

The estrous cycle

- **Definition**
- **Sexual Puberty** in the females is defined as the age at the first expressed estrous with ovulation
- **Sexual Maturity** in the females is defined as the age at the expressed estrous with ovulation and normal parturition

Definition

- **Estrous cycle** : reproductive cycle of female generally defined as period from one estrous to the next . It two phase
- 1- follicular phase(proestrus and estrus)
- 2- luteal phase (metestrus and diestrus)
- **Estrous** : period of sexual receptivity commonly referred to as “ heat “
- **Anestrous** : period when female does not have cycles occurring during pregnancy , season , pathology
.....

Animals classified according to estrous cycle

1 - Poly estrous; cow ,sow



TYPES OF ESTROUS CYCLE

2 - Seasonal poly estrous

A- short day breeder; ewe , doe



B –long day breeder; mare , queen



TYPES OF ESTROUS CYCLE

3 – monoestrous; bitch , wild animals



Causes of Anestrus

Pregnancy

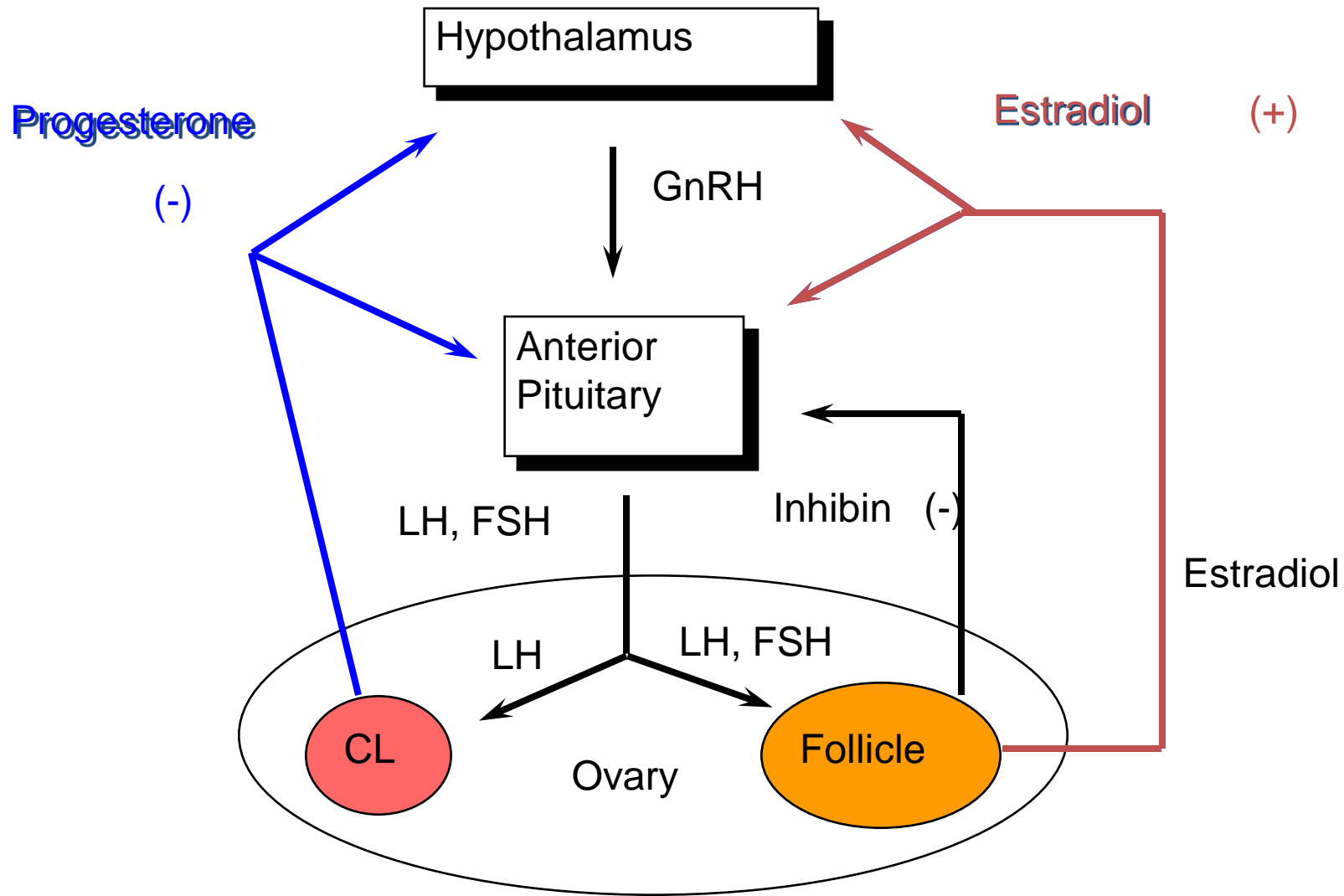
Presence of Offspring

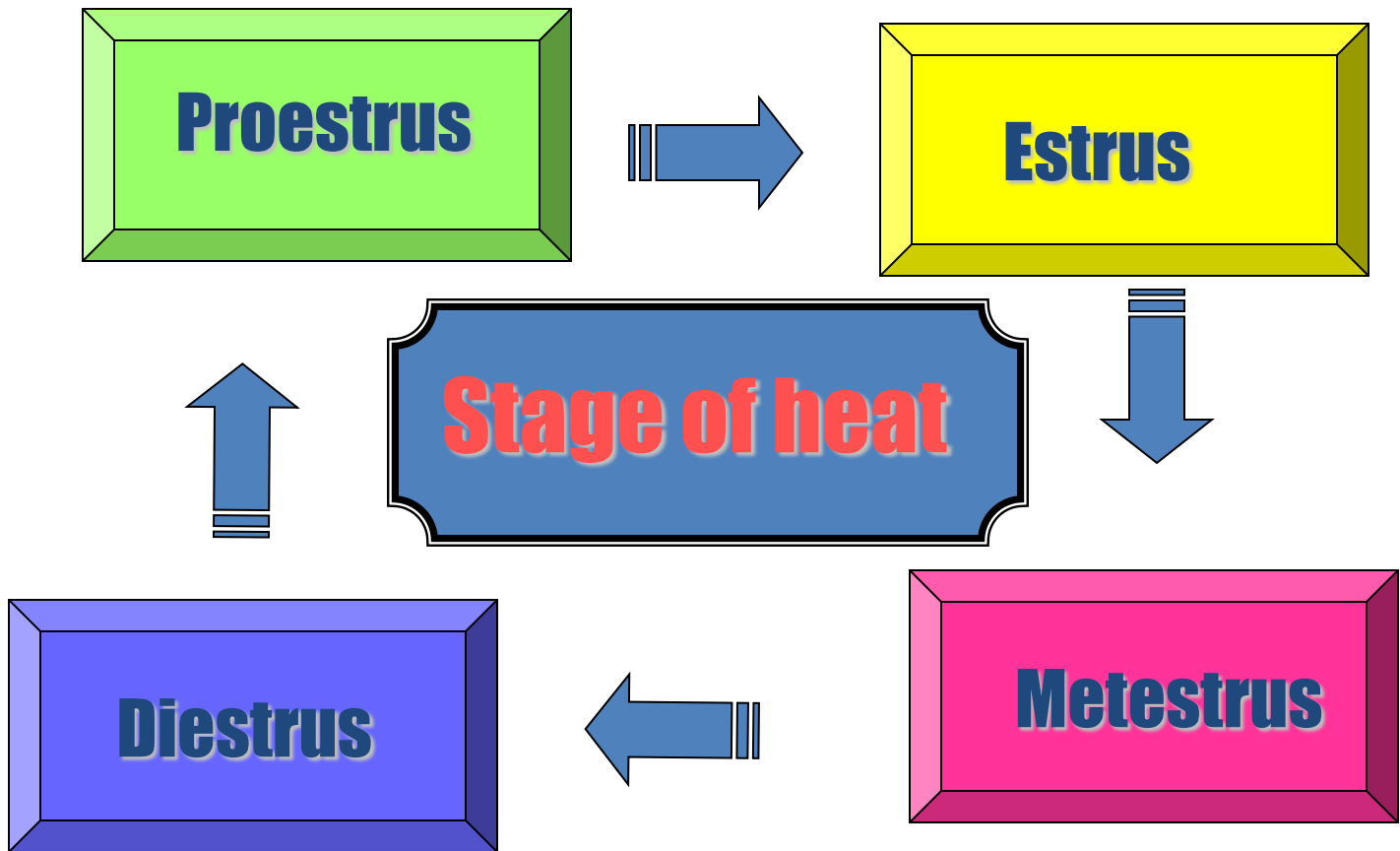
Season

Pathology

Nutrition

Stress





Average Reproductive Cycles

Species	Length of Estrous Cycle	Length of Estrus	Ovulation	Length of Pregnancy
cow	21 days polyestrus	18 hr	11 hr after end estrus	282 days
ewe	17 days seasonal (fall)	29 hr	near end 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 estrus (1-2 days before end of estrus)	335 days
Doe	21 days seasonal(fall)	30-40 hrs	few hrs after ovulation	149 days

Characteristics of Estrous Cycles

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

Follicular Phase

Stage of heat

A. Proestrus

- day 19 -21
- period for preparation of sexual activity

Proestrus

- FSH level increase
- follicle enlarges
- estrogen increases
- vascularity of the female reproductive tract increases
- endometrial glands begin to grow
- estrogen levels peak

Follicular Phase

Stage of heat

B. Estrus (heat, sexual desire)

- period of sexual activity, female permit mating
- duration : 6 - 30 hrs (heifer 15, cows 18hrs)

Estrus

- allows male to mount
- estrogen decreases
- LH surge occurs
- ovulation 24-48 hr after surge of LH
- uterine motility high with contractions moving toward oviduct
- sperm transport is optimal



Signs of Estrus

- Primary Sign of Estrus
 - Stands immobile when mounted.
 - Bellowing
 - Red vulva
 - Swollen vulva
 - Clear mucus discharge from vulva

Secondary Signs of Estrus

- Behavioral

- Increased Activity
- Walking the fence line
- Charging
- Butting
- Licking

- Sniffing
- Flehmen posture (inverted nostrils)
- Circling
- Chin-resting
- Mounting

- **Miscellaneous Signs** of Estrus
 - Depressed appetite
 - Depressed milk production
 - Frequent Urination



Arborization

Glassy, viscous One strand, shiny Clear and ha
the

character of

Fernerization increased

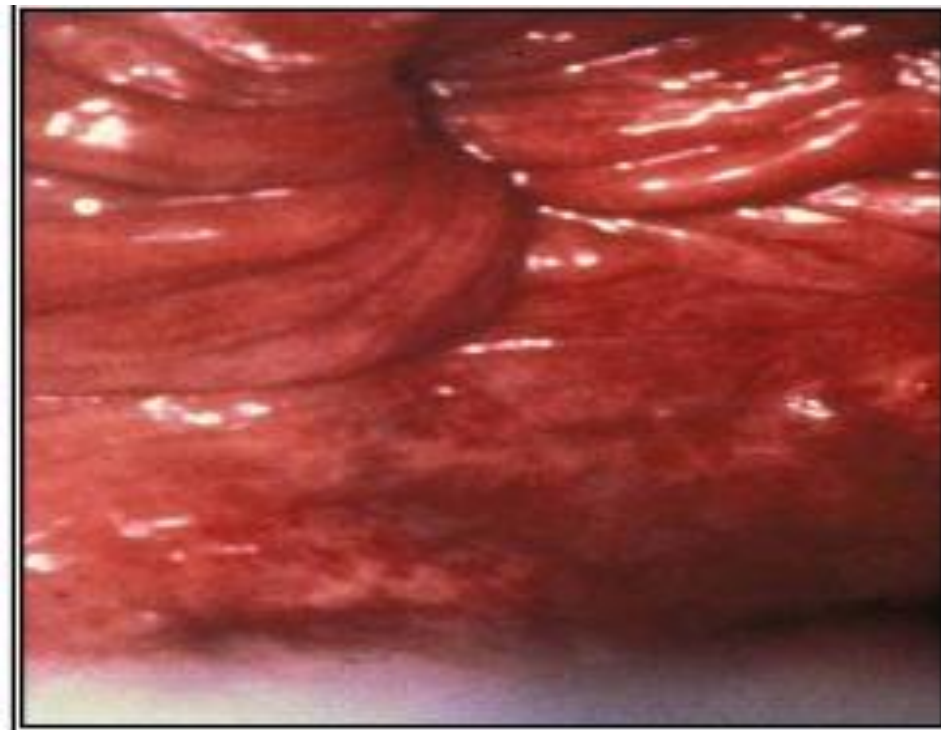


Vaginal findings

Hyperemia, congestion

Viscous, red, slightly dilated

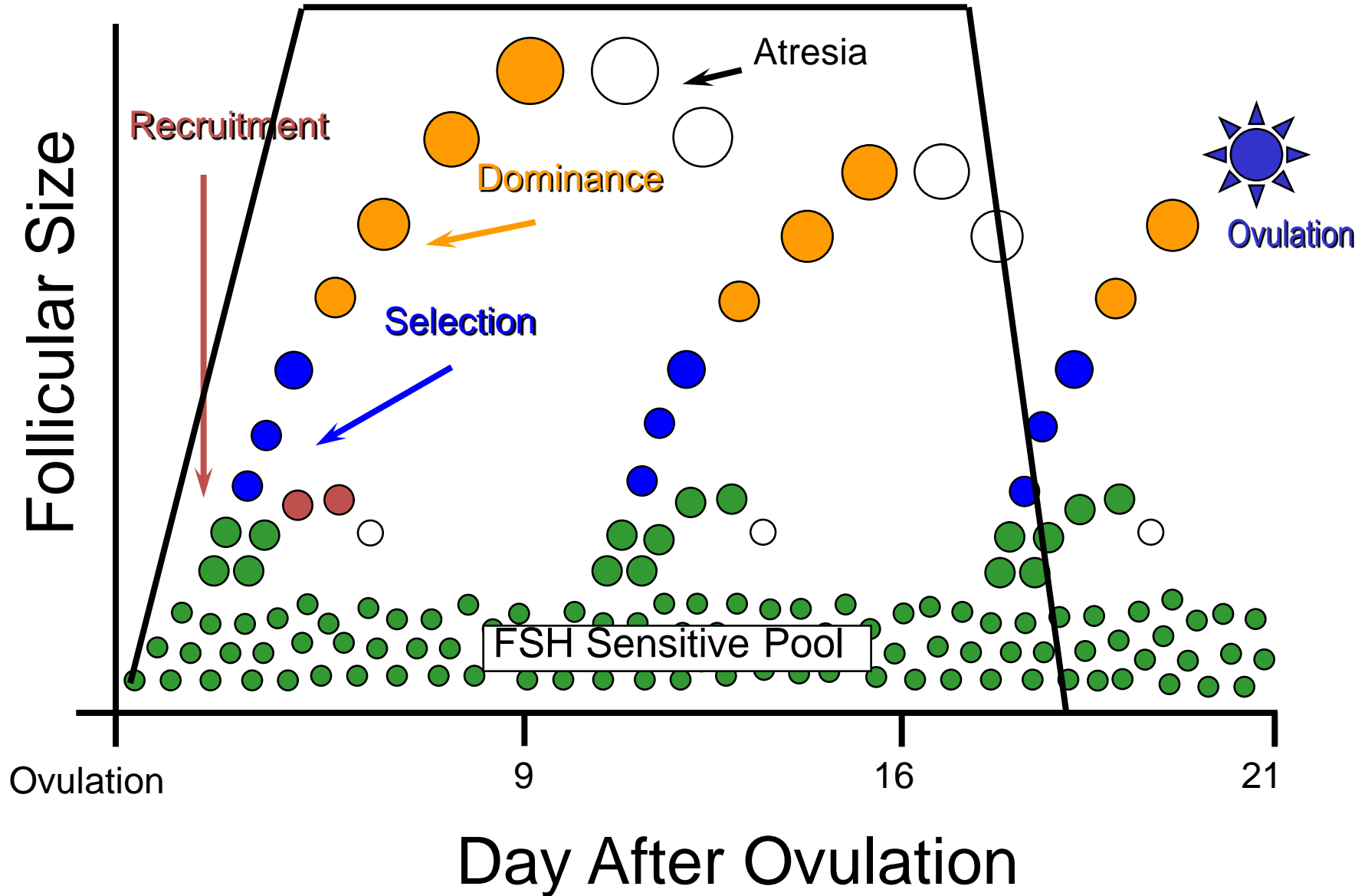
Rose shaped external os



- **During rectal palpation**
- Uterus is turgid
- Presence of GF

Follicular Waves in Cattle

Progesterone



Mating Behavior (Estrus signs)

- The mare will allow the stallion to **smell and bite**.
- She will
 - extend her hind legs,
 - lift her tail to the side and
 - lower her rump.
 - The erect clitoris will be exposed frequently by contractions (**winking**) of the labia.
 - The **vulva will be elongate** and swollen, with the labia partly everted.
- The mare should be teased by a stallion for accurate detection.
 - Attempts to fight the stallion indicate she is not in estrus even though some other signs of estrus are apparent.



Estrous Cycle (Non-Pregnant)

- Proestrus (9 days)
 - Vulva swollen
 - Bloody discharge
 - Attracted to male but does not mate
- Estrus (9 days, ovulation day 2)
 - Accepts male
 - Straw-colored discharge
- Metestrus or Diestrus (90 days)
 - False pregnancy
- Anestrus (5 months)
 - Sexual inactivity

Bitch

Estrous Cycle - Pregnant

- **Proestrus (9 days)**
 - » **Vulva swollen**
 - » **Bloody discharge**
 - » **Attracted to male but does not mate**
- **Estrus (9 days, ovulation day 2)**
 - » **Accepts male**
 - » **Straw-colored discharge**
- **Pregnant Metestrus/Diestrus (50 - 60 days)**
 - » **Pregnancy**
 - » **Parturition (63 days from ovulation)**
- **Anestrus (5 months)**
 - » **Sexual inactivity**

Estrous Cycle

- Pro-estrus
 - 1 - 2 days
 - Attracted to males
 - Rubs head and neck on objects
 - Vocalization, posturing and rolling
- Estrus
 - Accepts male
 - 4 - 6 days if male present, 10 days if no male
 - Ovulation 27 hours after mating (induced)
 - Affectionate to aggressive towards owners

Estrous Cycle! (Queen)

- **Proestrus if queen did not ovulate**
 - » **8 - 10 days**
- **Diestrus after ovulation**
 - » **psuedopregnancy - 40 days**
 - » **pregnancy - 60 days**
- **Anestrus 3 - 4 months**

Luteal Phase

Stage of heat

C. Metestrus (after heat)

- **day 1-5 of cycle**
- **not permit mounting**
- **50% cow , 90% heifer - metestral bleeding**
- **corpus luteum begins to develop**

Metestrus

- estrogen low
- ovulation in cow
- corpus hemorrhagicum present
- uterus
 - contractions subside
 - endometrial glands continue to grow and become coiled
 - in cattle bleeding occurs
- FSH increases
 - triggering growth of follicles

Luteal Phase

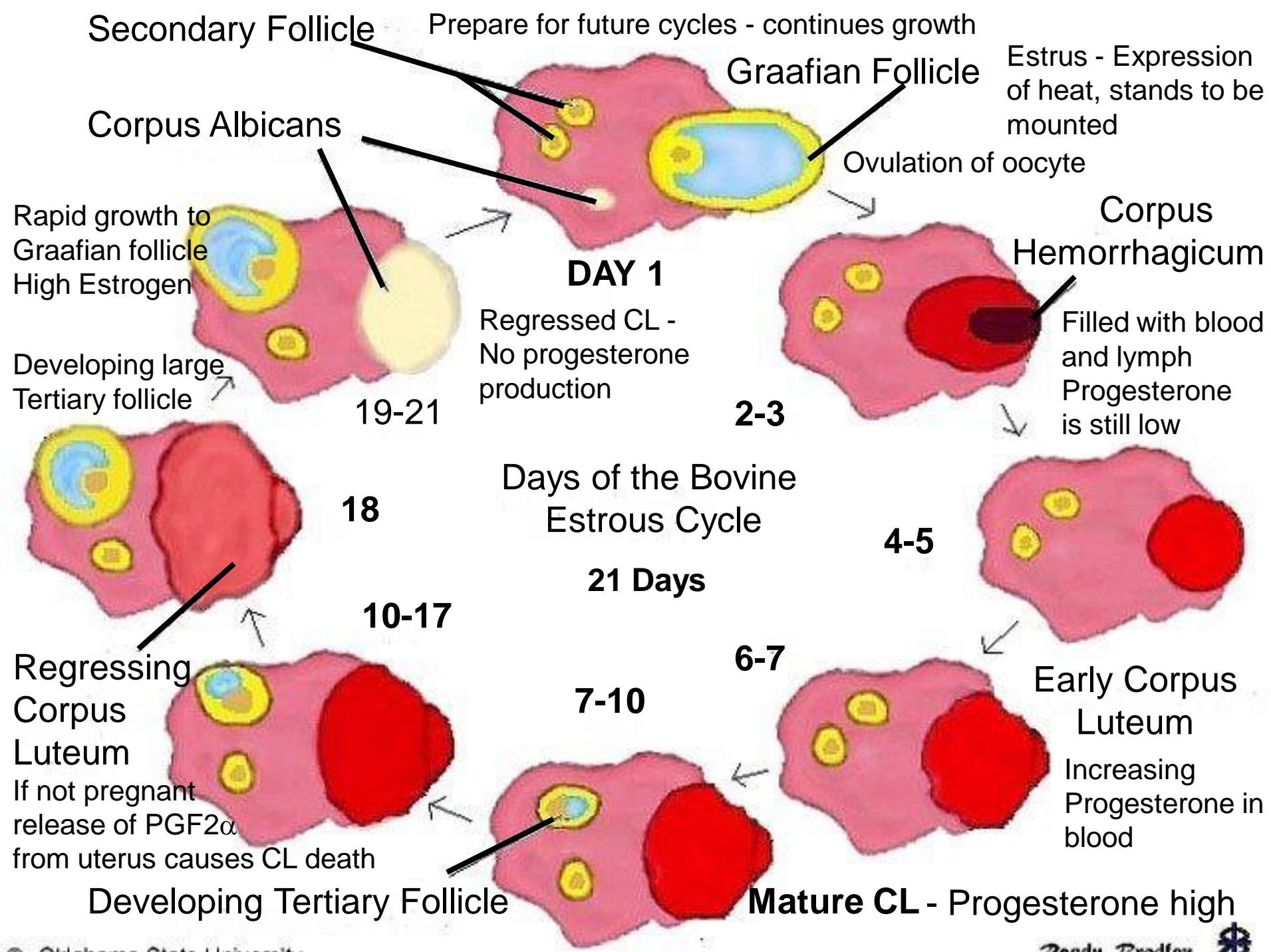
Stage of heat

D. Diestrus (between heat)

- **day 5 - 19**
- **complete lack of sexual desire**

Diestrus

- progesterone high
- FSH
 - Increases at some point to cause growth of ovulatory follicle
- Uterus
 - secretes fluid but volume gradually decreases
 - contraction stop
 - CL regresses at the end of this period if female is not pregnant due to PGF release

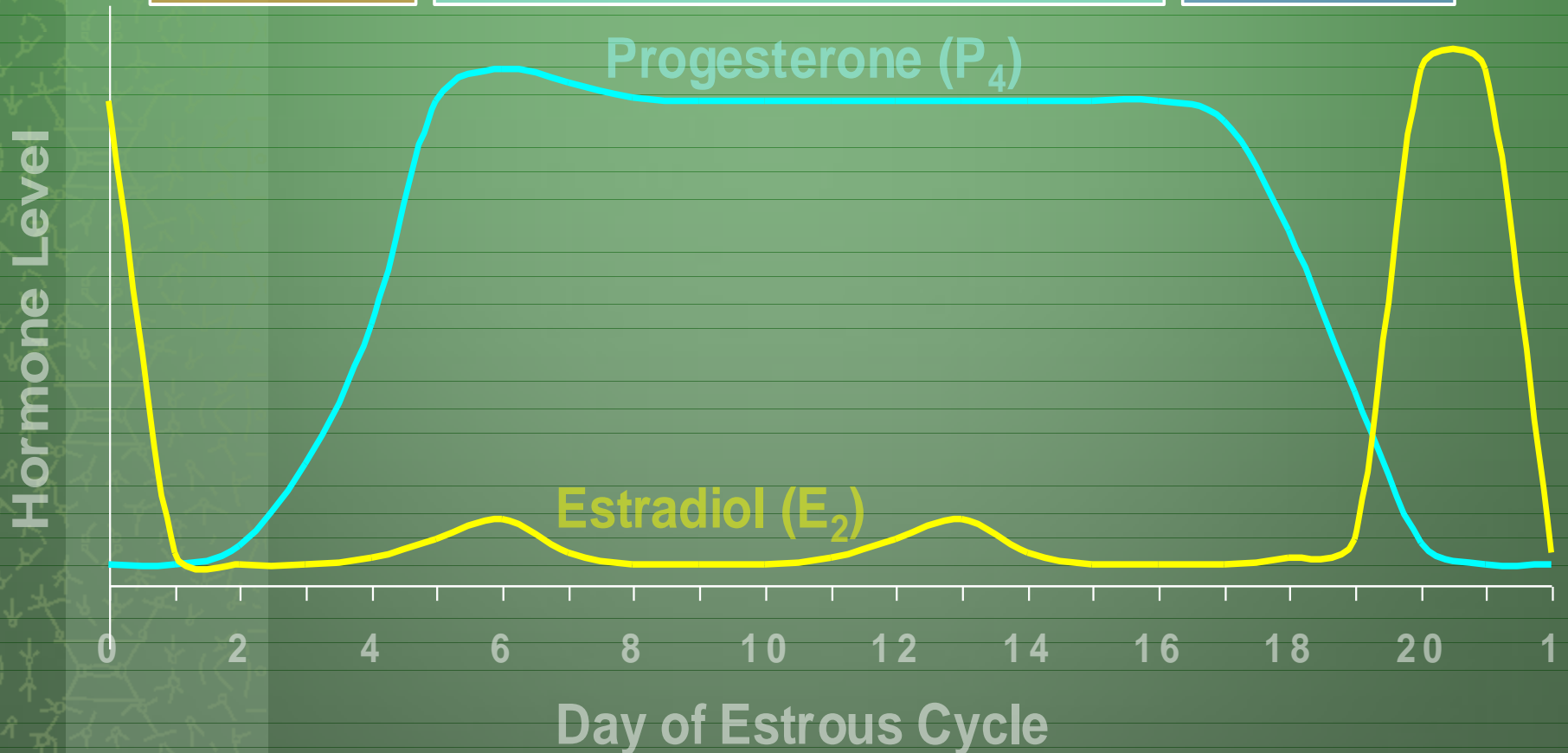


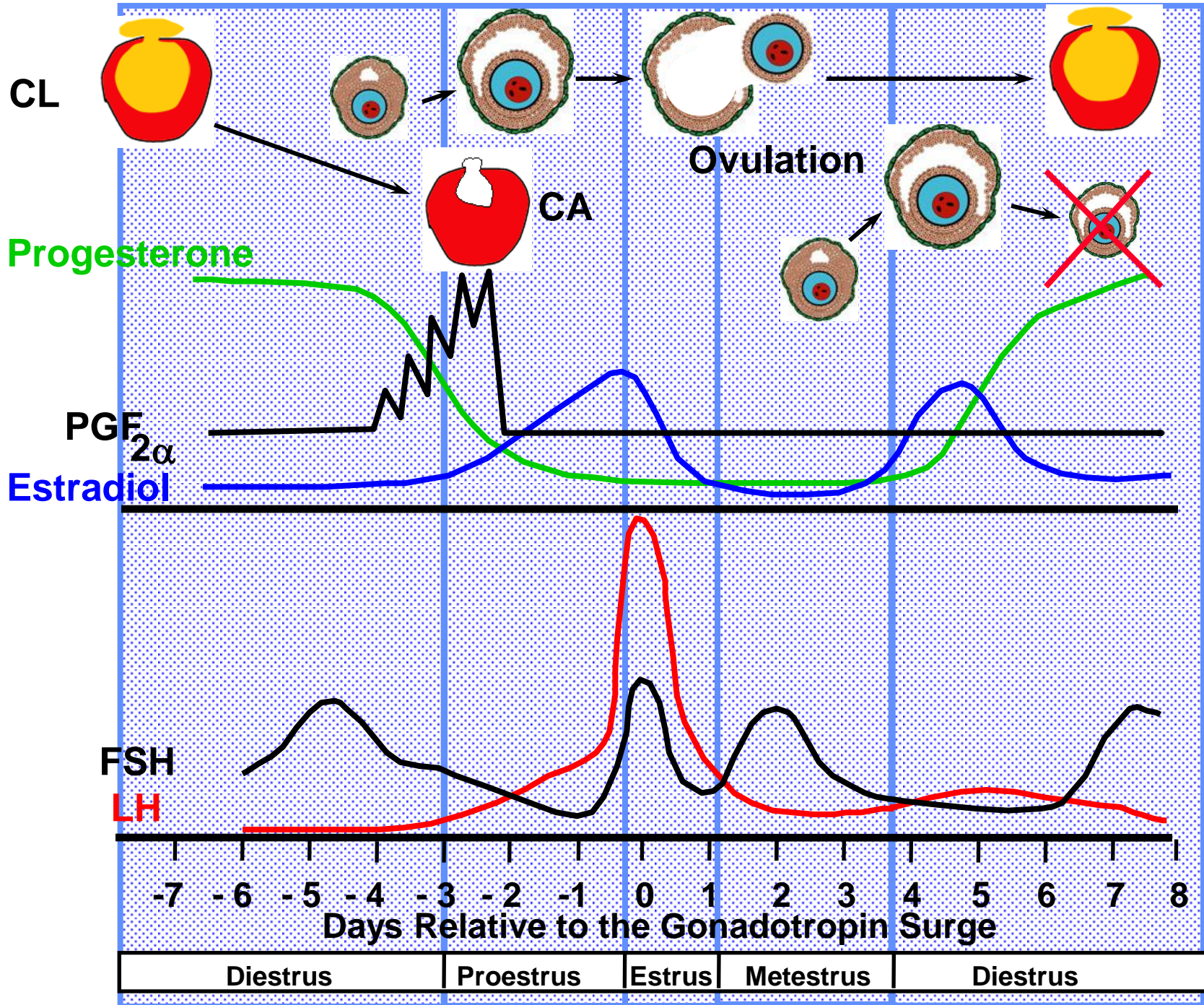
Estrous Cycle

New CL
Forming

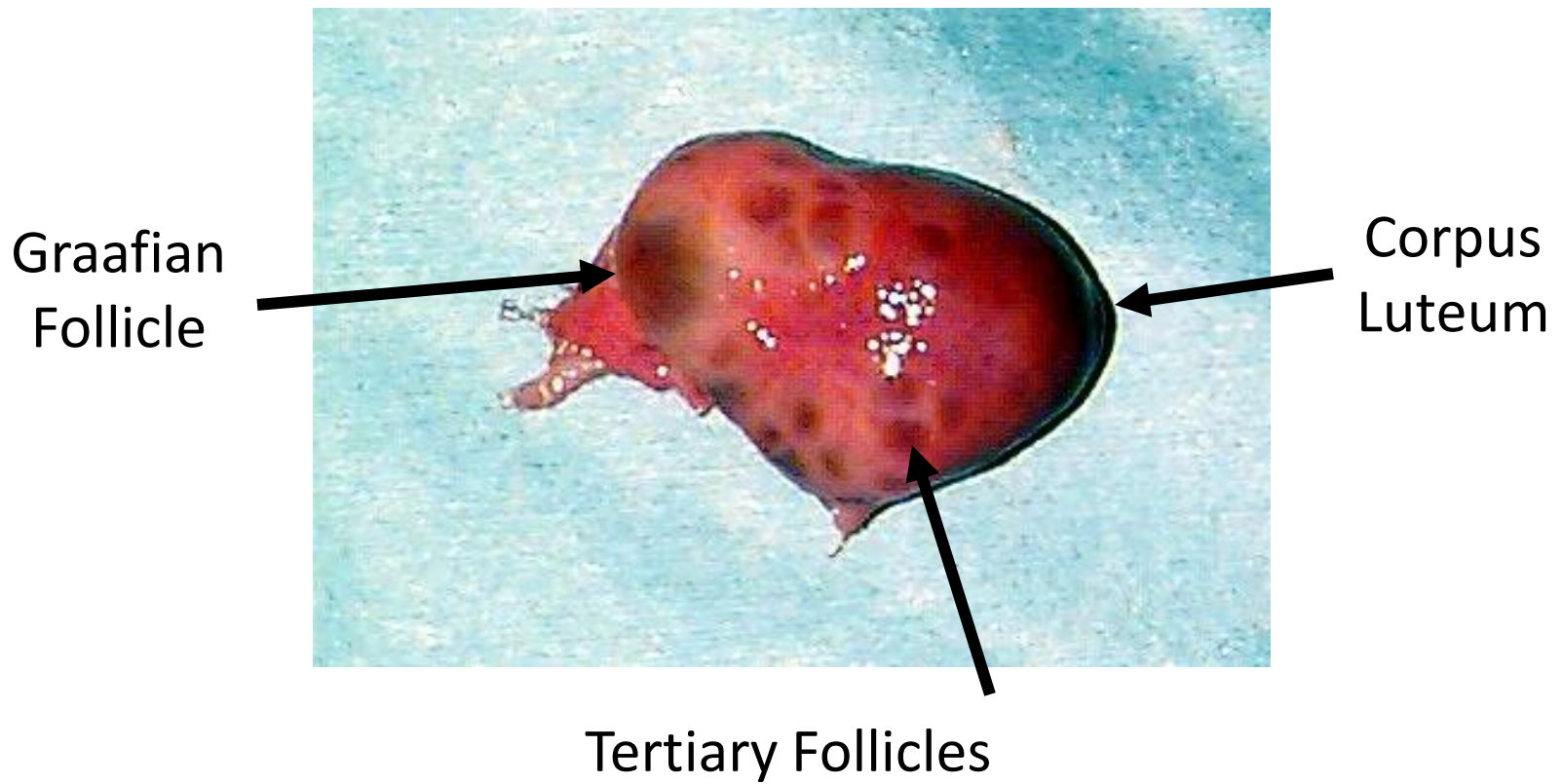
Mature CL Present

↑ Fol. Size
& ↓ CL Size

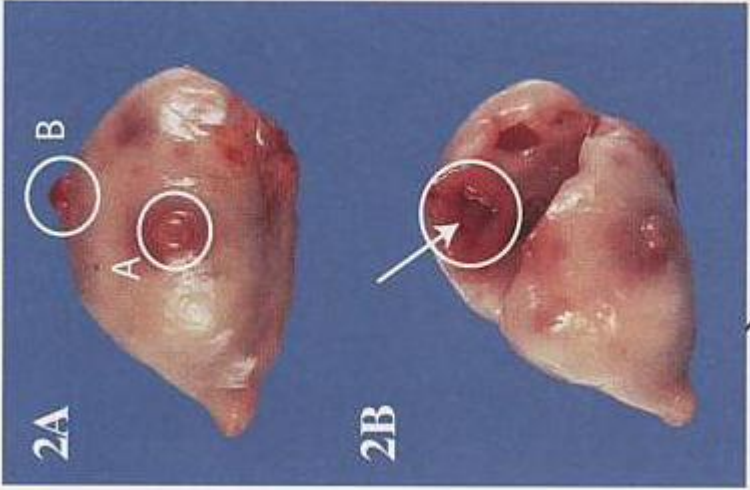




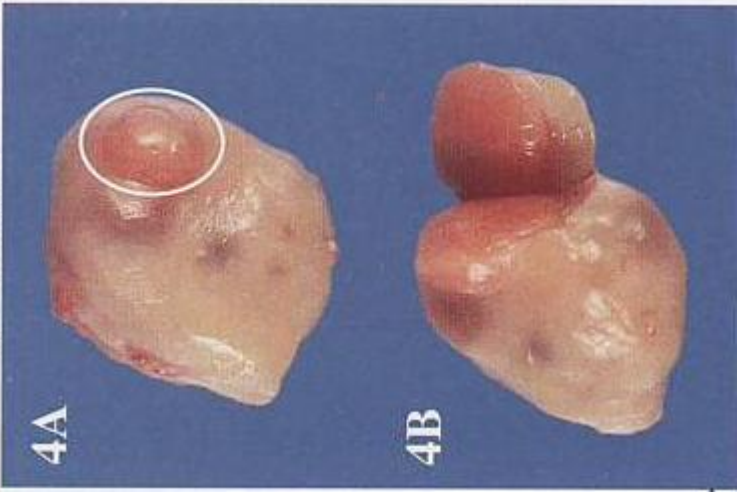
Ovary - CL and Follicle



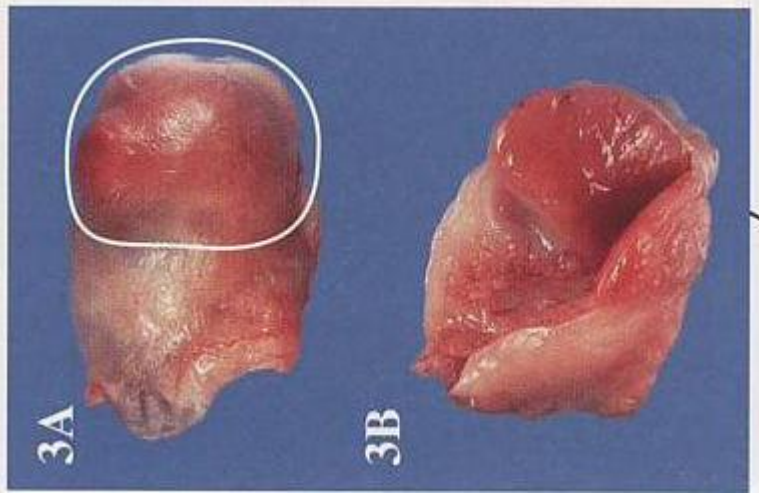
Late Metestrus



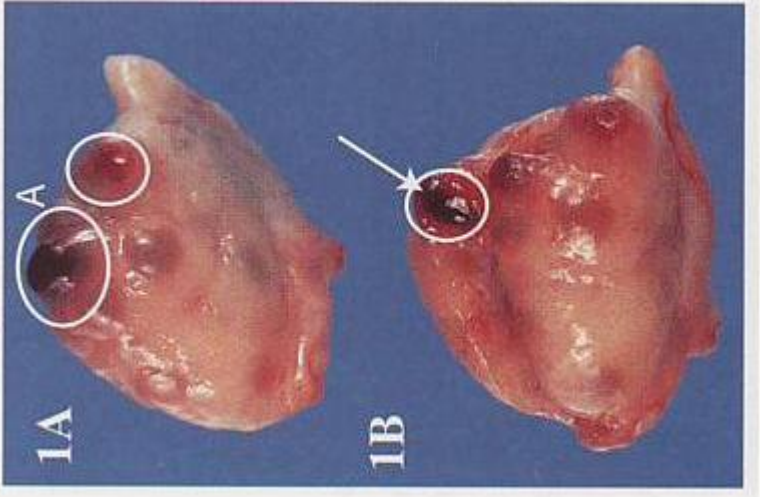
Proestrus



Diestrus



Early Metestrus



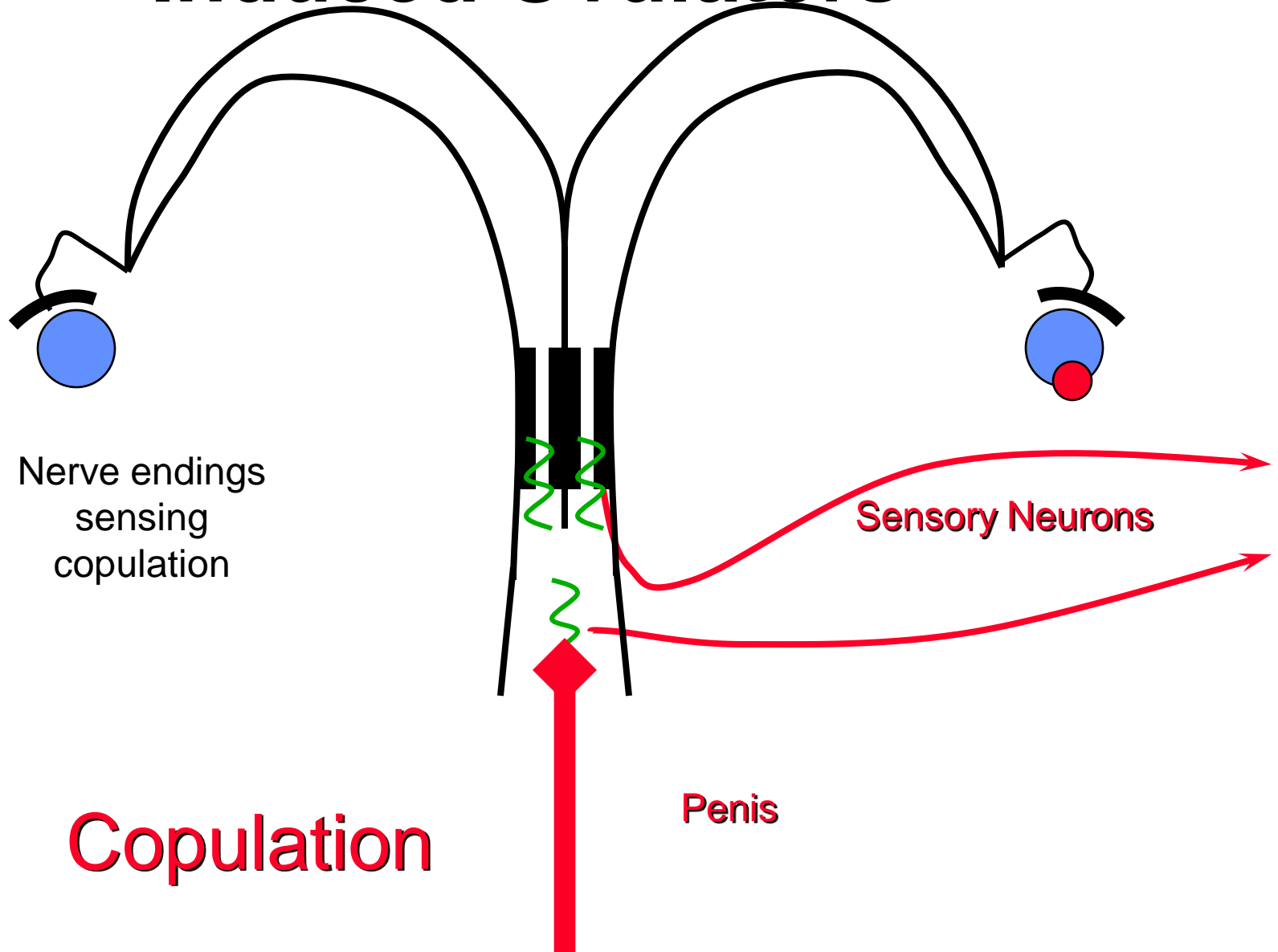
Animals induced ovulation

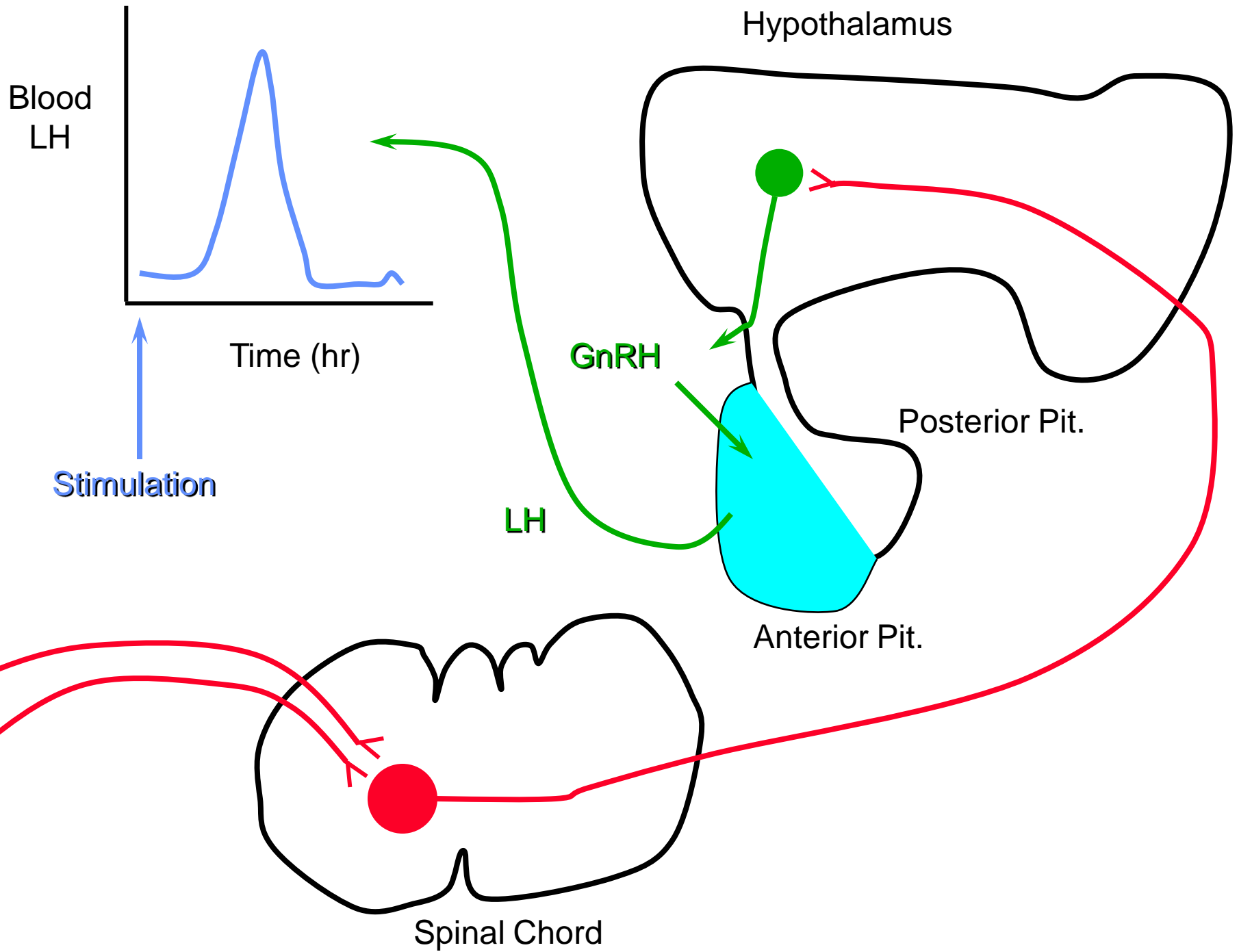


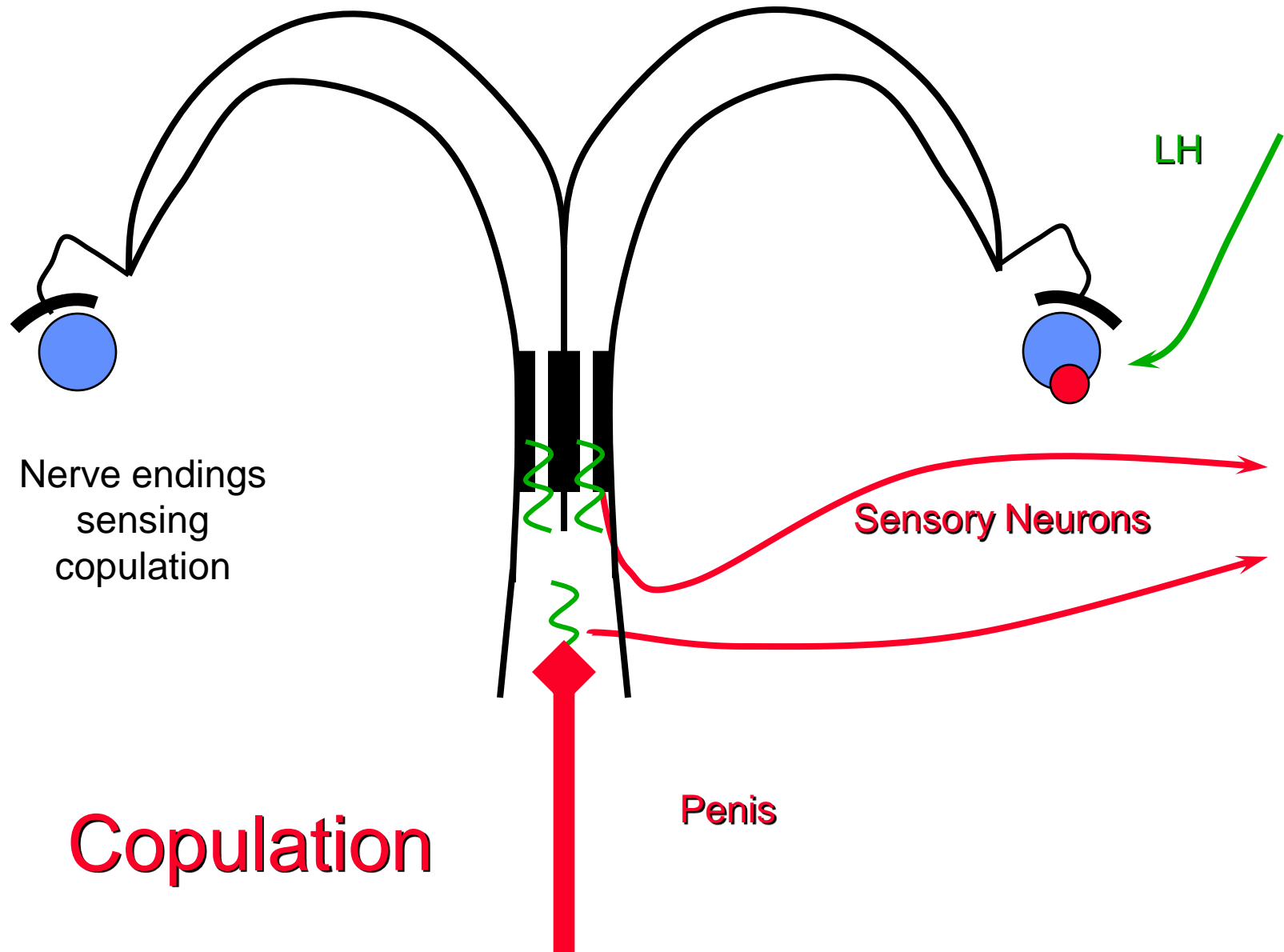
Spontaneous Ovulators

- **Retain some neural control of ovulation**
 - **heifers can alter the timing of the LH surge by clitoral stimulation**

Induced Ovulators







Nerve endings
sensing
copulation

Sensory Neurons

LH

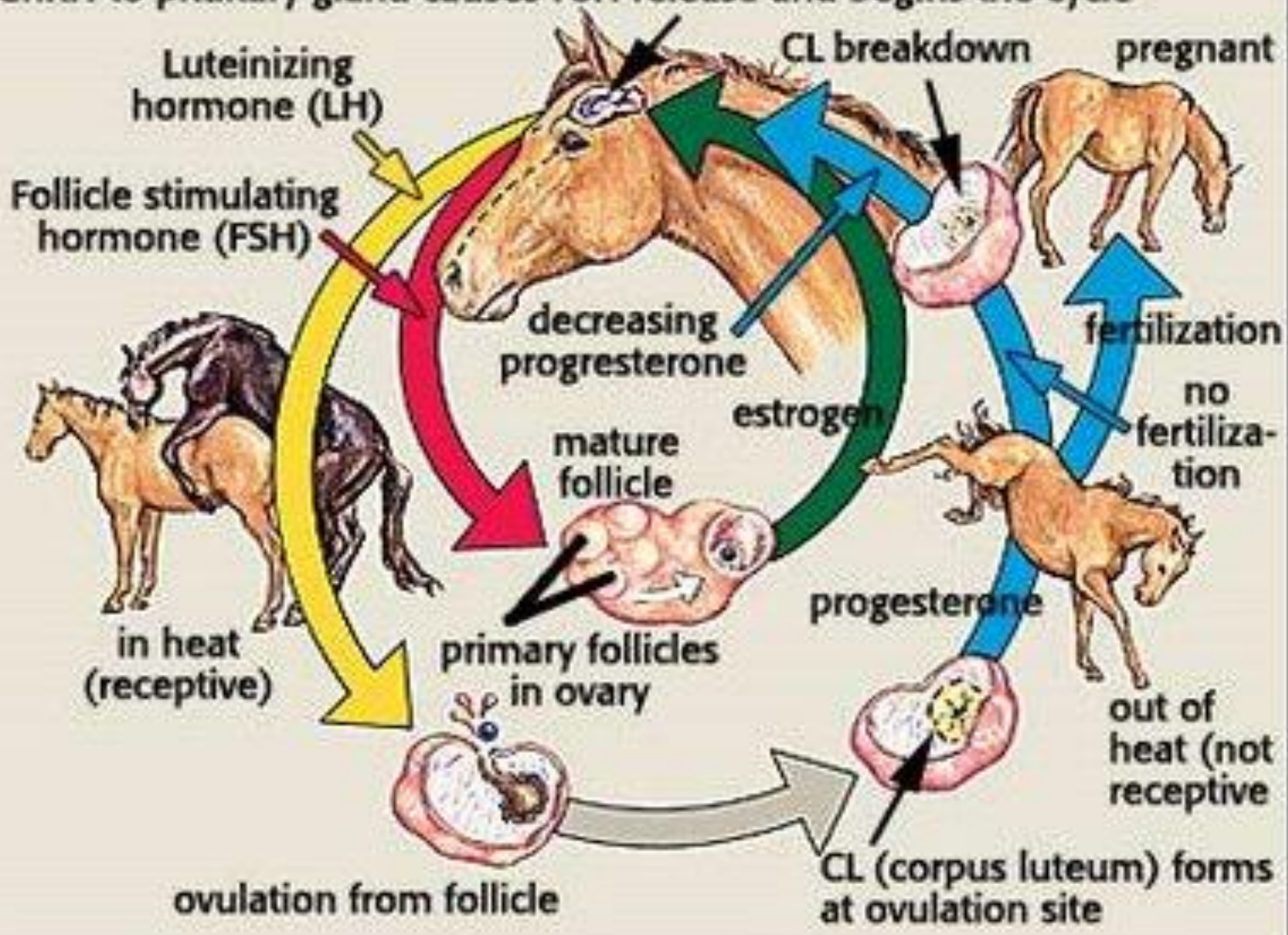
Copulation

Penis

Female reproductive parameters in domestic animals

	Cow	mare	ewe	doe	sow	bitch	queen
Age of puberty (month)	10 – 12 breed difference	15 – 24 seasonal effect	7 - 10	6 - 8	5 - 8	6 - 12	5 - 12
Age of sex maturation	30	36	10	8(if born in early ears)	10	5 - 12	6 - 12
Type of estrous cycle	Poly estrous	Seasonal poly estrous	Seasonal poly estrous	Seasonal poly estrous	poly estrous	monestrous	polyestrous
Length of estrous cycle	21 day	22 day	17 days	21 days	21 days	15 -65 weeks	2 – 3 weeks (if no mated)
Duration of estrous	24 (hours)	4 -7 days	36 hours (24 -48)	18 – 36 hours	48-72 hours	9 -10 days	3 -6 days
Optimal breed time(hours after onset of estrous)	10 -16	48 -72	18 - 24	24 - 36	12 - 30	48 -96	During estrous
Time of ovulation	4 -16 after estrous	24 -48 hours before end of estrous	24 hours after onset estrous	12 – 36 hours after onset estrous	24 – 42 hours after onset estrous	1 -3 day after onset estrous	25 – 50 hours after coitus
Mechanism of ovulation	spontaneous	spontaneous	spontaneous	spontaneous	spontaneous	spontaneous	induced
Ovulation rate (number of ova)	1	1	1 -2	2 -3	10 -20	6 -8	4

GnRH to pituitary gland causes FSH release and begins the cycle





Flehmen Response

Met estrous Bleeding



