# Section ( 3 )

# Estrous cycle (Cyclictiy)

- ***Def***:

  - The period bet. two successive heat .
  - The functional rhythm of female reproductve cycle .

- ***Types of Cyclicity***

  1. Polyestrus
  2. Seasonal Polyestrus
     - Long
     - Short
  3. Monoestrus
  4. Seasonal monoestrus

- ***Polyestrous :***

  The female can pregnant throughout the year without regard to the season ( female have many regular cycle all over the year ) as in : cattle , swin , rodent .

- ***Seasonal polyestrous :***

  Display clusters of estrous cycle that occur only during certain season of year

  It classified into :

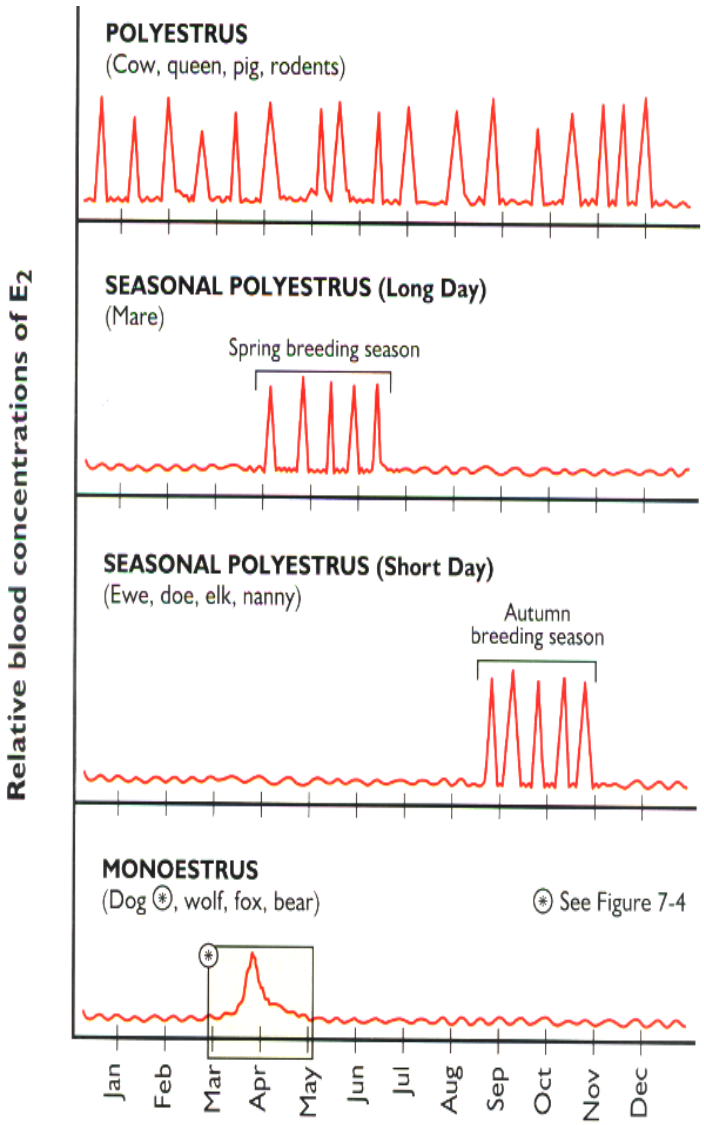
  A – Short day breeder

  B – long day breeder

- ***Monoestrous :***

  Animals that have one estrous cycle per year

  As : dogs , wolves , & foxes .

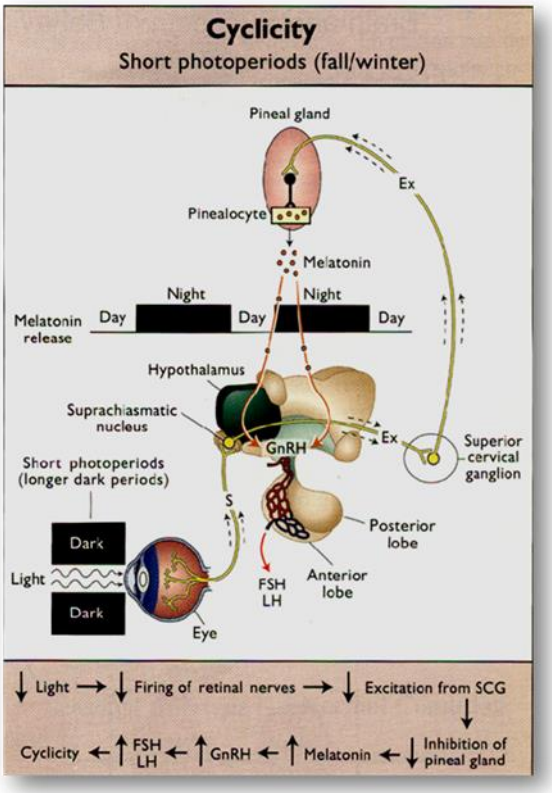


# Seasonal cyclicity

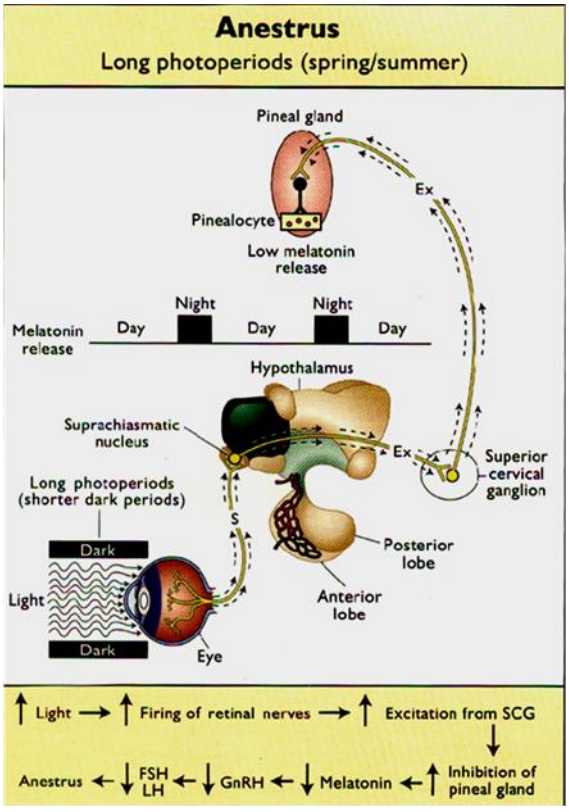
- **A – Short day breeder-sheep/goats:**

  The cycle of these animals occur when day is shorter as in case of autumn , winter and appear anestrous in spring , summer .

  – Estrous :
    - Retina – light (dark)
    - Less inhibition to suprachiasmatic nucleus
    - Superior cervical ganglion
      – Allows pinealoctes
        » Melatonin release causes GnRH



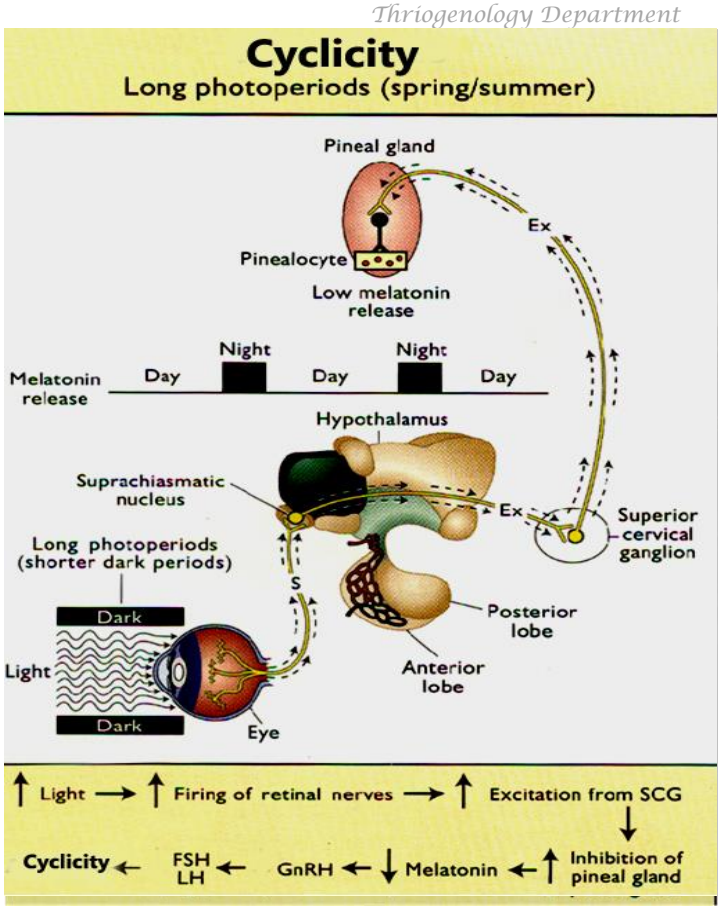

- Anestrus
  - Retina – light
  - Inhibits suprachiasmatic nucleus
  - Less uperior cervical ganglion stimulation
    – Less stimulation of pinealoctes
      » Less melatonin release



- B – Long day breeder ( Mare ):

  The cycle of these animals occur when the day is longer as in spring , summer and animals become anestrous in autumn & winter .

  – Estrous :
    - Retina – light
    - Inhibits suprachiasmatic nucleus
    - Less uperior cervical ganglion stimulation
      – Less stimulation of pinealoctes
        » Less melatonin release

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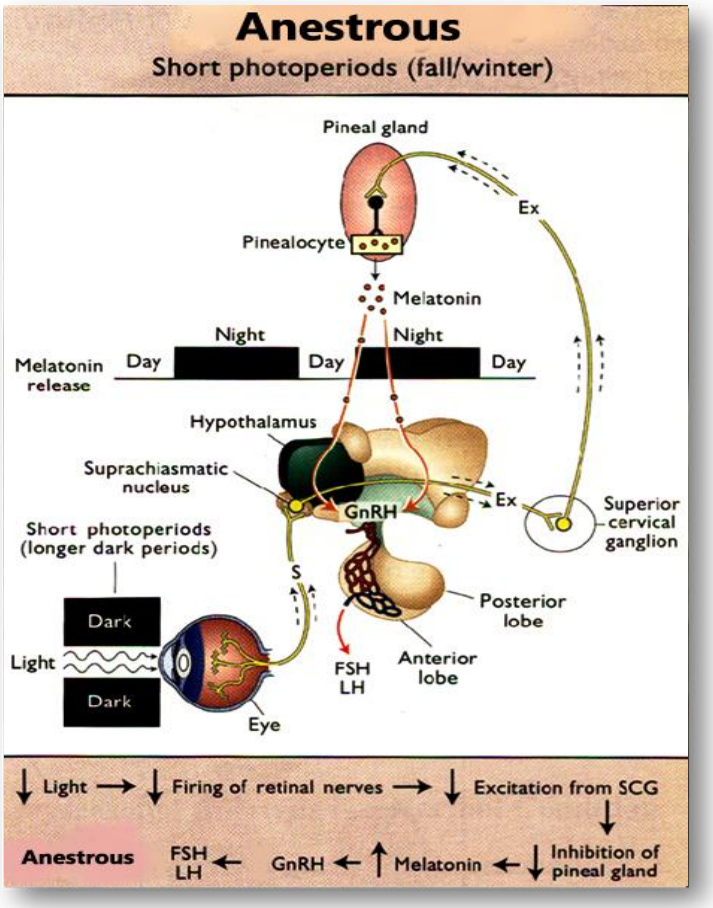
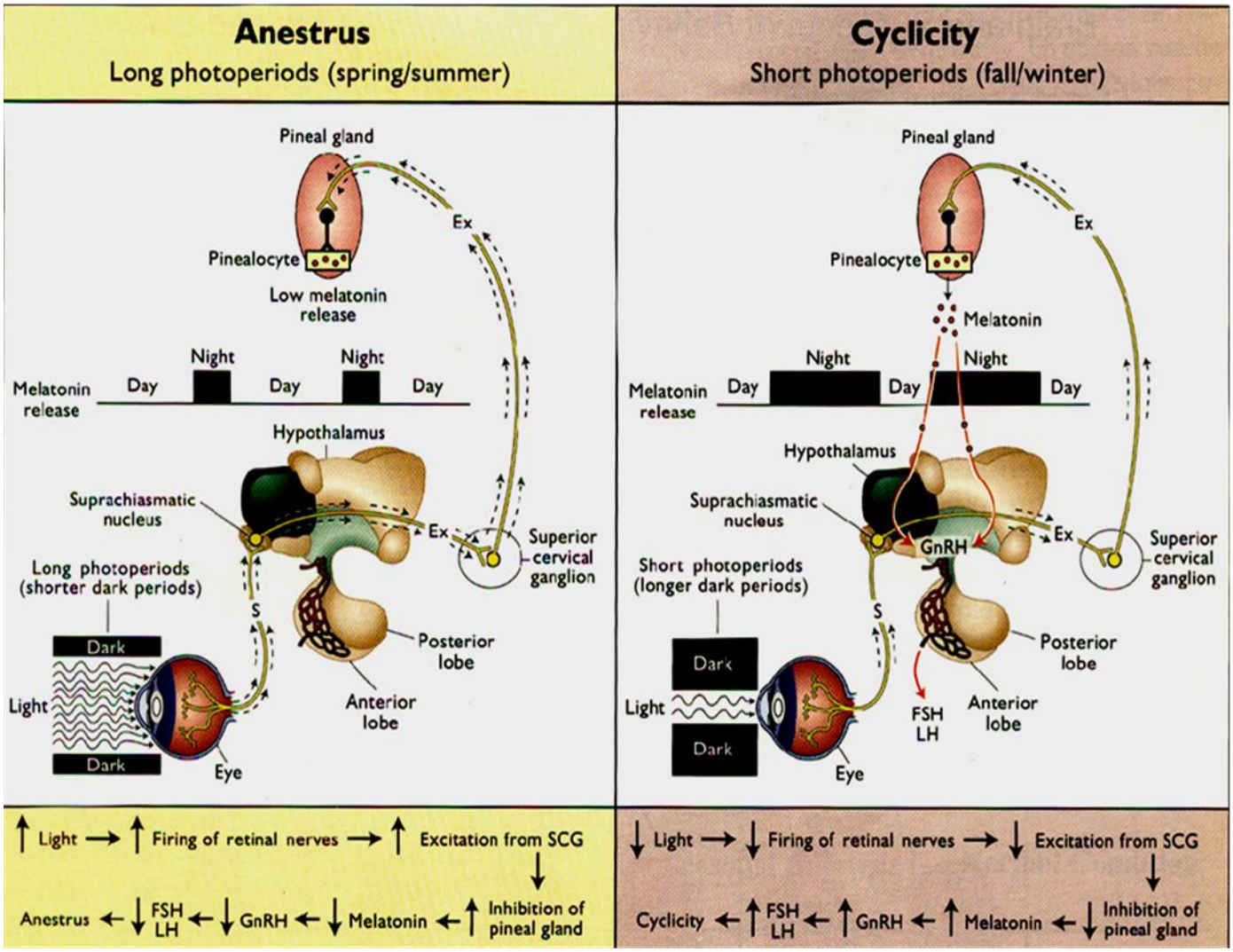
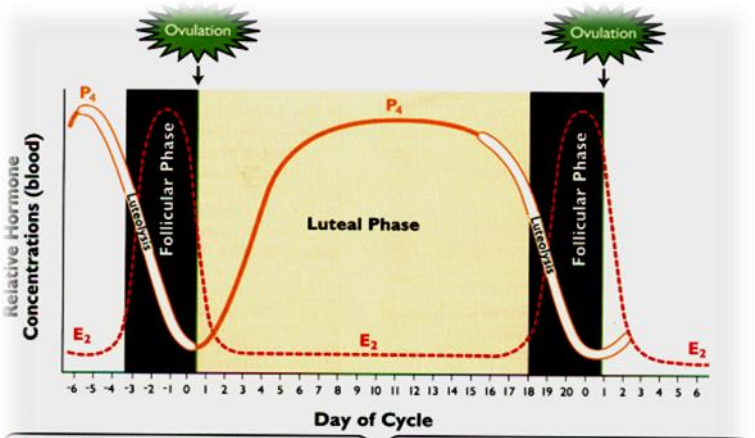


# (Mare - opposite)




## *Phases of Cycle*

- ***Follicular***
  - 20 % of cycle
  - Luteal regression
  - Follicle growth
  - estradiol
- ***Luteal***
  - 80% of cycle
  - Corpus luteum
  - Progesterone

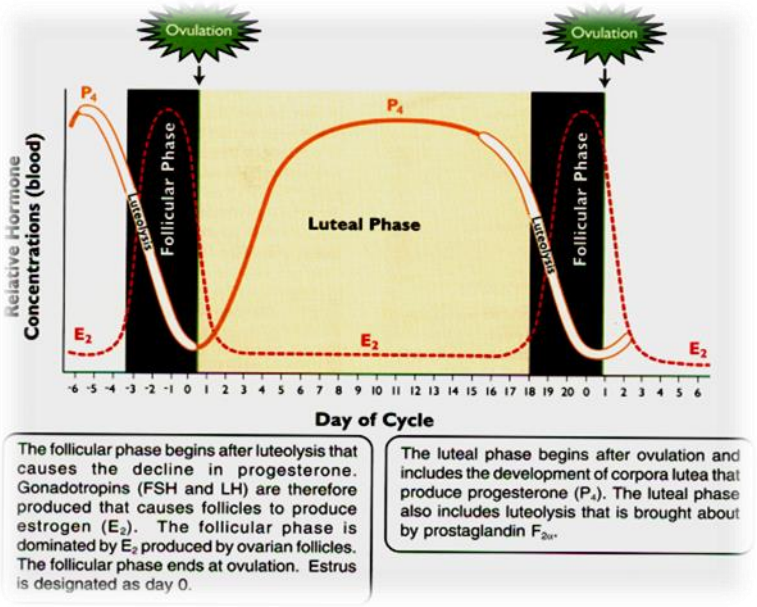



The follicular phase begins after luteolysis that causes the decline in progesterone. Gonadotropins (FSH and LH) are therefore produced that causes follicles to produce estrogen ($E_2$). The follicular phase is dominated by $E_2$ produced by ovarian follicles. The follicular phase ends at ovulation. Estrus is designated as day 0.

The luteal phase begins after ovulation and includes the development of corpora lutea that produce progesterone ($P_4$). The luteal phase also includes luteolysis that is brought about by prostaglandin $F_{2\alpha}$.

## *Follicular phase:*

- Primary ovarian structure is pre-ovulatory follicle .
- Graffian follicle max. E2 :
  - supress tonic center
  - activate surge center
  - activate sex center
- Represent 20 % of cycle




## *Luteal phase:*

- The phase include 3 parameters :
  - growth of CL
  - maturation of CL
  - regression of CL
- Represent 80% of cycle

## *Events occurs in luteal phase :*

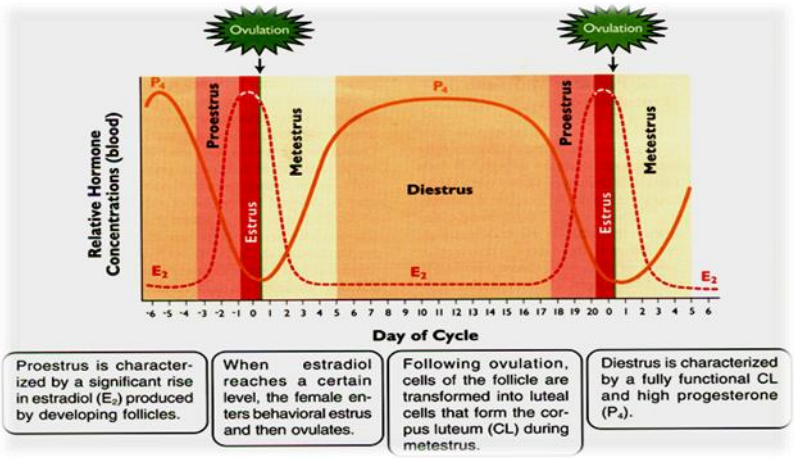
- ***Formation of CL :***
  - When follicle rupture at ovulation , bl.vs within follicular wall also ruptured result in formation of bloody clot – like appearance know as (corpus haemorrhgicum)observed from time of ovulation to 3 days after it.
  - CH become increase in size & loss his hemorrhagic appearance ( luteinization ) .
  - Luteinization is process which the cell of ovulatory follicle (theca & granulosa cells) are transformed into luteal tissue by action of LH .
  - After that CL become able to production of P4.
- ***Production of P4 :***
  - The CL increase in size gradually → increase production of P4 by luteal cells.
  - If occur fertilization the CL not regressed and but still to continue production of P4 to maintain pregnancy ( know as corpus gravidites ).
  - But if there is no fertilization CL is regressed ( lutealysis ) .
- ***Luteolysis :***
  - It mean disintegration of CL .
  - It occur during 1-3 days before end of luteal phase .
  - This process ch.ch. by dramatic drop in bl. Level of P4 .
  - The two hormones controlling luteolysis are :
    1. oxytocin hormone .
    2. PGF2α from endometrium .
  - Luteolysis resulting in :
    1. Stop P4 production .
    2. Structural regression to form corpus albicans .
    3. Follicular development & enhance to enter anew follicular phase end by ovulation .

If luteolysis not occur the animal will remain in sustain luteal phase because P4 inhibit gonadotropin secretion .

# Stages of Cycle

- **Proestrus**
- **Estrus**
- **Metestrus**
- **Diestrus**

- Follicular
  - Proestrus
  - Estrus
- Luteal
  - Metestrus
  - Diestrus




## Estrous cycle , Estrous & Ovulation

| animal | Length of estrous cycle ( Days ) | Duration of estrous phase ( Hours ) | Time of ovulation ( Hours ) |
|---|---|---|---|
| Cow | 21 - 23 | 18 -19 | 10 – 12 after end of estrous |
| Buffalo cow | 18 - 22 | 17 - 24 | 12 – 18 after end of estrous |
| Ewe | 16 - 17 | 24 - 36 | 30 – 36 from onset of estrous |
| Goat | 21 | 20 - 25 | 18 – 24 from onset of estrous |
| Mare | 19 - 25 | 4 - 8 days | 1 – 2 days before end of estrous |
| Camel | 24 | 5 days | 30 – 40 h. after coitus |

# Signs of estrous phase

## In Cow:

- Loss of appetite , drop of milk production .
- Long stand of viscous , transparent mucous hanging from vulva & soiling the tail and hock region .
- Loud vocalization .
- Rose mucous membrane .
- At early estrous the female jumping on other animals and refuse to be mounted by male ( due to high level of testosterone ) .
- At later estrous female stand quite with abduction of hind limb and raising its tail ( mating position ) .
- **Duldling `s reflex:**

  massage of lumber region by hand : if cow in heating stand quite , calm and take position of mating .

- **Clitoris reflex :**

  massage of clitoris : the cow show posture of mating .

## In Buffalo:

- ***Estrous mucous is little than cow .***
- ***Loud vocalization & stand quite beside male*** .
- Loss of appetite , drop of milk production .
- Long stand of viscous , transparent mucous hanging from vulva & soiling the tail and hock region .
- Rose mucous membrane .
- At early estrous the female jumping on other animals and refuse to be mounted by male ( due to high level of testosterone ) .
- At later estrous female stand quite with abduction of hind limb and raising its tail ( mating position ) .
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  massage of clitoris : the cow show posture of mating .

## In ewe&doe

- Has strong male seeking behavior ( presence of male stimulate estrous )
- It more appear in doe than ewe due to presence of fatty tail .
- Presence of estral mucous
- Rosy red mucous membrane .
- Frequent urination .

## *In She-camel:*

- Female secret especial secretion from pole gland (behind ear of female ) .
- This secretion stimulate male to protrude of soft palate if female in estrous .
- Presence of little estrous mucous .

## *In Mare:*

- Very little estral mucous just for librication to surface of genitalia .
- Vulva become large swollen .
- Detected by male ( introduce teaser )
    - If stand quite : it is in estrous
    - If stand face to face & kick teaser : not in estrous
- Frequent urination .
- Frequent protrusion of clitoris .

## *Estrus detection*

1. Tail painting: used oil – or water based paints applied to back of cow's spine.
2. Heat mount detector: devices are glued to the hair over the midline just in front of tail head.
3. Chin – ball devices:
4. Vaginal probes: measuring of electrical resistance of vaginal fluid at time of estrous, the lowest value occur around the time of estrous.
5. Teaser animal
6. Change in body temperature: during heat, vaginal temperature elevates 0.5 – 0.8 c but drop after ovulation.
7. Cervical mucus
8. Progesterone test in milk
9. Change in cow activity: by using pedometer
10. Close circuite television

# Ovulation

- M.G.F release max estrogen which stimulate release surge L.H .
- So pre-ovulatory follicle undergo 3 major changes:
    - Cytoplasm and nuclear maturation of oocyte
    - Disruption of cumulus cells from granulosa layers
    - Thinning of external follicular wall
- In all spp. ovulation occur in any place on ovary except hilus ( but in mare occur in only one place called ovulation fossa )

## ✓ Types of ovulation :

1. Spontaneous ovulation
2. Induced ovulation

1. Spontaneous ovulation :
    - As in: cow , buffalo , ewe , doe & mare .
    - Ovulate with a regular frequency & not require copulation .
    - Ovulation occur due to response of hormonal changes ( peak of estrogen → secrete S.L.H .
2. Induced ovulation :
    - As in : she-camel , rabbit doe & queen .
    - Ovulation require stimulation of vagina and/or cervix
    - If mating not happen → no ovulation → no CL ( G.F → maturation → regression )

## ✓ Mechanism of ovulation :

1. **Mechanically** :
    - The follicle present mainly on surface of ovary on form of elevation & oviduct contain fimbria which help oviduct to pick up ovulated ova .
    - The fimbria start to move and make massage to foolicle → ore thinning of follicular wall → stigmaa formation → ovulation .
2. Hormonally :