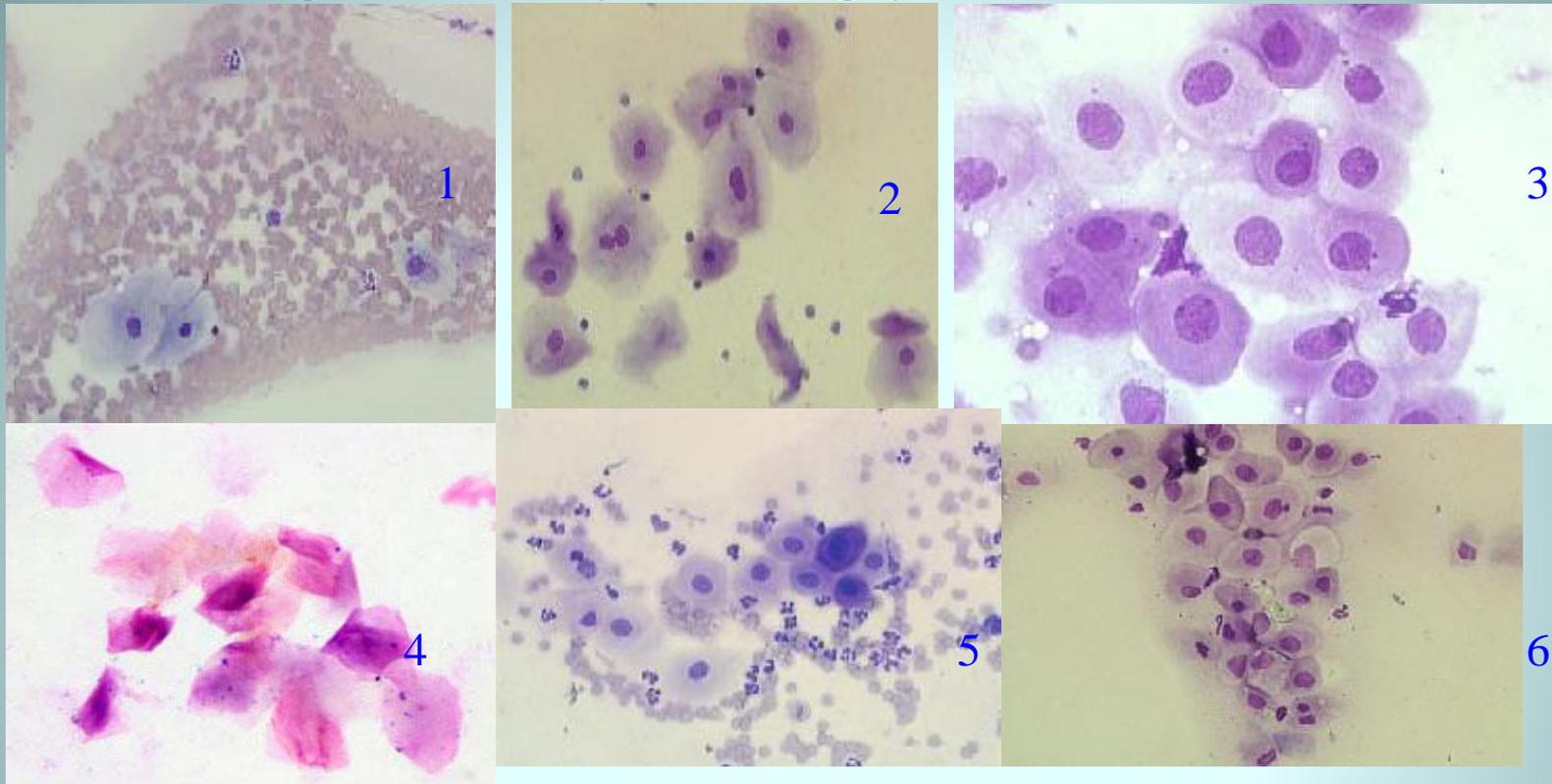
Average bitch may ovulate 12 days of proestrus however it may ovulate as early as day 5 of proestrus to day 30 of proestrus hence mating on a predetermined day may fail to result in conception

A poor correlation exists between behavioral events and endocrine events

Some bitches may refuse to accept particular males.

Breeding should thus be done on the basis of a vaginal cytology and disappearance of vaginal turgor or assay of LH

Vaginal cytology in the bitch



1. RBCs during early proestrus 2. Small parabasal cells during mid proestrus with few RBCs 3. Parabasal cells during mid to late proestrus 4. Cornified (epithelial cells) during estrus 5. A few parabasal cells neutrophils and RBCs during late estrus/diestrus 6. Anestrus

Estrus in sheep



- Estrus is detected by a teaser marker Ram. Fig 1 shows the Flehmen response shown by the teaser and Fig 2 shows a marker Ram with grease applied over its brisket. Fig 3 shows a ewe in estrus marked by a teaser

1



2



3



Signs of estrus in goats

Vocalization

Wagging of the tail (Up and down movement of the tail)

Slight discharge

Pawing the ground with the legs

Vulvar edema and vaginal congestion

A goat in estrus may sometimes develop the udder



Signs of estrus in equids

Signs of estrus in equids are generally shown on teasing:

Urinating in front of a stallion

Lip synchrony towards a stallion

Winking of clitoris

Squatting

Cervical relaxation



Estrus in camels



Estrus behavior in the male (extrusion of the soft palate 1) and female camel (2 and 3) and the mating stance (4)

Estrus in a cat

The lordosis response shown by a female cat in estrus in the presence of a Tom cat (1) and dropping of its ears (2), besides this cats show vocalization



Estrus in a sow



The peculiar turning of the ears and the vulval edema is shown in the photographs. A sow stands to be mounted by a person when in estrus.



- The above lectures are also explained in video lectures at my YouTube Channel Govind Narayan Purohit
- Kindly share the videos and subscribe to my channel if you like them
- Thanks