

# Parturition

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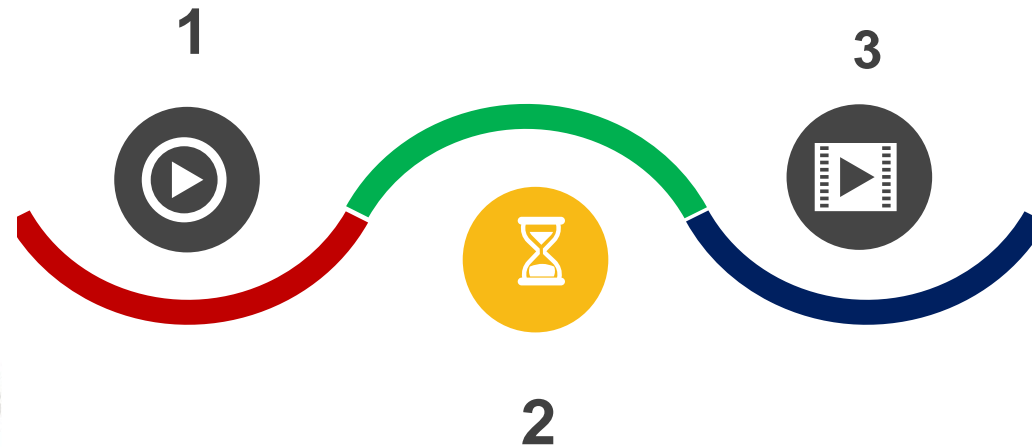


## Endocrinology

Hormones and Enzymes involved

## Stages of parturition

Duration and physio-morphological changes



## Clinical sign

### Behavioral changes

- Relaxation of sacrosciatic lig. : 24 - 48 hr prior
- Vulva : edematous & more flaccid
- Udder: enlarged & edematous
- White mucus discharge
- Anorexia, restlessness, abdominal pain etc.

# Parturition in different species



**Parturition** - Parturition is the **expulsion of fetus along with its membrane from the uterus** through maternal passage by **natural forces**, and in such a state of development that, in domesticated animals the **fetus is capable of independent life**.

- **Calving** – Act of parturition in cows and buffaloes.
- **Kidding** – Act of parturition in doe.
- **Lambing** – Act of parturition in ewe.
- **Farrowing** – Act of parturition in sow.
- **Whelping** – Act of parturition in dog.
- **Foaling** – Act of parturition in mare.

# Major activities after completion of gestation period

**Feto-uterine disproportion (advancing gestation)**

**Hormonal changes (P4 – E2, Aromatization)**

**Contractile uterus (de-polarization)**



# Initiation of parturition

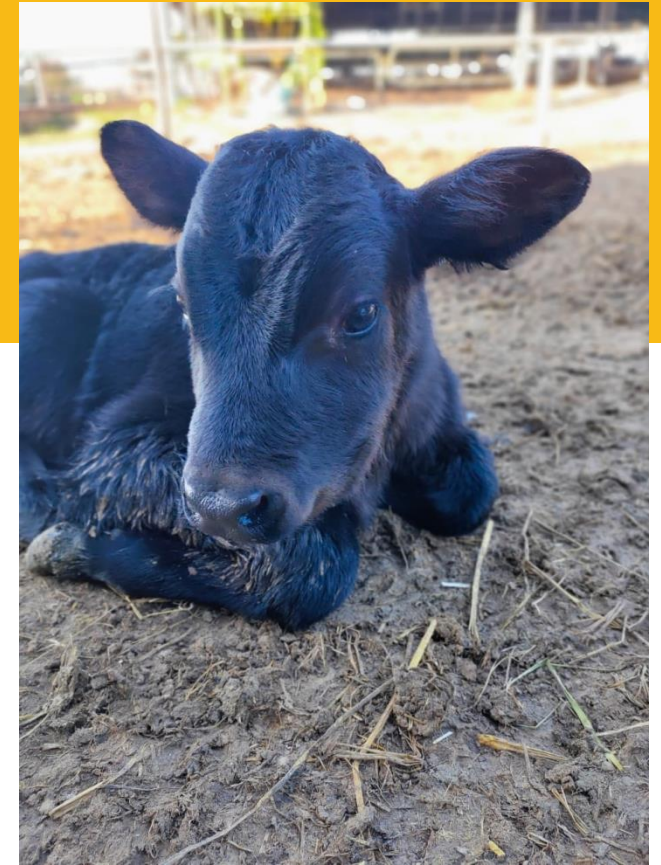
**Who decides ?**

**Dam - Date**

**Fetus - Time**

Sharp rise in **fetal** cortisol in last 2—3 weeks of gestation

Factors responsible for sharp rise of fetal cortisol level



# Possible factors responsible for initiation of parturition

**Physical  
factors**

**Biochemical  
factors**

**Neuro-endocrine  
factors**

# Possible factors responsible for initiation of parturition

|                            | Probable factors  | Effects  |
|----------------------------|---|--|
| <b>Physical factors</b>    | <ol style="list-style-type: none"><li>1. Increase in <b>fetal size</b></li><li>2. Uterine <b>distension</b></li><li>3. <b>Fatty degeneration</b> of placenta &amp; presence of infarcts</li></ol>         | <ol style="list-style-type: none"><li>1. Increase in <b>uterine irritability</b></li><li>2. <b>Reversal of progesterone block</b></li><li>3. Leads to <b>interference</b> in fetal nutrition &amp; initiations of <b>separation</b> process of fetus from uterus</li></ol> |
| <b>Biochemical factors</b> | <ol style="list-style-type: none"><li>1. Increase in <b>CO<sub>2</sub> tension</b> in maternal blood due to increased fetal activity</li><li>2. Release of <b>fetal antigens</b> like serotonin</li></ol> | <ol style="list-style-type: none"><li>1. Increased <b>uterine contractility</b></li><li>2. Release of <b>collagenase</b> &amp; <b>stoppage</b> of blood supply to cotyledons</li></ol>   |

# Possible factors responsible for initiation of parturition

|                                | Probable factors   | Effects   |
|--------------------------------|--|---|
| <b>Neuro-endocrine factors</b> | <p><b>FETAL</b></p> <ol style="list-style-type: none"> <li>1. Increase in cortisol in adrenals</li> <li>2. Increase in ACTH by pituitary</li> <li>3. Increase in corticotrophin releasing hormone (CRH) in hypothalamus</li> <li>4. Increase in endogenous opioids</li> </ol> <p><b>MATERNAL</b></p> <ol style="list-style-type: none"> <li>1. Reversal of progesterone block</li> <li>2. Release of Relaxin</li> <li>3. Placental estrogens rise</li> <li>4. Proinflammatory cytokines</li> <li>5. Release of PG</li> <li>6. Release of oxytocin</li> </ol> | <ol style="list-style-type: none"> <li>1. Convert P4 to E2 &amp; release of PG</li> <li>2. Stimulate cortisol release</li> <li>3. Stimulate ACTH</li> <li>4. Stimulate ACTH secretion</li> </ol><br><ol style="list-style-type: none"> <li>1. Myometrial contractility</li> <li>2. Dilation of birth canal</li> <li>3. Release of PG</li> <li>4. Dilation of pubic symphysis &amp; sacro-sciatic ligaments</li> <li>5. Softening of cervix, Stimulate smooth muscle contractility.</li> <li>6. Myometrial contractions</li> </ol> |



# Primary Precursors of Initiation of Parturition

- ✓ Pig – Prostaglandin
- ✓ Sheep – Foetal Cortisol
- ✓ Cow - Foetal Cortisol + Prostaglandin
- ✓ Mare - Oxytocin

# Effect of elevated fetal cortisol

## Activation of placental (cotyledon) enzymes

- ❖ 17  $\alpha$  -hydroxylase
- ❖ 17-20 amylase
- ❖ Cytochrome system

↓ P4

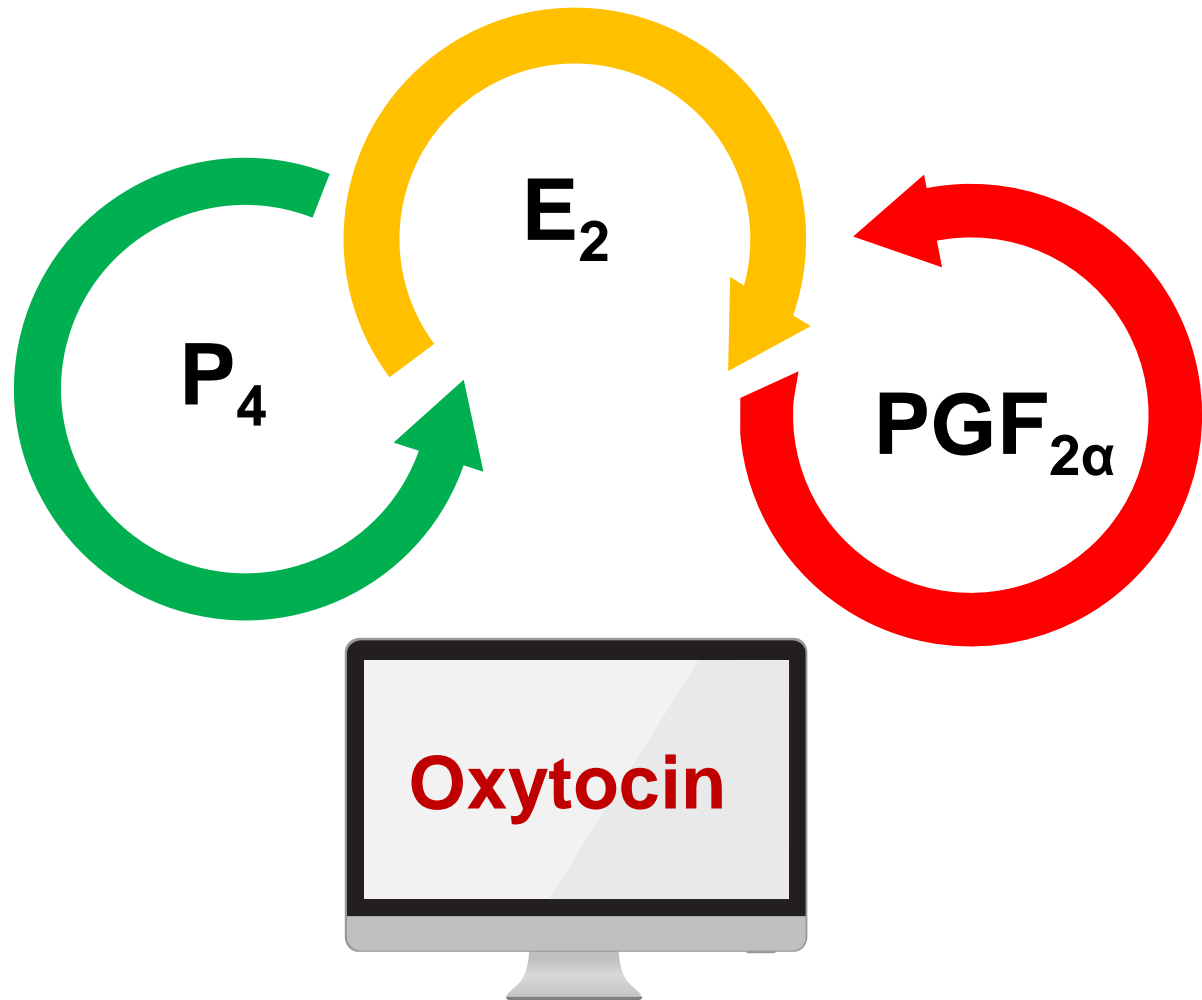
↑ E2



Effect of ↑ E2

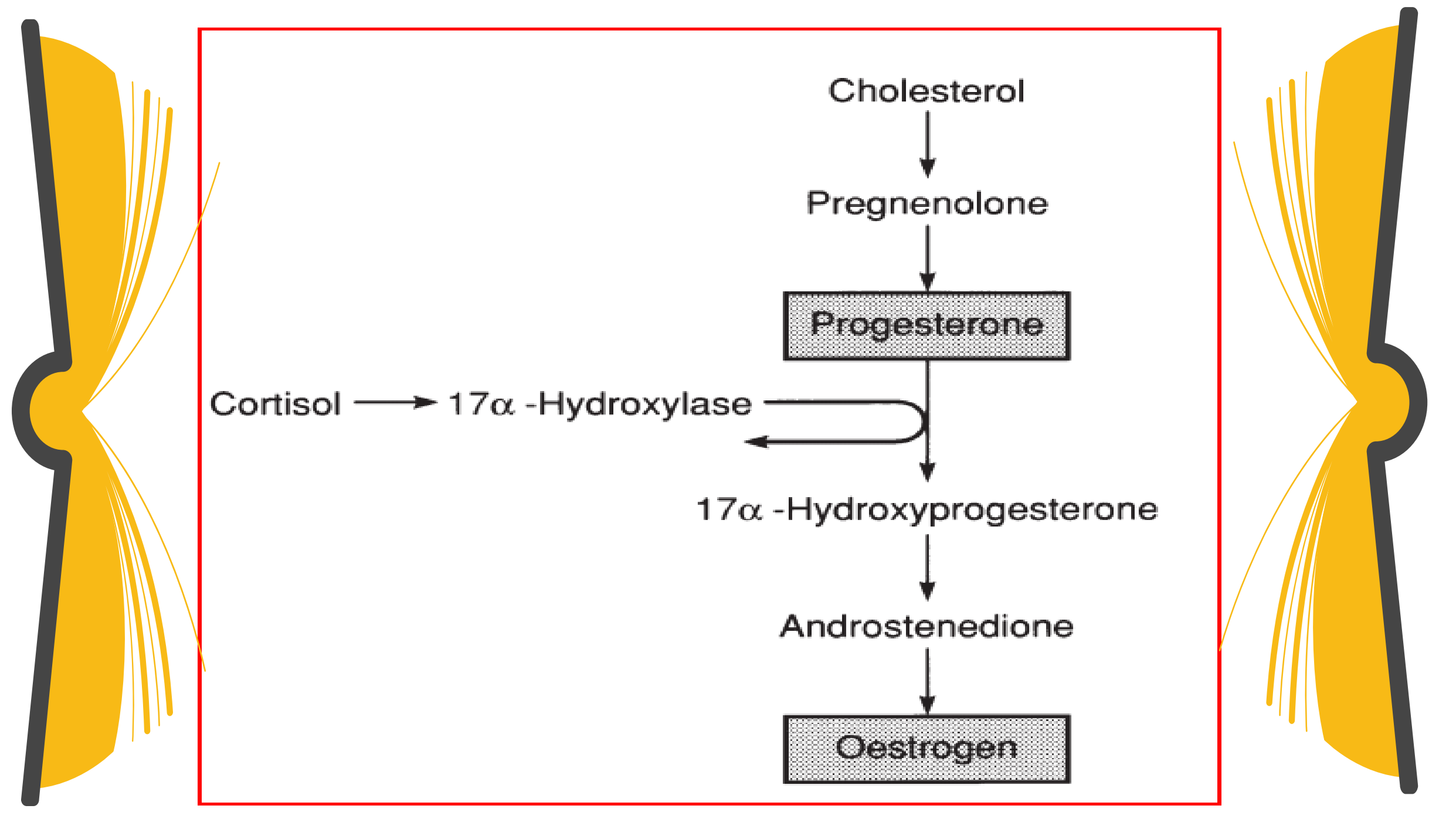
- A** Depolarization of myometrial cells
- B** Develops receptors for oxytocin in the myometrium
- C** Relaxes cervix (change in collagen fiber texture)
- D** Activate placental enzymes phospholipase A2
- E** Production of PGF2 $\alpha$

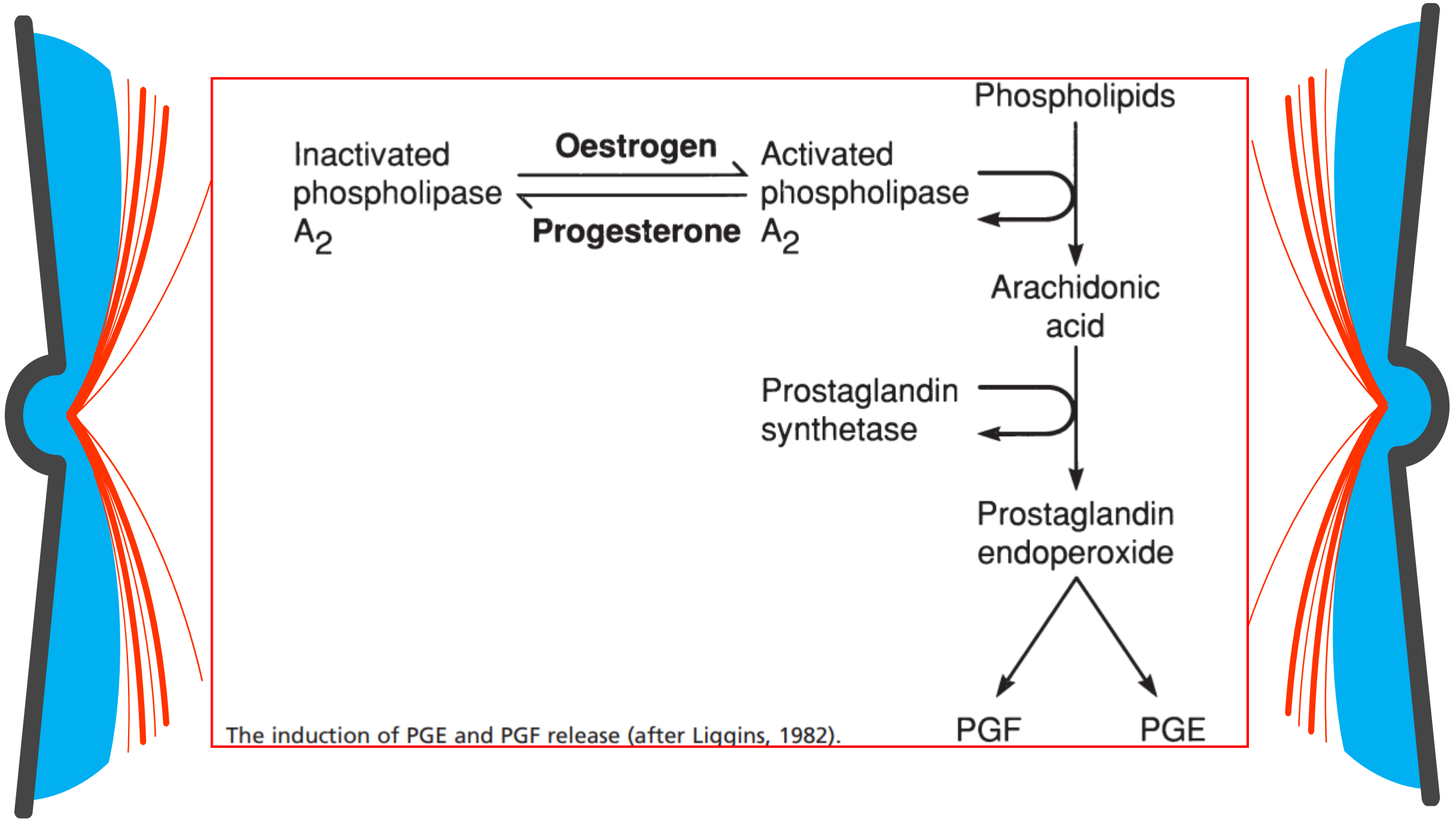
# Endocrine regulation of parturition – major players



## Role of $PGF_{2\alpha}$

- Luteolysis – lysis of CL
- Sharp decline in  $P_4$  level
- Initiate uterine contractions
- Potentiate Oxytocin release from posterior pituitary
- Oxytocin further stimulate pg release (inc. magnitude of contraction)





Inactivated  
phospholipase  
A<sub>2</sub>



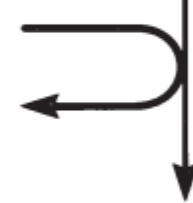
Activated  
phospholipase  
A<sub>2</sub>

Phospholipids



Arachidonic  
acid

Prostaglandin  
synthetase



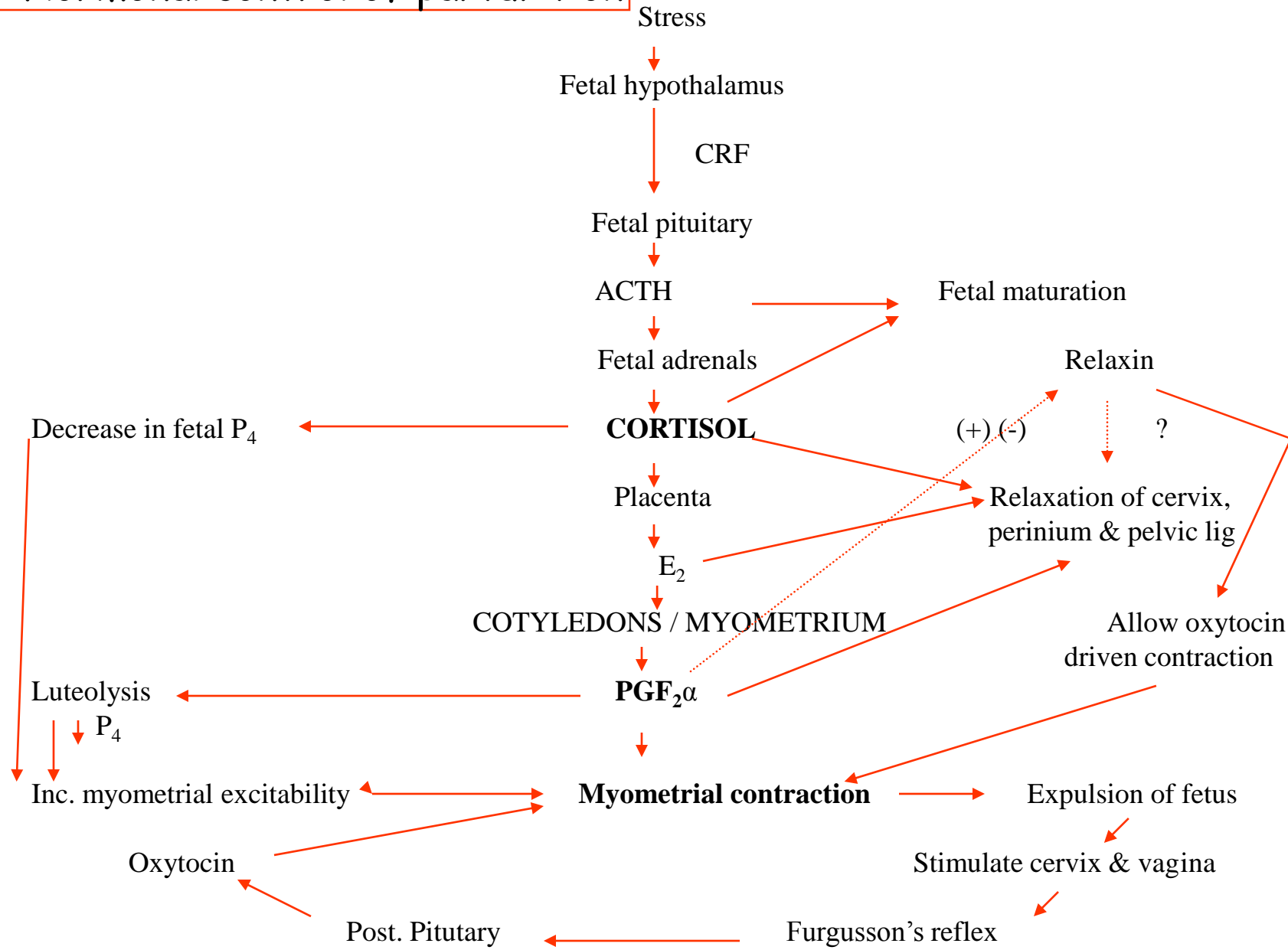
Prostaglandin  
endoperoxide

PGF

PGE

The induction of PGE and PGF release (after Liggins, 1982).

# Hormonal control of parturition



# Some species specific hormones

## Relaxin/insulin-like family peptides

Commonly denoted by – RLNs

### Major source of RLNs

➤ Placenta – Horse, cat, dog, rabbit and camel

➤ Carpus luteum – **Pig** and rodents



## RLNs functions - *At prepartal period*

Relaxin act in concert with progesterone, oestrogens, oxytocin, and prostaglandins

*Species specific role – with special reference to sow*

- Relaxation of the pubic ligament
- Preparation of the vaginal canal for parturition.
- Softening of cervix
- 10 to 24 hours before farrowing relaxin concentrations **increase** significantly.
- In cows/buffaloes – role of relaxin is not documented



# Next Class

## Stages of Parturition