

ONSET AND PHYSIOLOGY OF LABOR

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Objectives:

- Definition of labor.
- Factors that trigger the onset of labor.
- Hormonal changes that precedes and accompany labor
- Phases of uterine activity
- Clinical stages of labor.

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.

Small group activity

- Does non pregnant uterus contract?

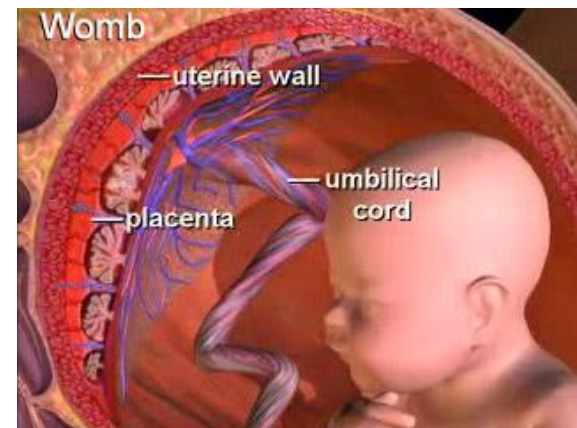
Natural
Solutions
to Cut
the
CRAMPS



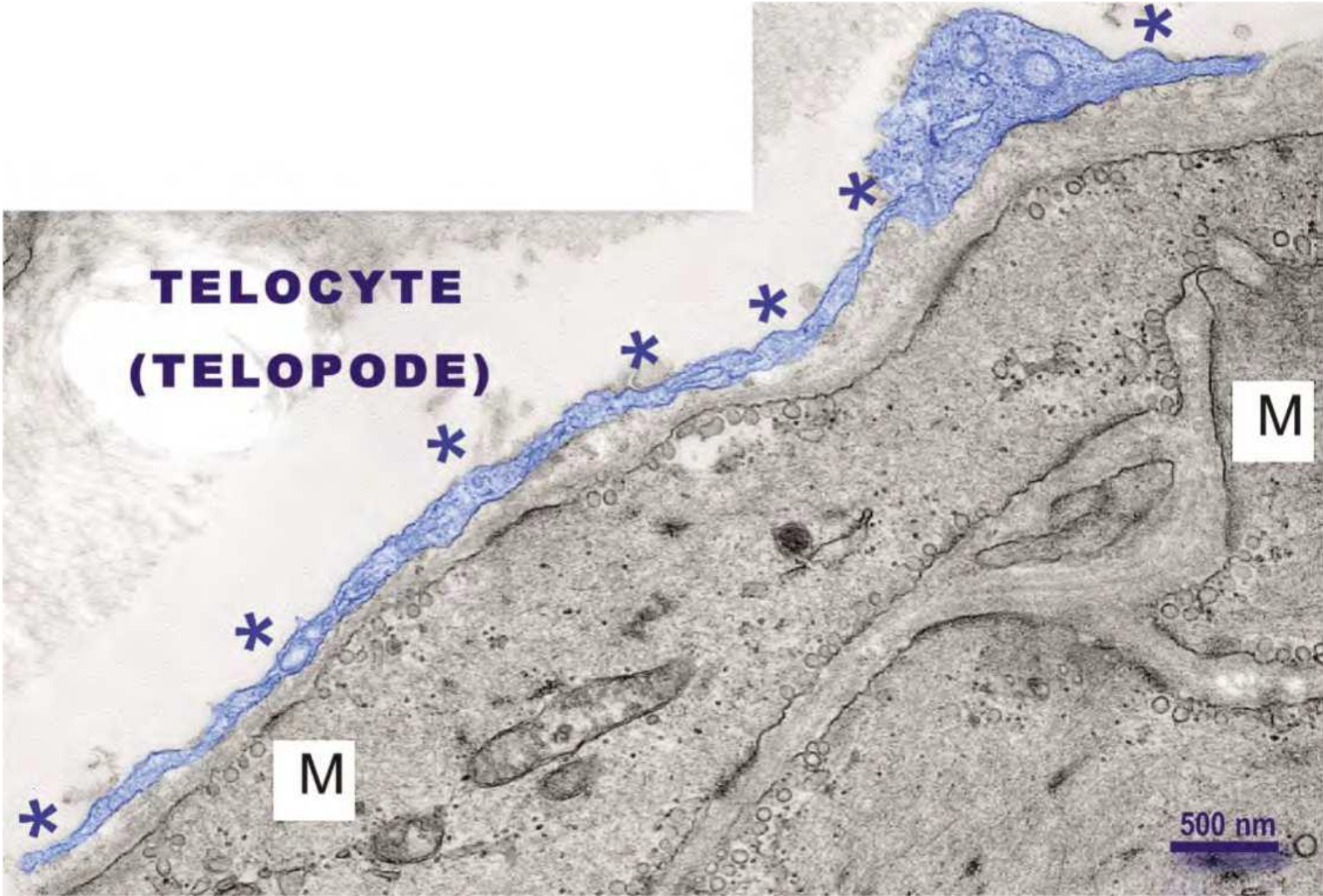
Mary Vance, NC

Parturition

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



Pacemaker cells (Telocytes)



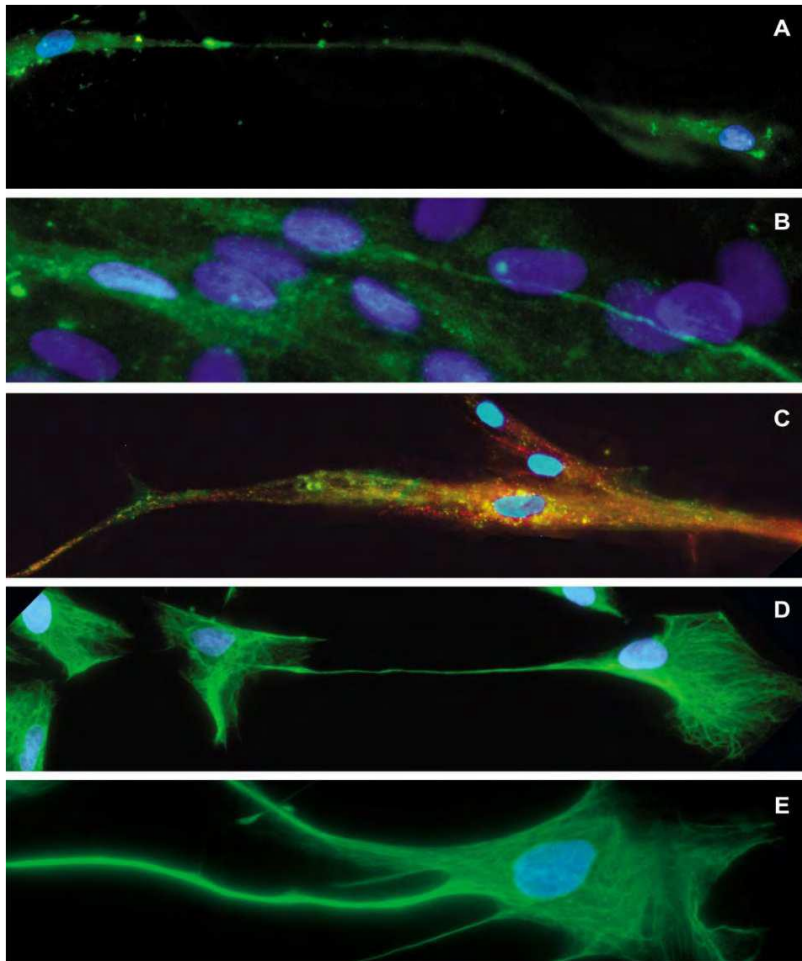


Fig. 17. Human myometrium cells in culture (the 2nd passage): c-kit (green in A, B), c-kit and CD34 (red and green, respectively, in C) and vimentin (green in D, E). Cells which display the morphologic TC feature (long, moniliform processes) express c-kit and contact adjacent cells (A–C). Some cells suggestive of TCs co-express c-kit and CD34 (C). The characteristic cell processes are immunoreactive for vimentin and establish connections with nearby cells (D and E). Original magnification 60x, nuclear counterstaining with Hoechst 33342 (blue). Reproduced, with permission, from Ciontea et al., 2005.

Hormonal changes

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

Hormonal changes

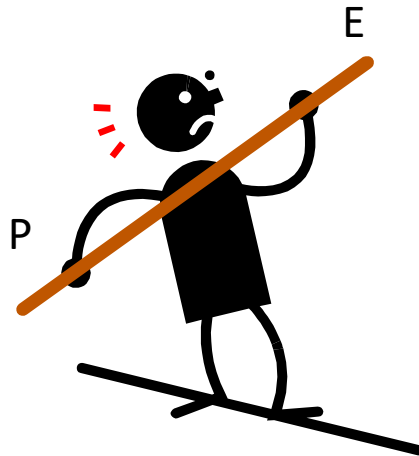
□ Progesteron

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

Potential

□ Estrogen

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



Hormonal changes

□ Oxytocin

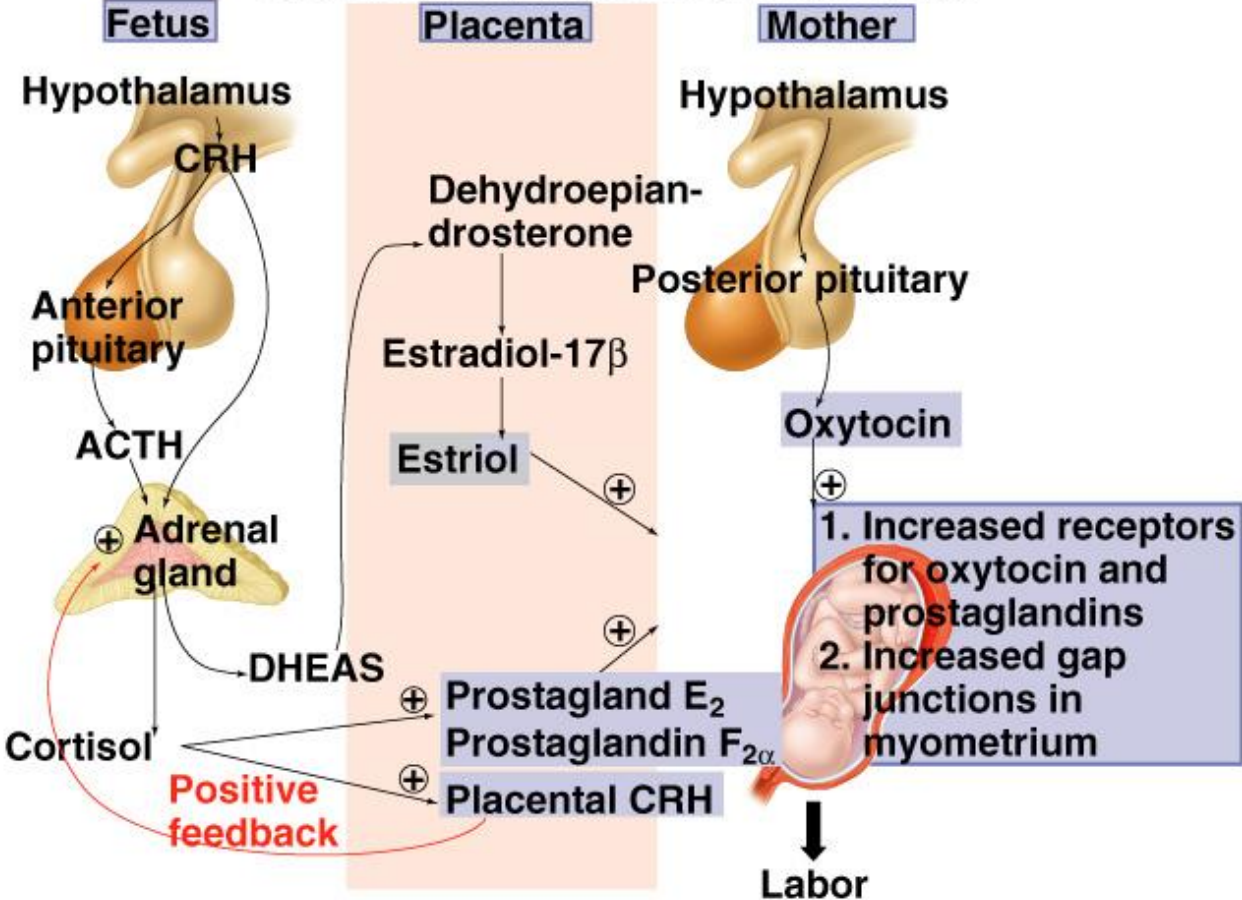
- Dramatic ▲ of oxytocin receptors (200 folds)
 - gradual transition from passive relaxed to active excitatory muscle (↑responsiveness).
- Increase in Oxytocin secretion at labor
- Oxytocin increase uterine contractions by
 - Directly on its receptors
 - Indirectly by stimulating prostaglandin production

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

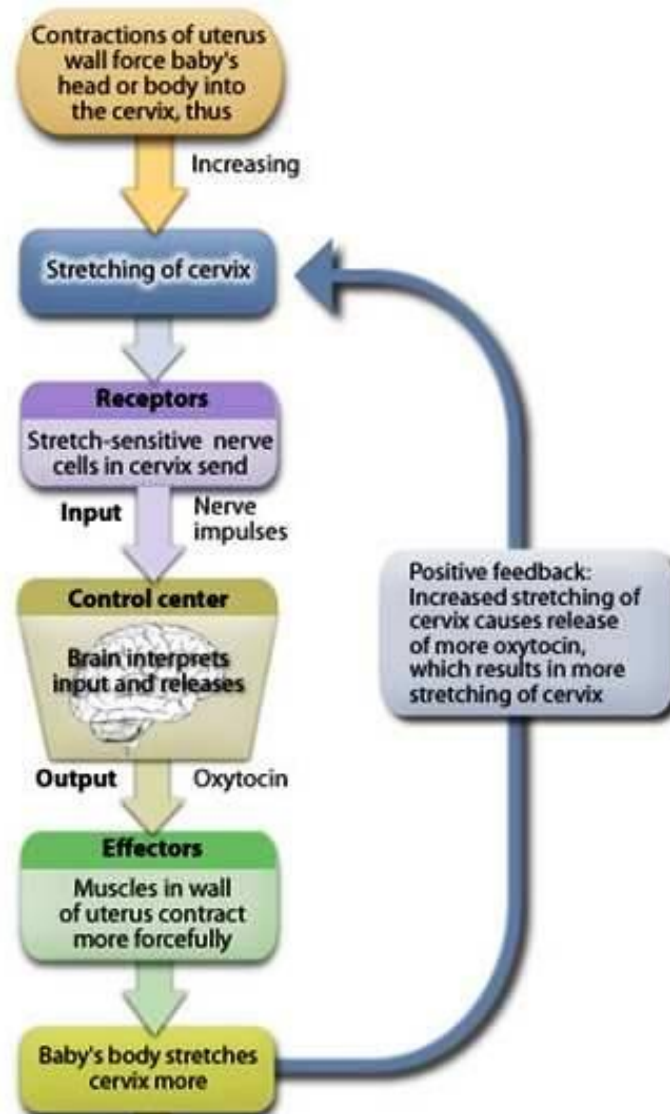
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Mechanical changes

- 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



Initiation of Labor

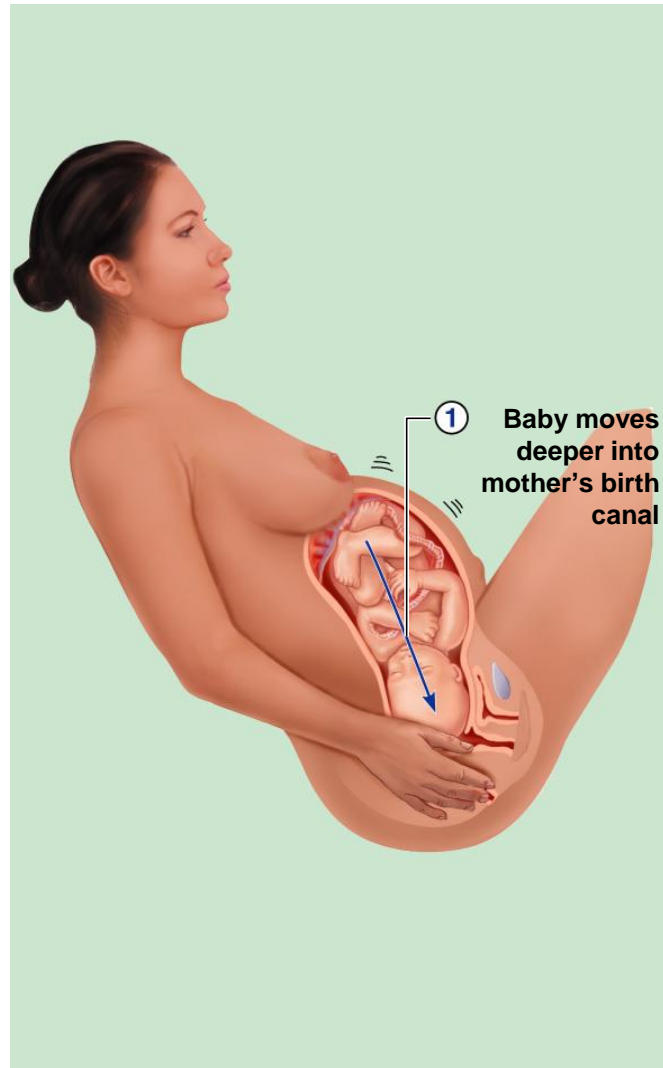


Figure 16.19, step 1

Initiation of Labor

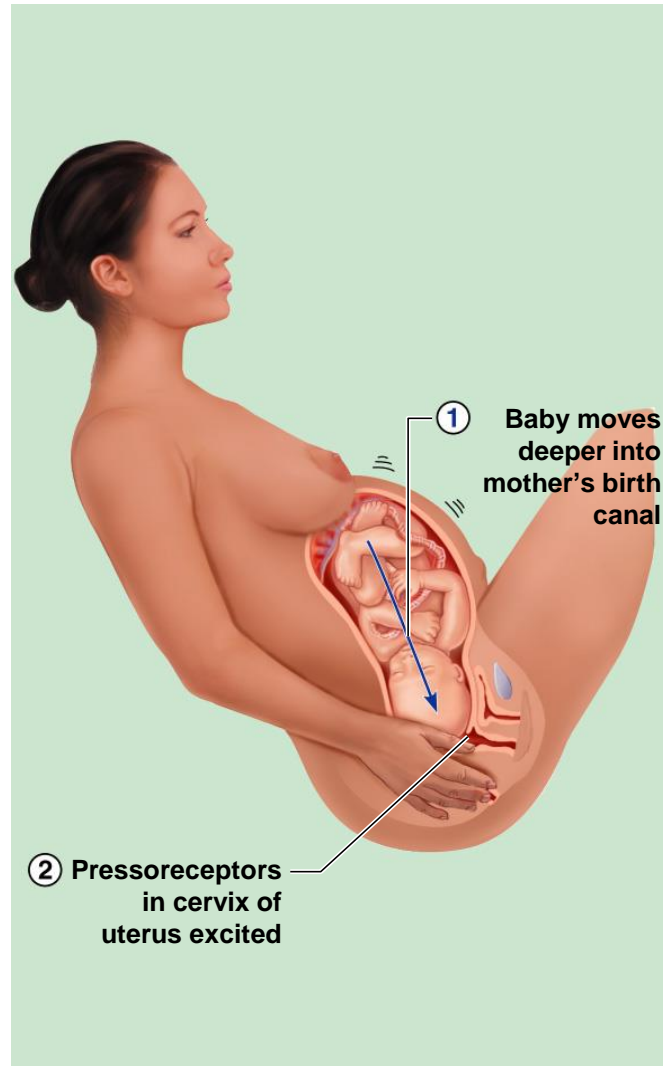


Figure 16.19, step 2

Initiation of Labor

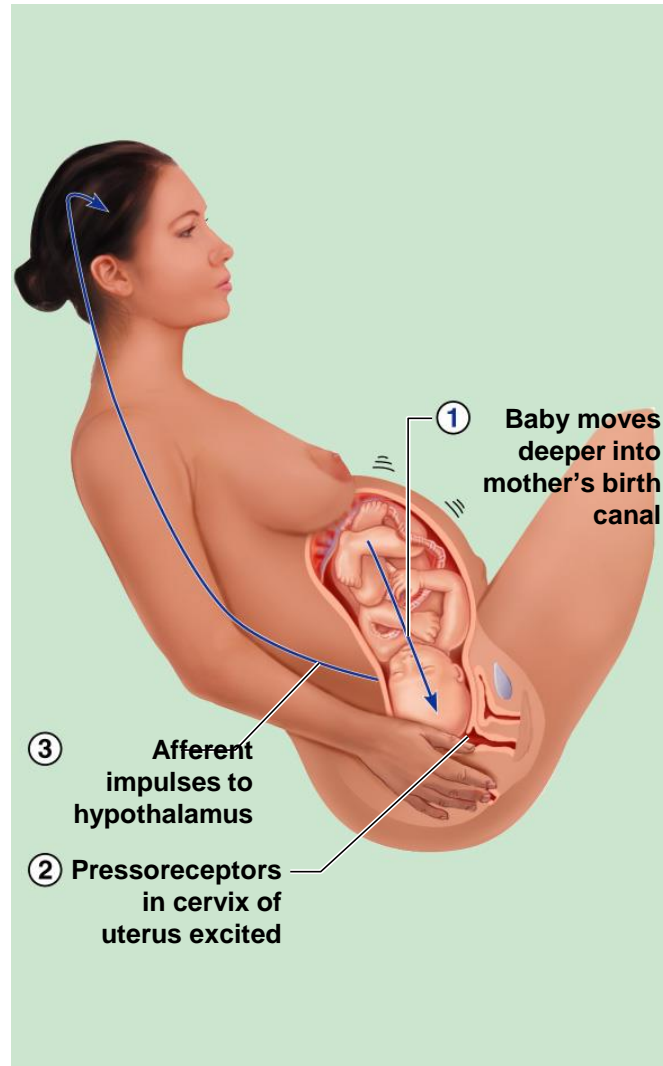


Figure 16.19, step 3

Initiation of Labor

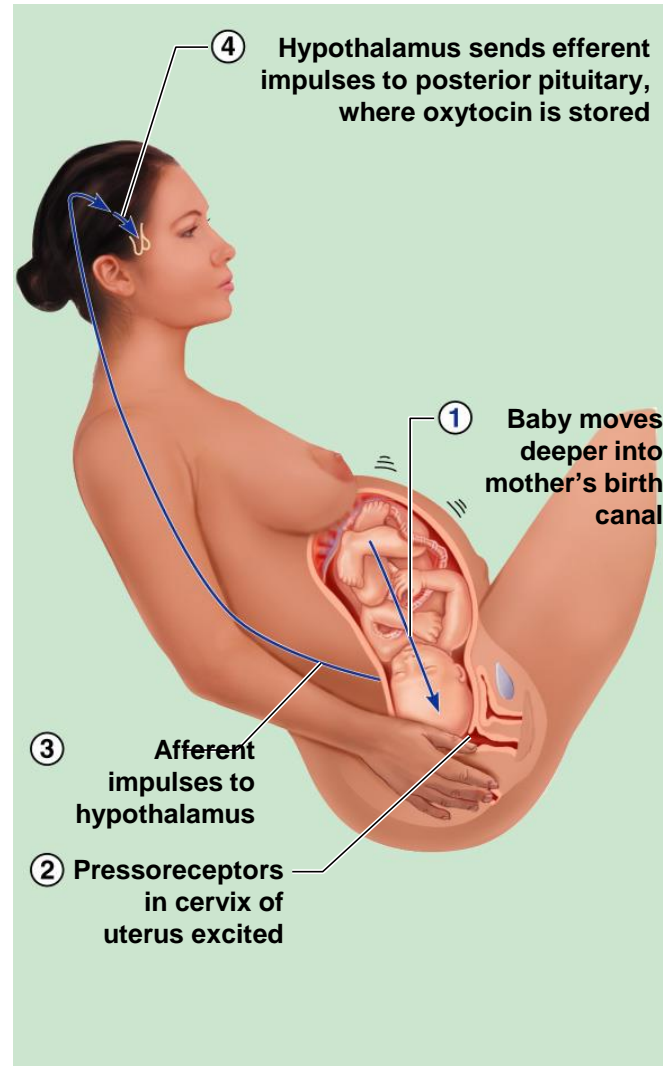


Figure 16.19, step 4

Initiation of Labor

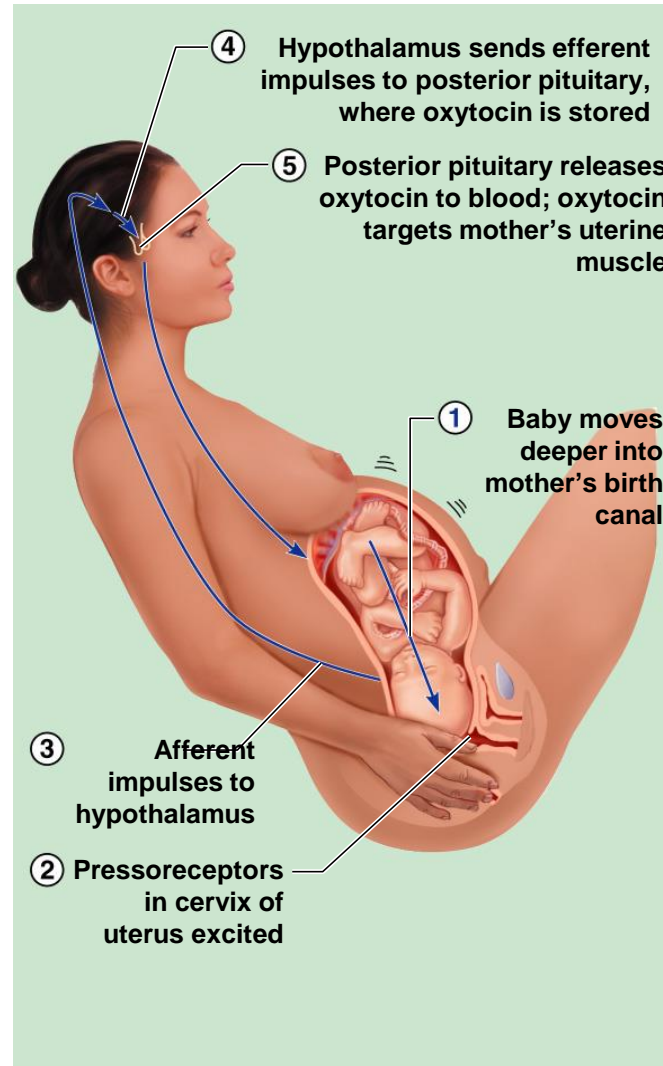


Figure 16.19, step 5

Initiation of Labor

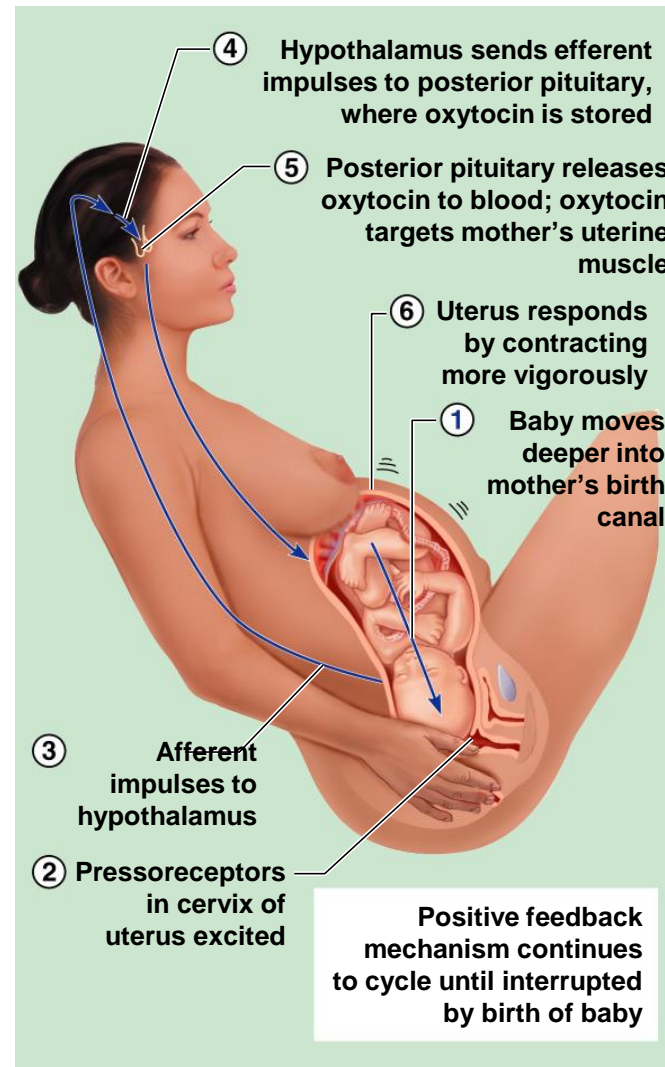


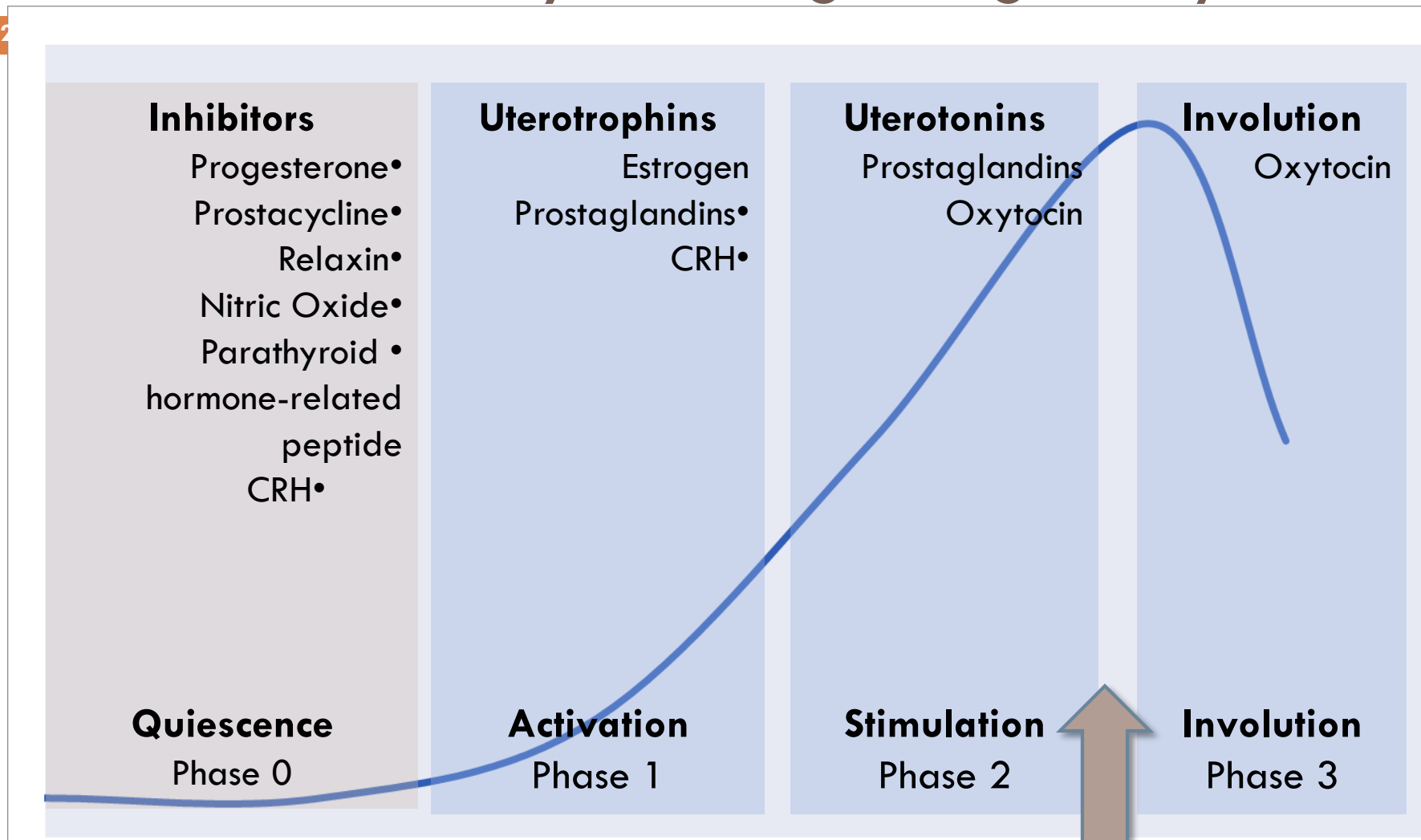
Figure 16.19, step 6



Phases of parturition

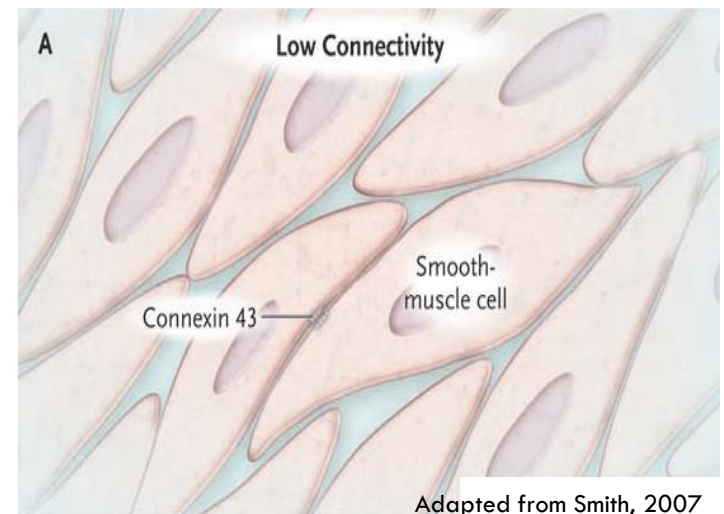
- Phase 0
 - ▣ Pregnancy: uterus is relaxed (quiescent)
- Phase 1
 - ▣ Activation
- Phase 2
 - ▣ Stimulation: stage 1 & stage 2
- Phase 3 = stage 3
 - ▣ Delivery of the placenta and uterine involution

Uterine Activity During Pregnancy



Phases of parturition

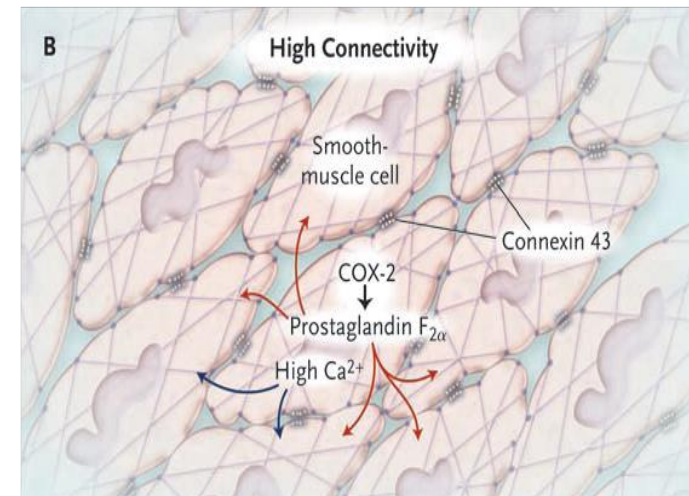
- Phase 0 (pregnancy)
 - ▣ Increase in cAMP level
 - ▣ Increase in production of
 - Prostacyclin (PGI_2) cause uterine relaxation
 - Nitric oxide (NO) cause uterine relaxation



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 uterotonins
 - 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 involusion

Mechanism of parturition

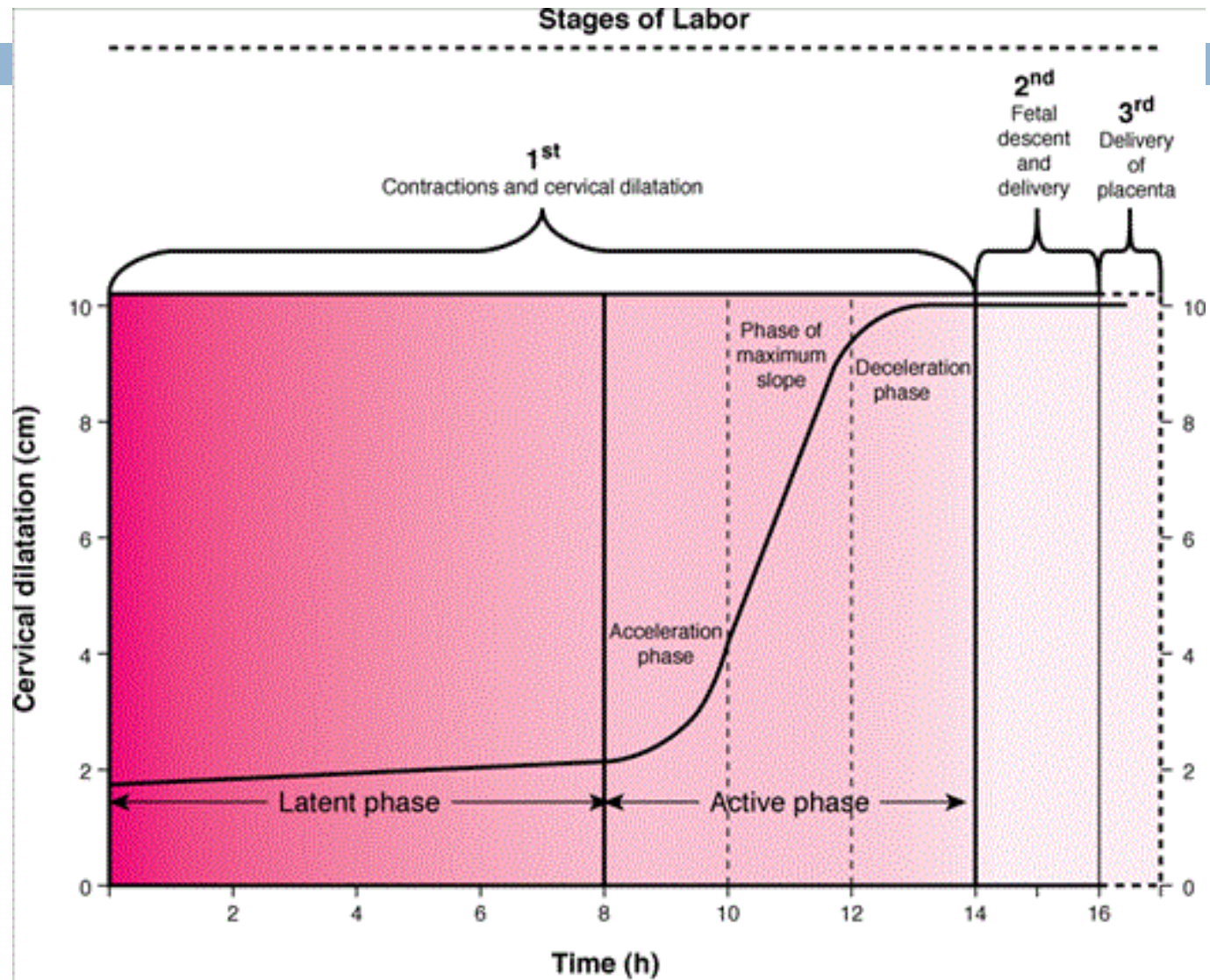
- Contractions start at the fundus and spreads to the lower segment
- The intensity of contractions is strong at the fundus but weak at the lower segment
- In early stages 1 contraction/ 30 minuets
- As labor progress 1 contraction/ 1-3 minutes
- Abdominal wall muscles contract
- Rhythmical contractions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

Onset of labor

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



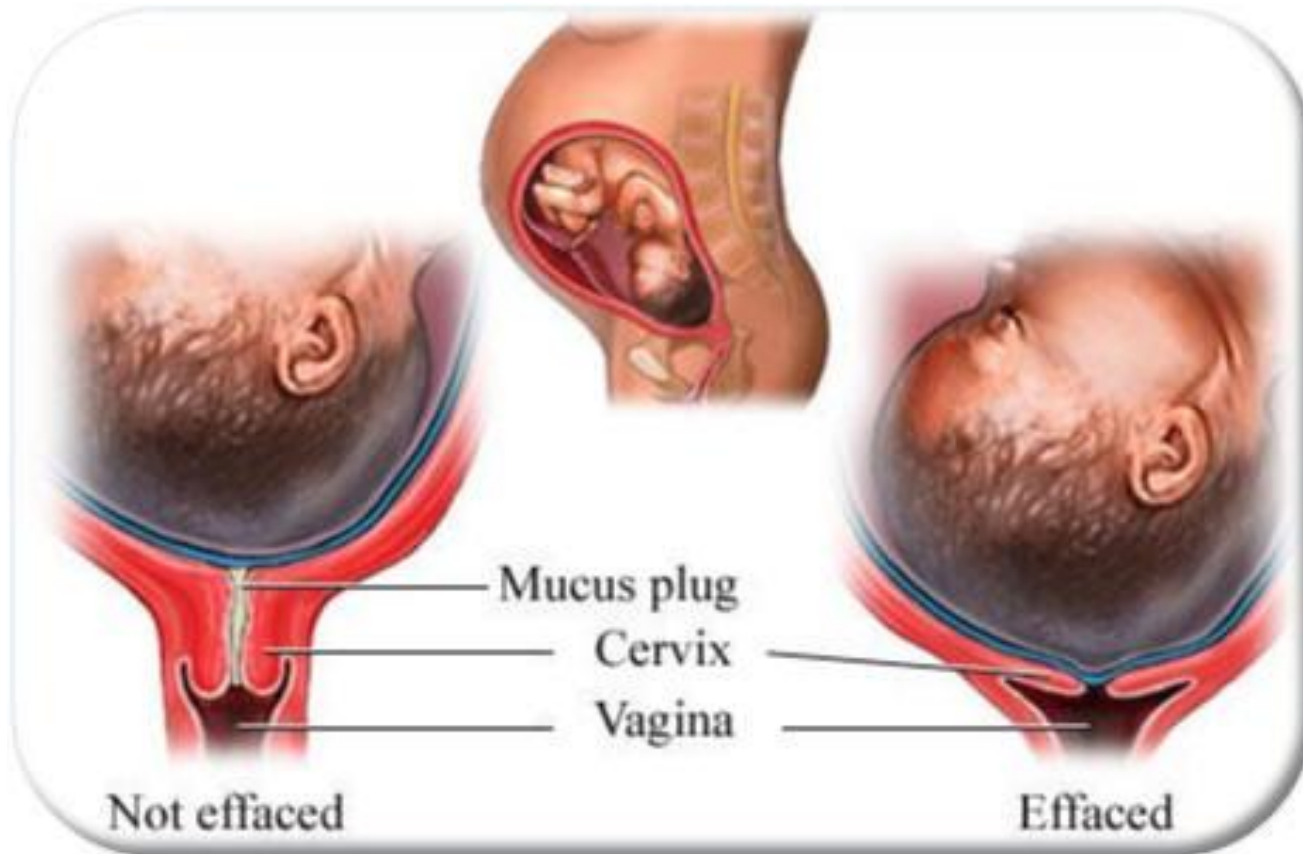
Stages of labor



Stages of Labor

- Dilation (stage 1)
 - Cervix becomes dilated
 - Full dilation is 10 cm
 - Uterine contractions begin and increase
 - Cervix softens and effaces (thins)
 - The amnion ruptures (“breaking the water”)
 - Longest stage at 6–12 hours

Cervical effacement and dilatation



Stages of Labor

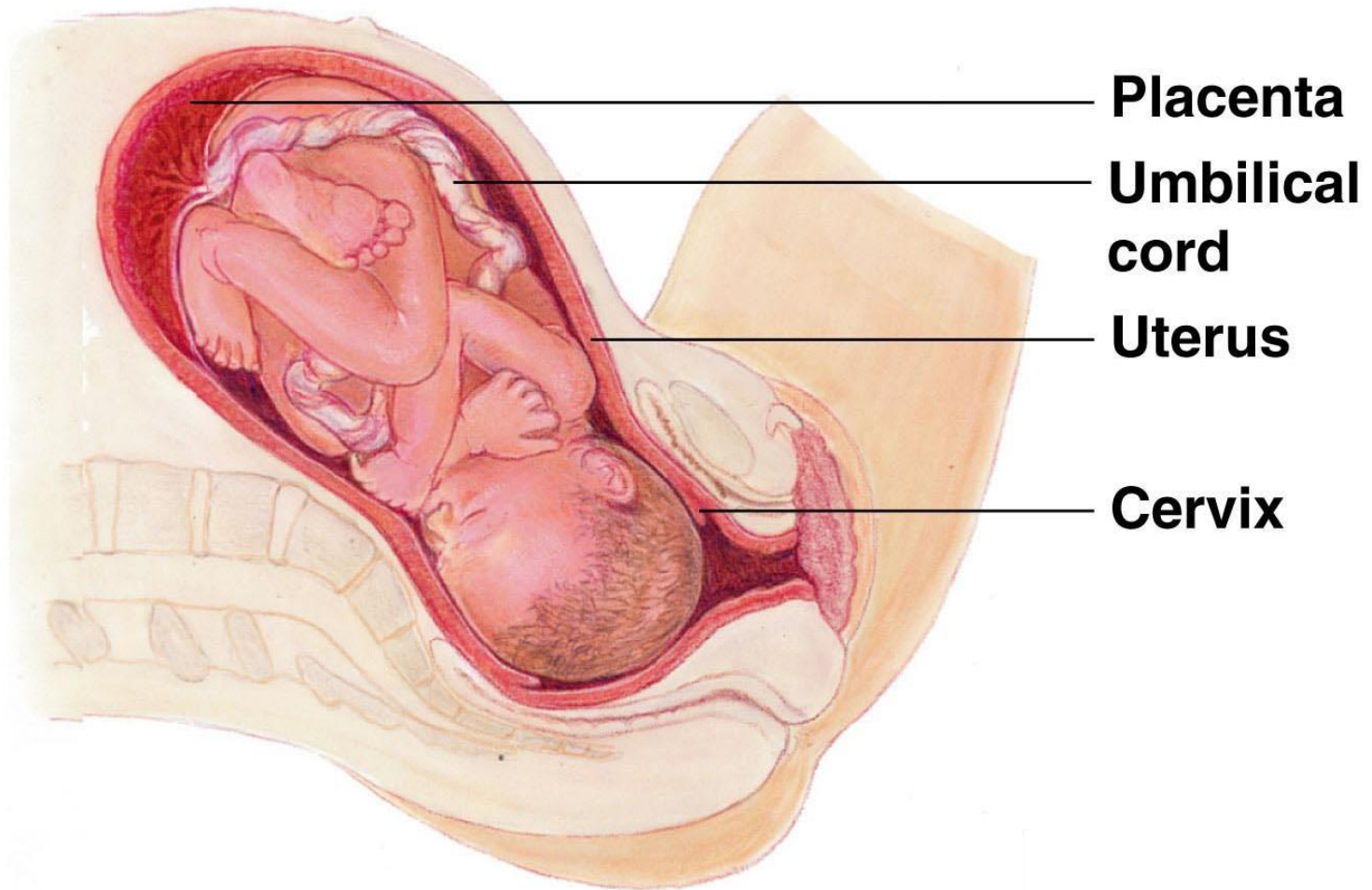


Figure 16.20 (1 of 3)

① Dilation of the cervix

Stages of Labor

- Expulsion (stage 2)
 - ▣ Infant passes through the cervix and vagina
 - ▣ Can last 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)
 - ▣ Breech presentation is buttocks-first

Stages of Labor



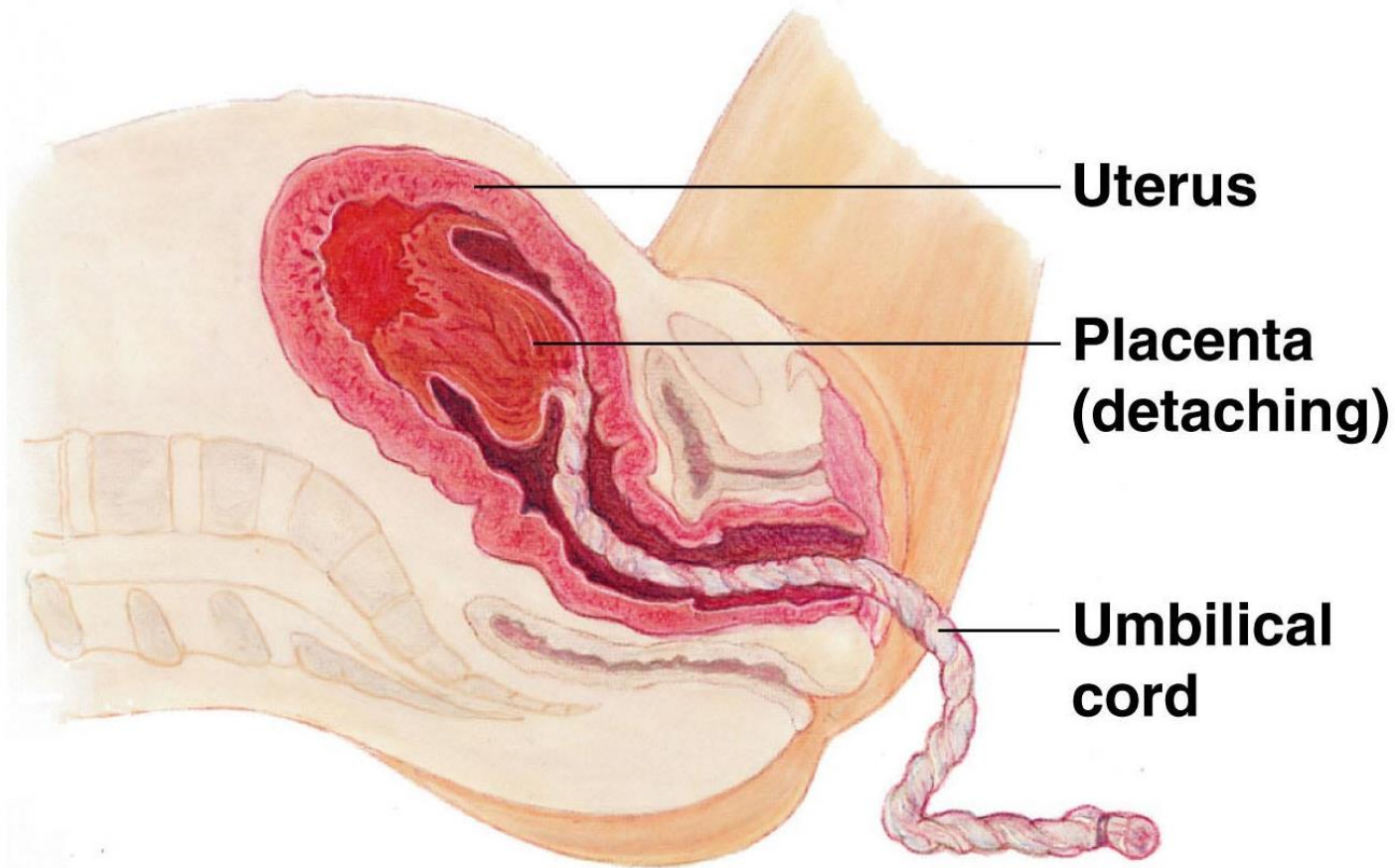
② Expulsion: delivery of the infant

Figure 16.20 (2 of 3)

Stages of Labor

- Placental stage (stage 3)
 - ▣ Delivery of the placenta
 - ▣ Usually accomplished within 15 minutes after birth of infant
 - ▣ Afterbirth—placenta and attached fetal membranes
 - ▣ All placental fragments should be removed to avoid postpartum bleeding

Stages of Labor



③ Delivery of the placenta

New arrival



{فَأَجَاءَهَا الْمَخَاضُ إِلَى جِذْعِ النَّخْلَةِ قَالَتْ يَا لَيْتَنِي مِتُّ قَبْلَ هَذَا وَكُنْتُ
نَسِيًّا مَّنْسِيًّا {23} فَنَادَاهَا مِنْ تَحْتِهَا أَلَّا تَحْزَنِي قَدْ جَعَلَ رَبُّكِ تَحْتَكِ
سَرِيًّا {24} وَهَزِّي إِلَيْكِ بِجِذْعِ النَّخْلَةِ تُسَاقِطُ عَلَيْكَ رَطْبًا جَنِيًّا {25}
فَكُلِي وَاشْرَبِي وَقَرِّي عَيْنًا { سورة مريم..}

