

# ONSET AND PHYSIOLOGY OF LABOR

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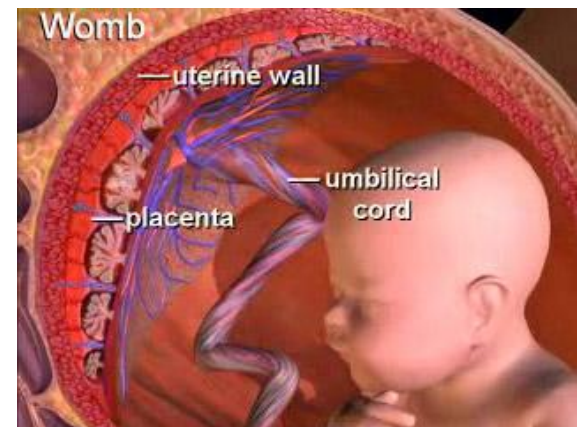
# Parturition

## □ Definition

- ▣ Uterine contractions that lead to expulsion of the fetus to extrauterine environment
- ▣ Towards the end of pregnancy the uterus become progressively more excitable and develops strong rhythmic contractions that lead to expulsion of the fetus.

# Parturition

- Uterus is spontaneously active.
- Spontaneous depolarization of pacemaker cells.
- Gap junctions spread depolarization
- Exact trigger is unknown
  - ▣ Hormonal changes
  - ▣ Mechanical changes



# Hormonal changes

- Estrogen & Progesterone
  - ▣ Progesterone inhibit uterine contractility
  - ▣ Estrogen stimulate uterine contractility
- From 7<sup>th</sup> month till term
  - ▣ Progesterone secretion remain constant
  - ▣ Estrogen secretion continuously increase
  - ▣ Increase estrogen/progesterone ratio

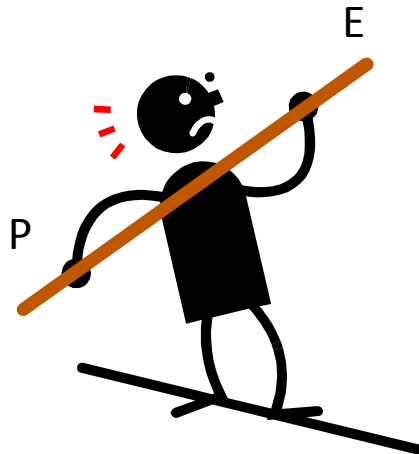
# Hormonal changes

## □ Progesteron

- ▼ GAP junctions
- ▼ Oxytocin receptor
- ▼ prostaglandins.
- ▲ resting mem. Potential

## □ Estrogen

- ▲ GAP junctions with onset of labour.
- ▲ Oxytocin receptors.
- ▲ Prostaglandins



# Hormonal changes

## □ Oxytocin

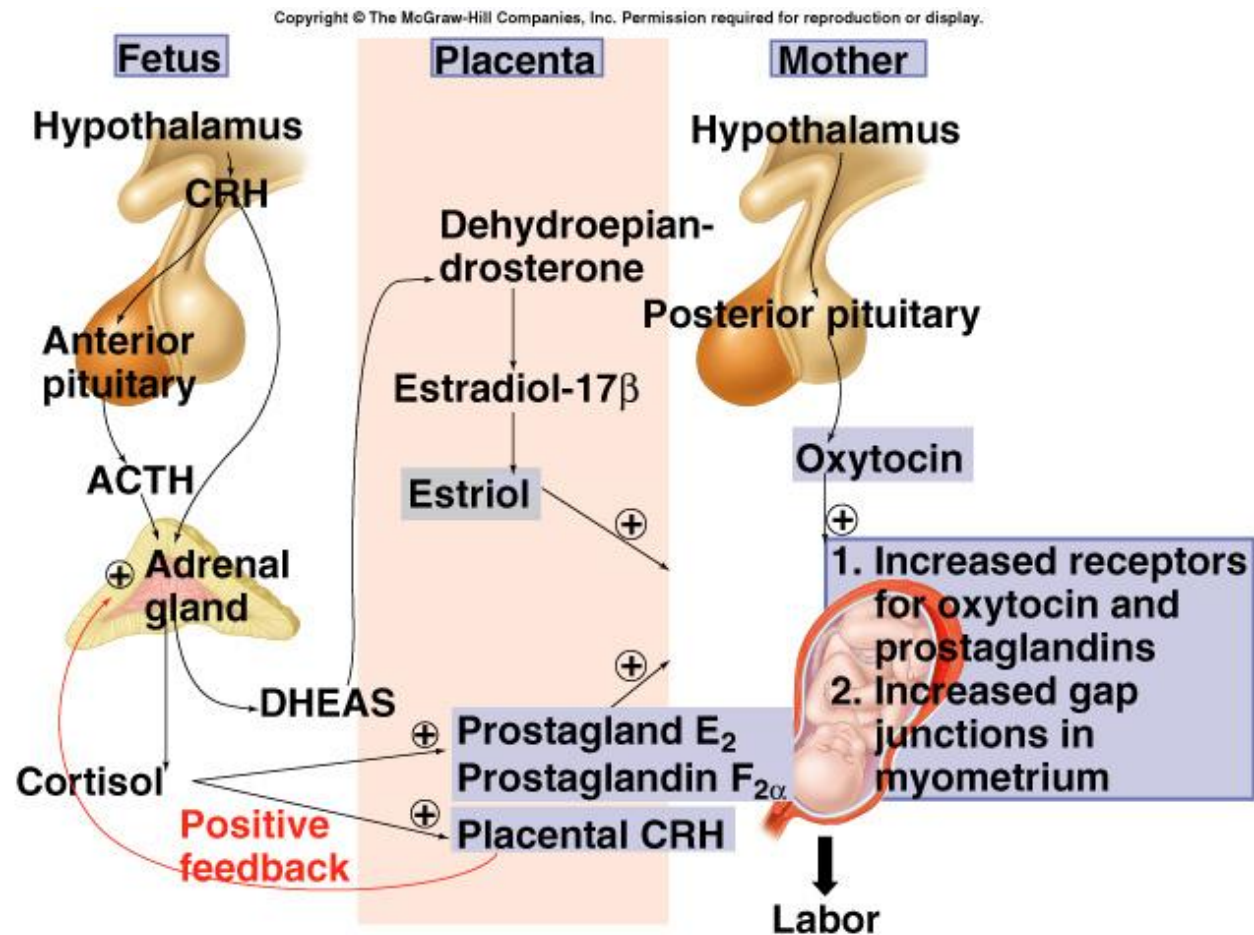
- Dramatic ▲ of oxytocin receptors (200 folds)
  - gradual transition from passive relaxed to active excitatory muscle (↑responsiveness).
- Increase in Oxytocin secretion at labor
- Oxytocin increase uterine contractions by
  - Directly on its receptors
  - Indirectly by stimulating prostaglandin production

# Hormonal changes

## □ Prostaglandins

- ▣ Central role in initiation & progression of human labour
- ▣ Locally produced (intrauterine)
- ▣ Oxytocin and cytokines stimulate its production
- ▣ Prostaglandin stimulate uterine contractions by:
  - Direct effect:
    - Through their own receptors
    - Upregulation of myometrial gap junctions
  - Indirect effect:
    - upregulation of oxytocin receptors

# Parturition

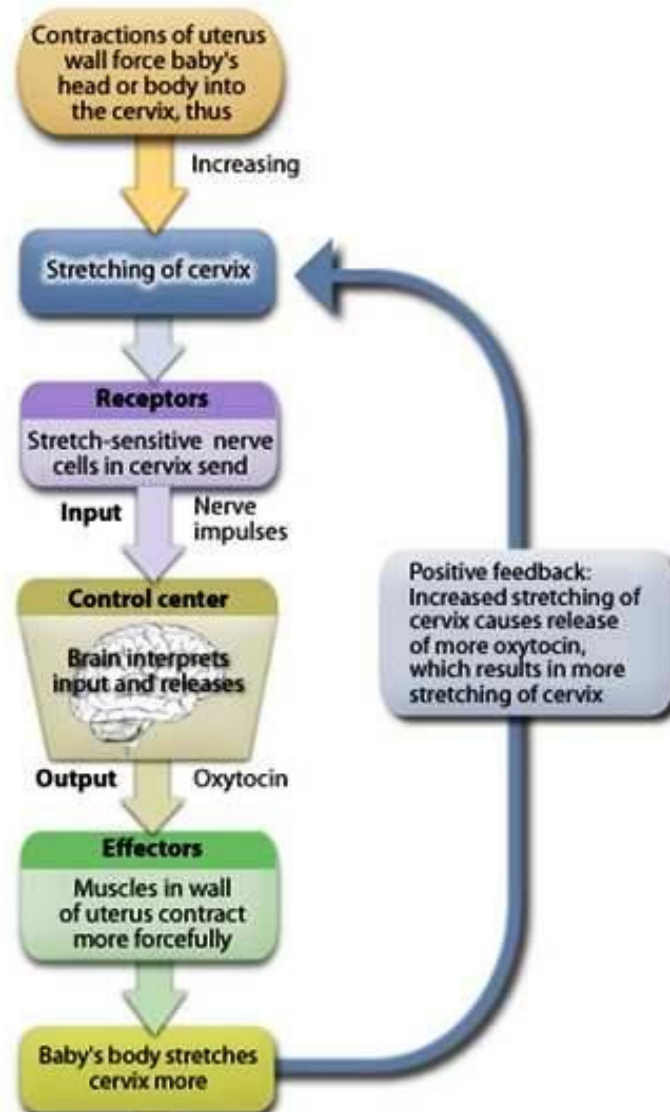




# Mechanical changes

- Stretch of the uterine muscle
  - ▣ Increases contractility
    - Fetal movements
    - Multiple pregnancy
- Stretch of the cervix
  - ▣ Increases contractility (reflex)
    - Membrane sweeping & rupture
    - Fetal head
      - Positive feedback mechanism

# Positive feedback mechanism

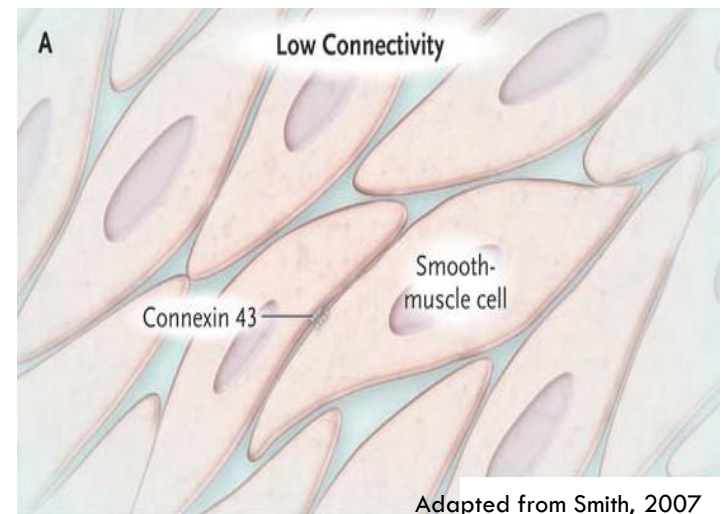


# Phases of parturition

- Phase 0
  - ▣ Pregnancy: uterus is relaxed (quiescent)
- Phase 1
  - ▣ Activation
- Phase 2
  - ▣ Stimulation: stage 1 & stage 2
- Phase 3 = stage 3
  - ▣ Delivery of the placenta and uterine involution

# Phases of parturition

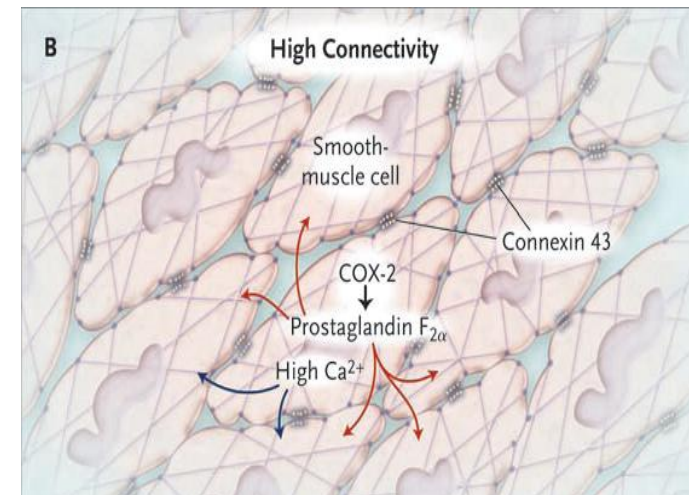
- Phase 0 (pregnancy)
  - ▣ Increase in cAMP level
  - ▣ Increase in production of
    - Prostacyclin ( $\text{PGI}_2$ ) cause uterine relaxation
    - Nitric oxide (NO) cause uterine relaxation



# Phases of parturition

## □ Phase 1 (activation)

- Occurs in third trimester
- Promote a switch from quiescent to active uterus
- Increase excitability & responsiveness to stimulators by
  - Increase expression of gap junctions
  - Increase G protein-coupled receptors
    - Oxytocin receptors
    - Increase PGF receptors



# Phases of parturition

## □ **Phase 2 (stimulation)**

- Occurs in last 2-3 gestational weeks
- Increase in synthesis of
  - Cytokines
  - Prostaglandins
  - Oxytocin
- Includes 2 stages:
  - Stage 1
  - Stage 2

# Phases of parturition

- **Phase 3 (uterine involution)**
  - ▣ Pulsatile release of oxytocin
  - ▣ Delivery of the placenta
  - ▣ Involution of the uterus
    - Occurs in 4-5 weeks after delivery
    - Lactation helps in complete involution

# Mechanism of parturition

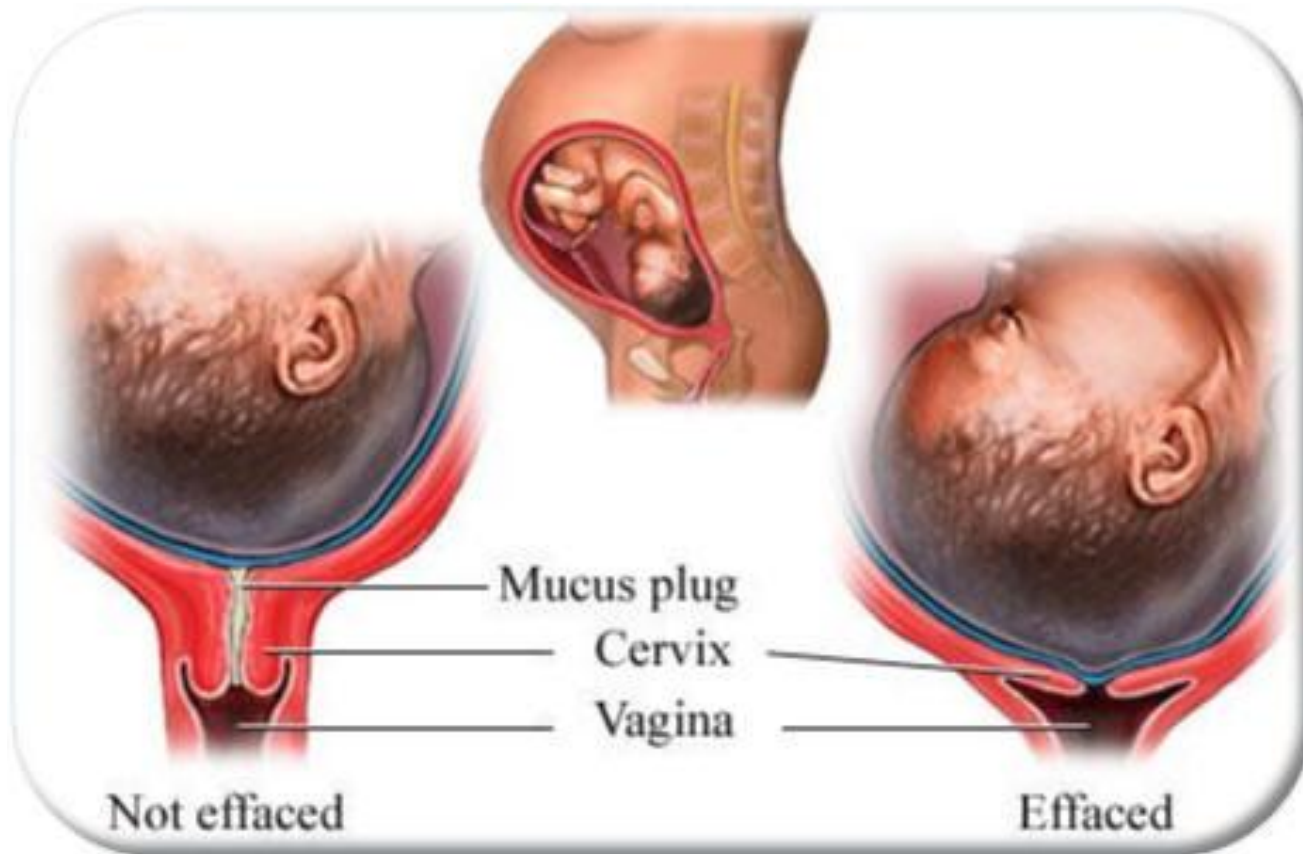
- Contractions start at the fundus and spreads to the lower segment
- The intensity of contractions is strong at the fundus but weak at the lower segment
- In early stages 1 contraction/ 30 minuts
- As labor progress 1 contraction/ 1-3 minutes
- Abdominal wall muscles contract
- Rhythmical contractions allows blood flow



# Onset of labor

- During pregnancy
  - ▣ Periodic episodes of weak and slow rhythmical uterine contractions (Braxton Hicks) 2<sup>nd</sup> trimester
- Towards end of pregnancy
  - ▣ Uterine contractions become progressively stronger
  - ▣ Suddenly uterine contractions become very strong leading to:
    - cervical effacement and dilatation

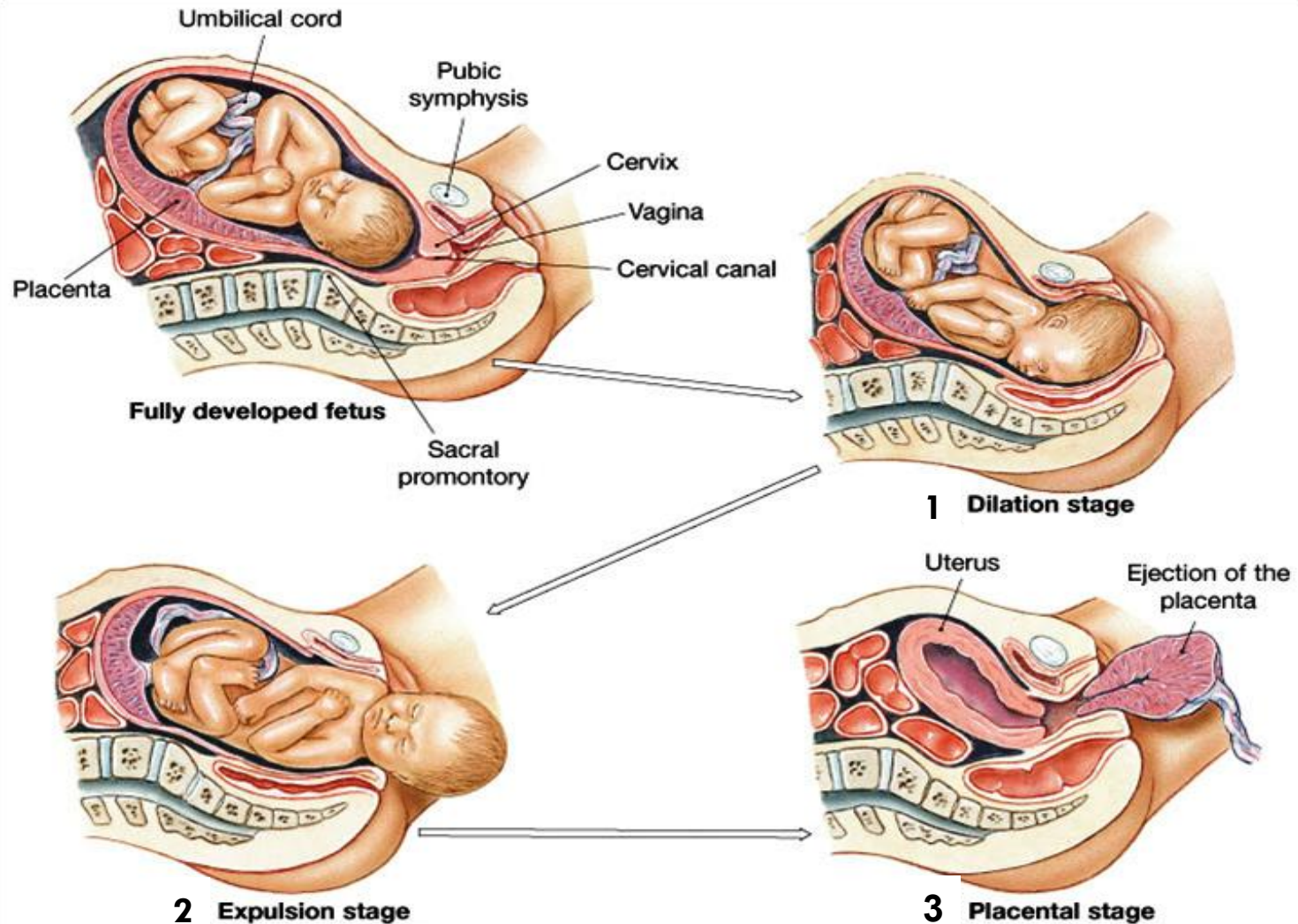
# Cervical effacement and dilatation



# Stages of labor

- Stage 1:
  - ▣ Commences with the onset of labour and terminates when the cervix has reached full dilatation and membranes ruptured (lasts 8-24 hours).
- Stage2:
  - ▣ Stage of expulsion begins at full cervical dilatation and ends with expulsion of the fetus (lasts 1-30 minutes).
- stage 3:
  - ▣ Begins with the delivery of the child and ends with the expulsion of the placenta.

# Stages of labor



# New arrival

