REBRODUCTIVE BLOCK

Physiology Team

LECTURE 7

PHYSIOLOGY OF LABOR

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Believe you can & you're halfway there !
Theodore Roosevelt

OBJECTIVES

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- Define parturition (labour, labor)
- **Recognize the factors triggering parturition**
- **Describe the hormonal changes that occur before and during parturition**
- **Understand the phases of parturition**
- Understand the clinical stages of labour

MIND MAP

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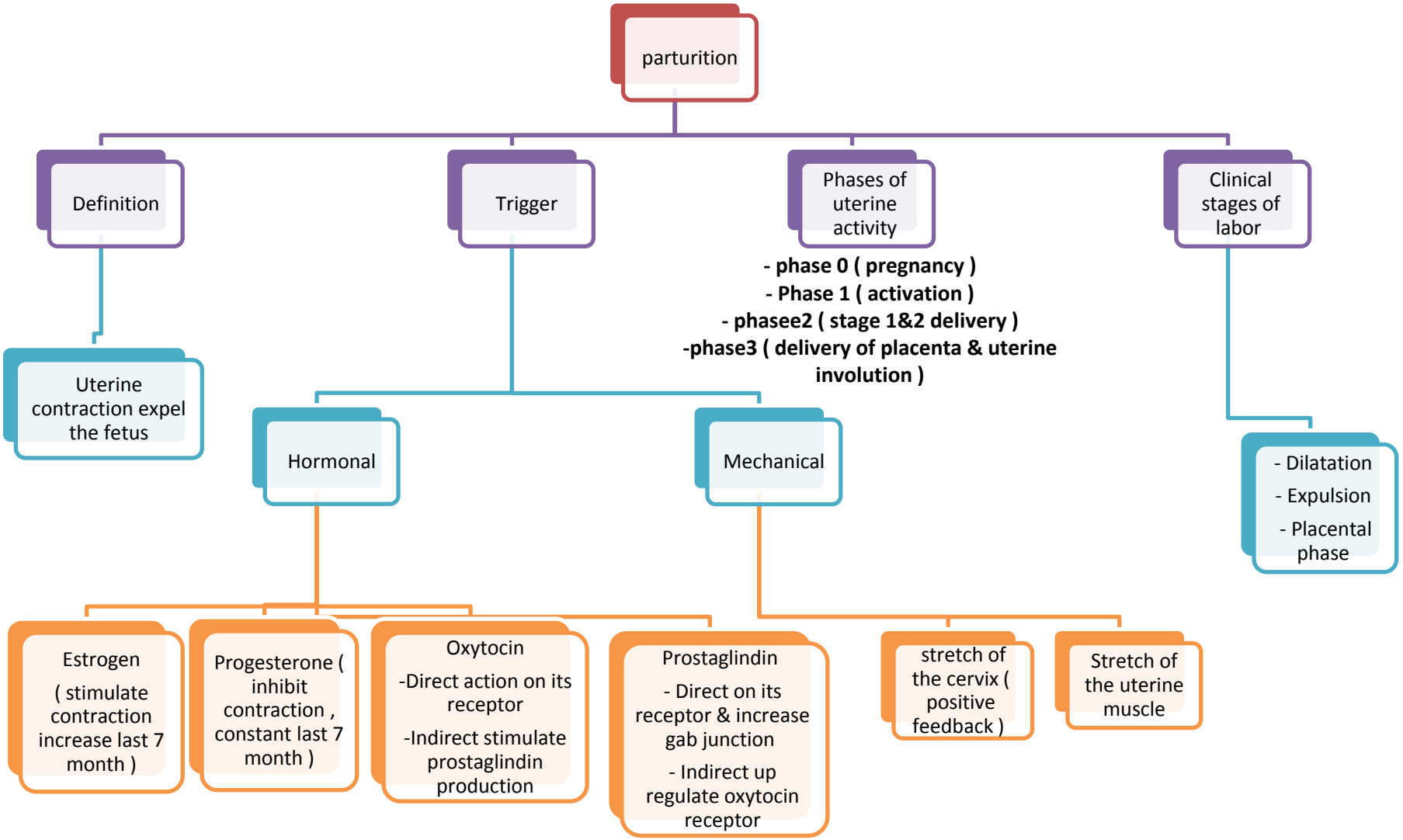

Parturition

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Definition:

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

- Uterus is spontaneously active " the control of uterine smooth muscles is involuntary, instead it has a myougenic action. This mean its action potential originates from inside the cells and the function of the autonomic nervous supply of uterus is just to regulate its contraction.
- Spontaneous depolarization of pacemaker cells.
- Gap junctions spread depolarization from one cell to another and all of them will work as one unit.

Exact trigger is unknown:

-Hormonal changes
-Mechanical changes

Progesterone and Estrogen:

- Progesterone inhibits uterine contractility
- Estrogen stimulates uterine contractility

During pregnancy, there is a balanced ratio between there level.

From 7tH month tell term: " the third trimester"

- Progesterone secretion remains constant or decreases slightly.
- Estrogen secretion increases continuously.
- Increase estrogen/progesterone ratio

*effects of progesterone and estrogen:

Progesterone	Estrogen
decrease Gap junction.	**increase** Gap junction with onset of labor.
Decrease Oxytocin receptors	**Increase** Oxytocin receptors.
Decrease prostaglandins	**Increase** Prostaglandins.
Increase Resting mem. Potential.	To enhance uterine contraction

Hormonal Changes:

Important

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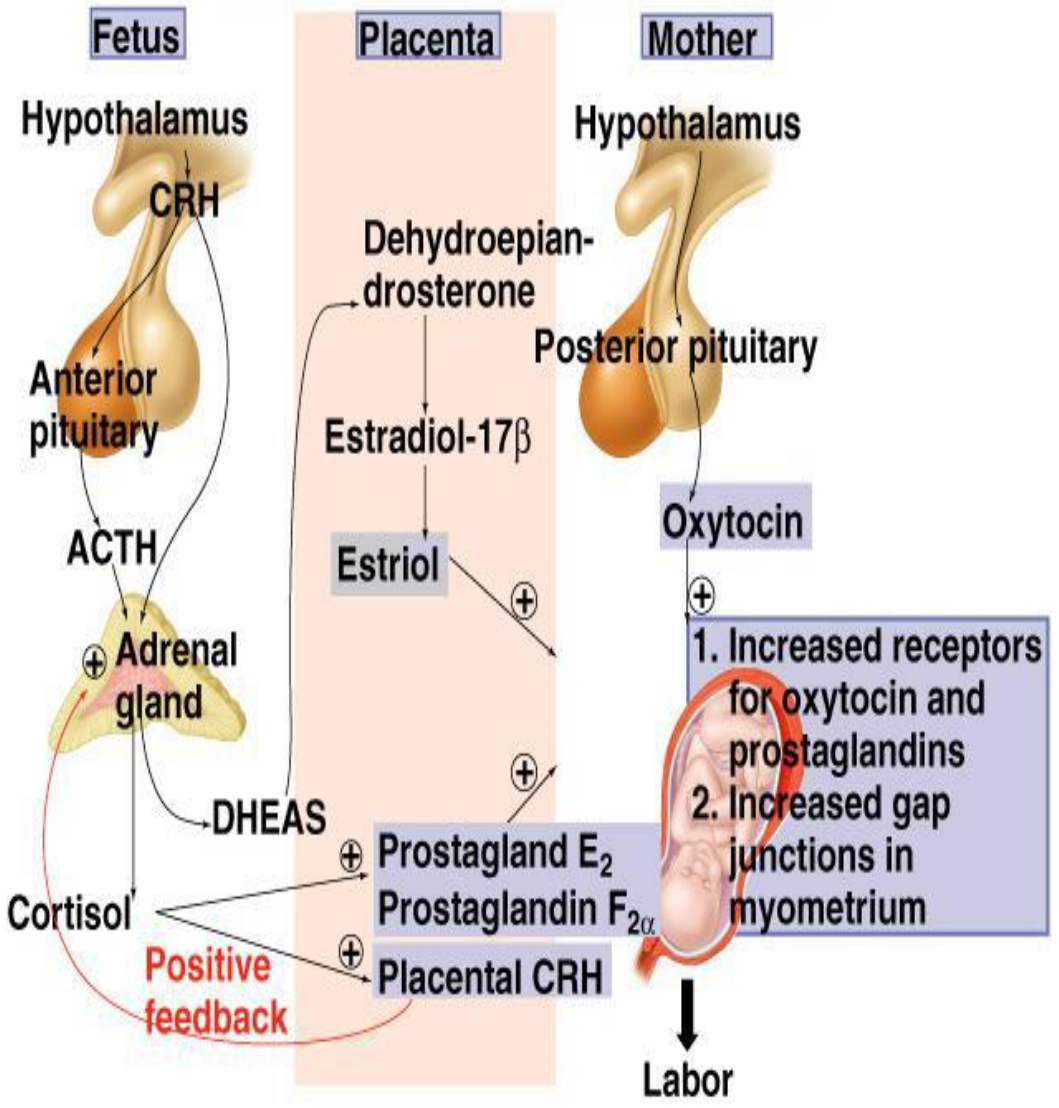
Oxytocin	Prostaglandins
At end of pregnancy, Dramatic ▲**of oxytocin receptors** (200 folds) leading to: 1. gradual transition from passive relaxed to active excitatory muscle (**↑responsiveness**). **2. Increase in Oxytocin secretion at labor** Oxytocin **increase uterine contractions by:** **1. Directly** on its receptors **2. Indirectly** by stimulating prostaglandin production • decreased level of oxytocin will lead to more prolonged labor. **Triggers of oxytocin release at the end of third trimester " last 2 w of pregnancy" include:** **1. cervical dilation and the pain caused by it.** 2. some of the hormonal effects on the Smooth muscles making them more excitable.	• Central role in initiation & progression of human labour • Locally produced (intrauterine) • Oxytocin and cytokines stimulate its production **Prostaglandin stimulates uterine contractions by:** **1. Direct effect:** -Through their own receptors -Upregulation of myometrial gap junctions. **2. Indirect effect:** -Upregulation of oxytocin receptors so there is a positive feedback between prostaglandins and oxytocin.

Parturition:

- Both the mother and her fetus have a role in parturition:
- The role of the mother has been explained in previous slides.
- The hypothalamus of full term fetus will start to secrete CRH which will stimulate the AP gland to release ACTH which in turn act on the fetus adrenal gland leading to the production of cortisol and DHEAS.
- The Cortisol has a positive feed back on prostaglandins receptors and production of placental CRH.
- So the fetus adrenal cortex can be activated by 2 hormones: 1- hypothalamic CRH. 2- placental CRH secreted in respone to the release of cortisole "positive feed back mechanism"
- The DHEAS will be converted in the placenta into estrogen.



Mechanical Changes:

Stretch of the Uterine Muscle:

- **Increases contractility.**
- **This stretched uterine muscles could be caused by:**
  - -Fetal movements.
  - -Multiple pregnancy.

This explains why the multi pregnant ladies have early delivery of there second child " at the first week of last month" as there uterus is more stretched than it was in the first pregnancy.

Stretch of the Cervix is more important:

- Increases contractility **(reflex)** explanation will be in next slide ^_^

- **Causes of cervical dilation:**

✓ **Membrane sweeping & rupture** performed by doctors if the lady complete the full term of pregnancy and never has labor contraction

✓ **Fetal head**

- **Positive feedback mechanism**

Positive Feedback Mechanism between cervix and uterus during labor:

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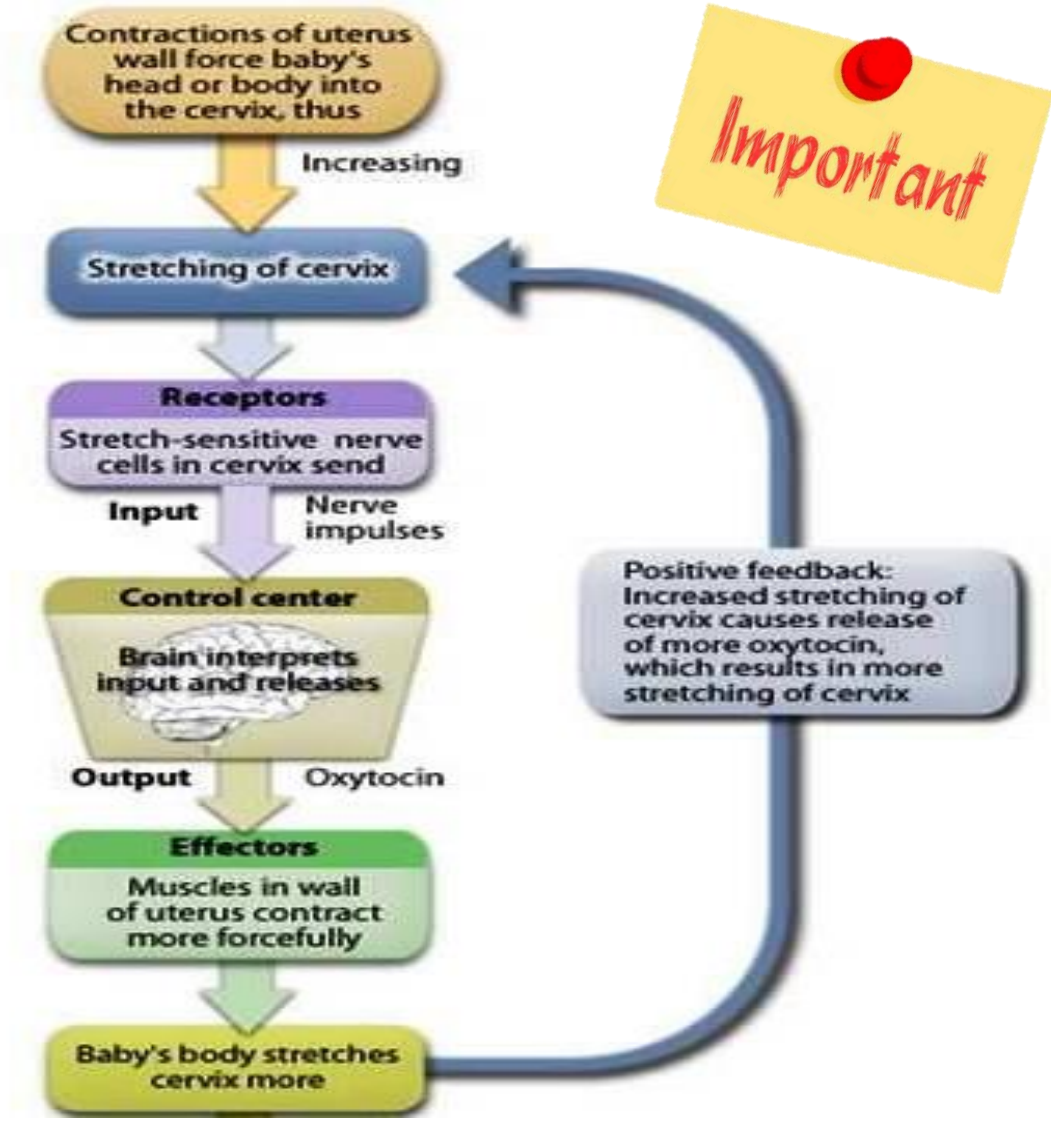
Ferguson Reflex:

- Cervix is very sensitive and any dilation will cause pain.
- Menstrual pain is mainly due to cervical dilation caused by the flow of blood through it.
- At delivery, Pain caused by cervical dilation will lead to reflex uterine contraction which in turn cause the cervix to be more dilated. so this will induce more pain and repetition of this reflex.

* **it is very very very important to understand the diagram**



Initiation of labor:

Cephalic presentation "head first" is considered normal and occurs in about 97% of deliveries

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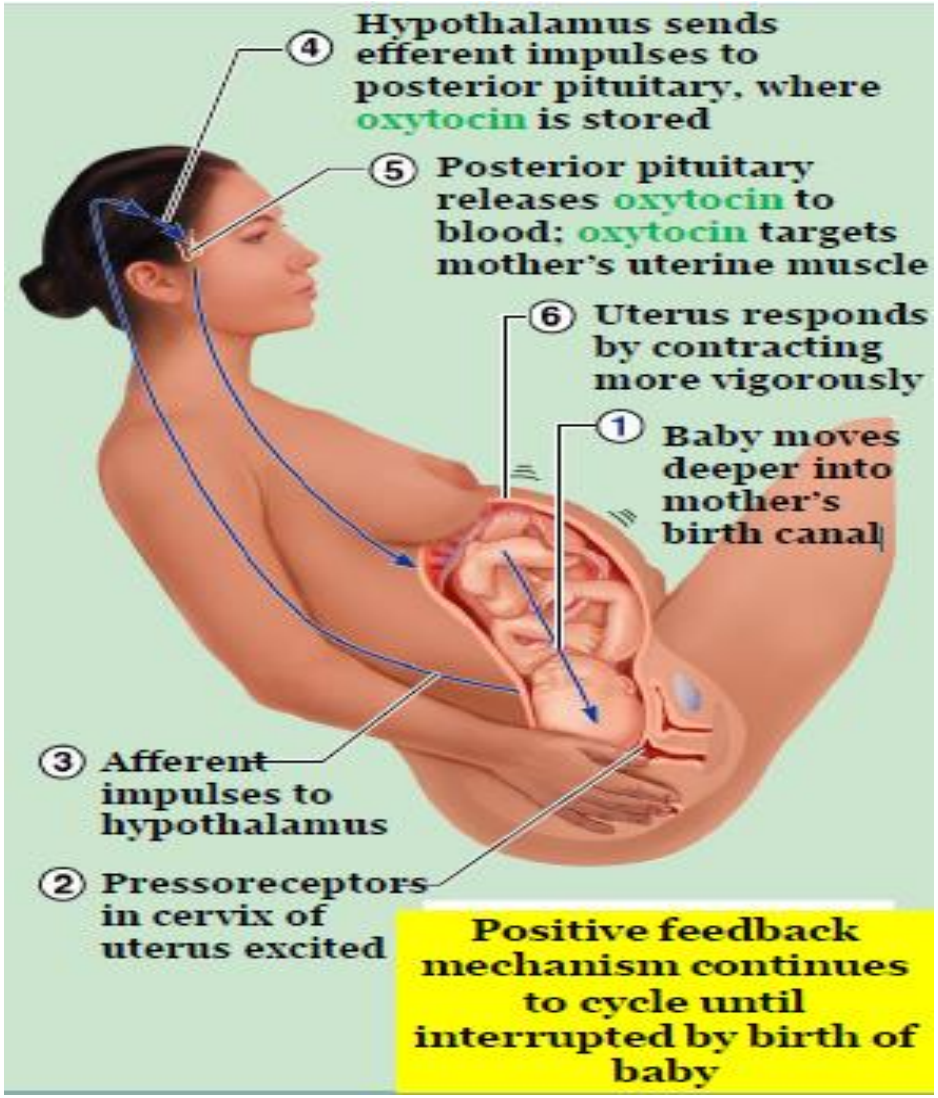
- 1- Engagement is when the parietal bones of the baby's head dips below the pelvic brim. Typically, engagement occurs at 38 weeks gestation for a first time mother. For women who have already carried a baby through pregnancy, the time of engagement may wait until labor contractions bring descent of the baby into the pelvis .
- For your external information and if you want to know aboutbaby's movement in birth canal click on ^_^
- http://www.youtube.com/watch?v=66jMER1Savg
- http://spinningbabies.com/about-spinning-babies/390-how-do-babies-rotate?start=1
- the true labor contractions are rythmatic, continues and progressive contraction يعني تجيها انقباضات كل نص ساعة بعدين كل ربع ساعة وهكذا وفي كل مرة تزيد شدتها و مدتها, other wise it is false labor pain " known as Braxton Hicks contraction"



Phases of uterine activity

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Phase 0 (pregnancy)

•Increase in cAMP level

Increase in production of :

- Prostacyclin (PGI2) causes uterine relaxation
- Nitric oxide (NO) causes uterine relaxation

Note : in this phase there is less connexine (a gap Junction protein) low connectivity between cells

Phase 1 (activation)

- Occurs in third trimester &Promote a switch from quiescent to active uterus

Increase excitability & responsiveness to stimulators by :

1.Increase expression of gap junctions (allow faster transmition of action potential &to contract as a one unite)

2.Increase G protein-coupled receptors :

-Oxytocin receptors

-Increase PGF receptors

Phase 2 (stimulation)

- Occurs in last 2-3 gestational weeks
- Increase in synthesis of uterotonins (A utero**tonic** is an agent that induce contraction or greater **tonicity** of the uterus.)
  - Cytokines
  - Prostaglandins
  - Oxytocin

It Includs 2 stages:

✓Stage 1

✓Stage 2 (delivery)

Phase 3 (uterine involution)

- Pulsatile release of oxytocin
- Delivery of the placenta
- Involution of the uterus (returen back to original size)
- Occurs in 4-5 weeks after delivery
- Lactation helps in complete involution(suckling cause increase oxytocin which contract both myoepithilial cells of the breast and the uterus)

Clinical stages of labor

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Mechanism of parturition

- Contractions start at the fundus and spread to the lower segment
- The intensity of contractions is strong at the fundus but weak at the lower segment(the bulk of the muscle more in the fundus)

In early stages:

1 contraction/ 30 minuets

As labour progress:

1 contraction/ 1-3 minutes

- Abdominal wall muscles contract
- Rhythmical contractions allow blood flow
- (sustain contraction block blood flow causing ischemia> that's why contraction is painful because it is sort of ischemia)

Onset of labor

During pregnancy

- Periodic episodes of weak and slow rhythmical uterine contractions (Braxton Hicks)2nd trimester
- (**false labor**, are sporadic uterine contractions but it is less frequent and less intese than true labor)

Towards the end of pregnancy

- Uterine contractions become progressively stronger
-
- Suddenly uterine contractions become very strong leading to:
- Cervical effacement and dilatation (any contraction without cervical dilatation >> no labor)

Clinical stages of labor

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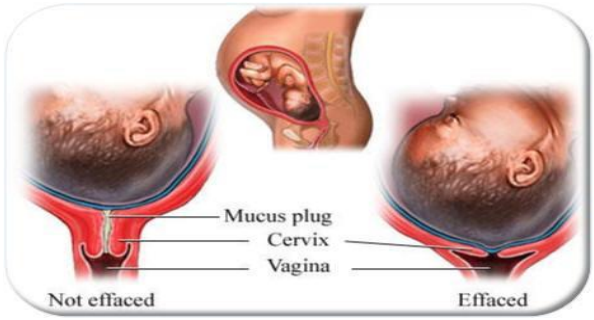
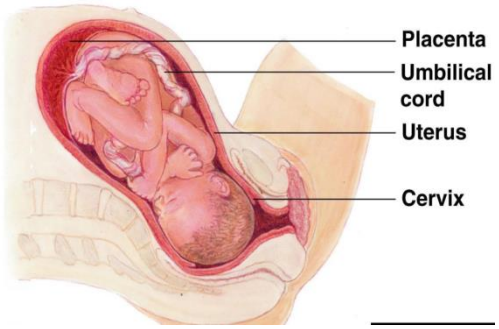
1-Dilation

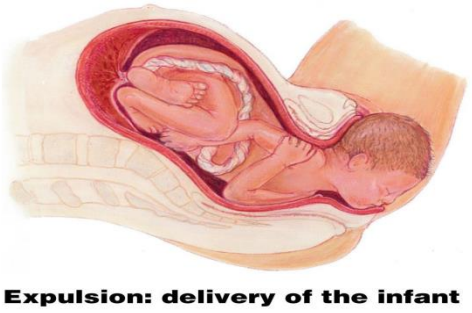
- Cervix becomes dilated
- Full dilation is 10 cm (one finger= 2cm)
- Uterine contractions begin and increase
- Cervix softens and effaces (thins)
- The amnion ruptures (“breaking the water”) if labor delayed doctor might rupture the membrane to enhance labor
- Longest stage at 6–12 hours (But if mother had multiple parturitions it will take shorter time)
- Cervix must be soft and dilated during labor , but vagina made up of muscle and elastic fiber and can be easily dilated by fetus head
- In late pregnancy fetus head become engaged in the pelvis
- Effacement of the cervix refer to thinning of the cervix & shortens, with, pulling up into the uterus and becoming part of the lower uterine wall.

2-Expulsion

- Infant passes through the cervix and vagina
- Can lasts as long as 2 hours, but typically is 50 minutes in the first birth and 20 minutes in subsequent births
- Normal delivery is head first (vertex position)=cephalic presentation
- Breech presentation is buttocks-first Stages of Labor (less common , harder delivery)



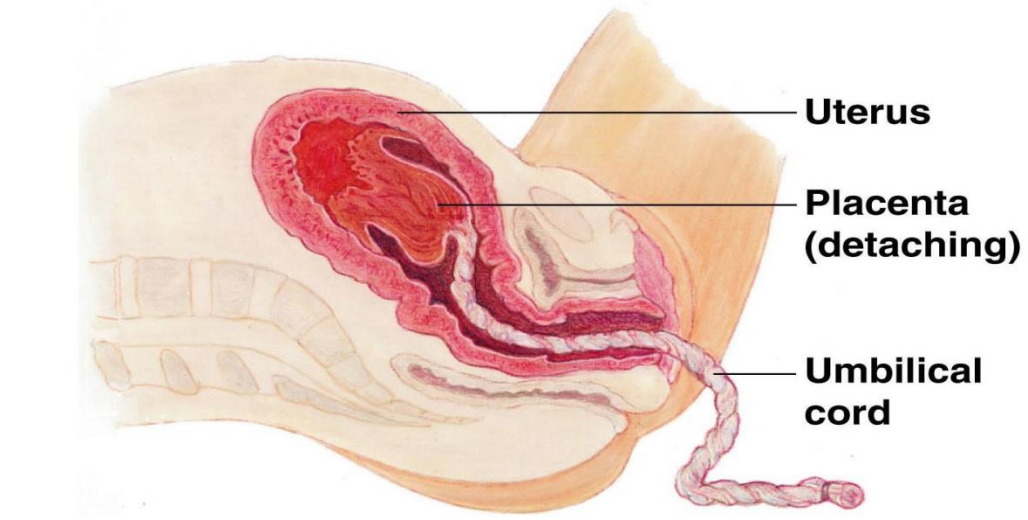




② Expulsion: delivery of the infant

3-Placental stage

- Delivery of the placenta
- Usually accomplished within 15 minutes after birth of infant
- After birth—placenta and attached fetal membranes are delivered
- All placental fragments should be removed to avoid postpartum bleeding (if remnant of placenta remain inside, uterine contraction sustain)



③ Delivery of the placenta

Prturition is the uterine contractions that lead to expulsion of the fetus to extrauterine environment.

Exact trigger is unknown and it could be:

1 -*Hormonal changes* **Increase estrogen/progesterone ratio**

Oxytocin increase uterine contractions by:

- **Directly** on its receptors
- **Indirectly** by stimulating prostaglandin production

Prostaglandin stimulates uterine contractions by:

Direct effect: -Through their own receptors -Upregulation of myometrial gap junctions

Indirect effect: -Upregulation of oxytocin receptors

2 -Mechanical changes -Stretch of uterine muscles -Stretch of the cervix.

phases of uterine activity: phase 0 (pregnancy) - phase 1 (activation) - phase 2 (stimulation) – phase 3 (uterine involution).

Clinical stages of labor: 1- dilation. 2- expulsion. 3- placental stage.

QUESTIONS

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1. In which phase cAMP will be high :

A) phase0
B) Phase 1
C) Phase 2
D) phase 3

2. Contraction during labor start at :

A) Body of the uterus .
B) cervix
C) fundus.
D) vagina

3. During expulsion of the fetus which of the following not a normal delivery :

A) Cephalic presentation
B) Vertex position
C) Breech presentation

4. Oxytocin increases Uterine contraction indirectly by:

A) prostaglandins.
B) cortisol.

5. At the third trimester, which one of these hormones will be increased:

A) Progesterone.
B) Estrogen.
C) Both Estrogen and progesterone.

1	A
2	C
3	C
4	A
5	b

THE END

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If there are any Problems or Suggestions, Feel free to contact us:

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THANK YOU

IF YOU WANT TO SHARE ANY INFORMATION REGARDING PHYSIOLOGY OR ANY OTHER SUBJECT .. YOU CAN MENTION THIS ACCOUNT

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