ONSET AND PHYSIOLOGY OF LABOR

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Objectives:

- Define labor/labour (parturition).
- Recognize the factors triggering the onset of labor.
- Describe the hormonal changes that occur before and during labor.
- Describe the phases of uterine activity during pregnancy and labor.
- Know the clinical stages of labor.

Parturition

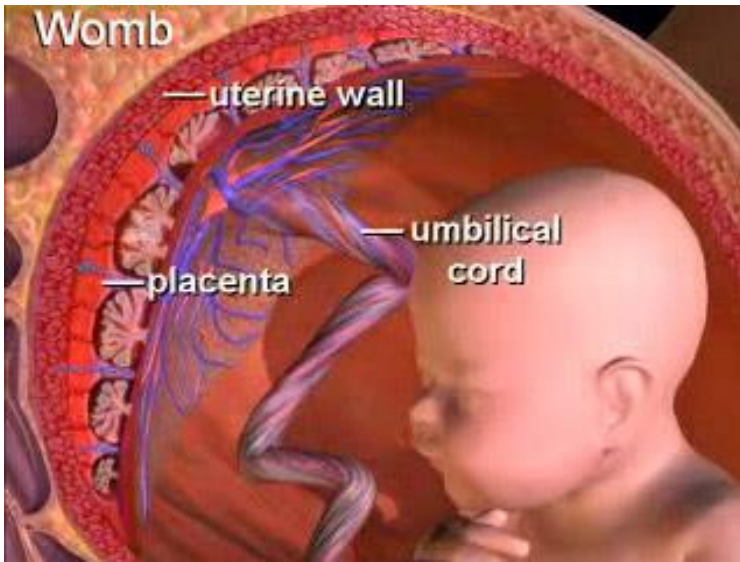
- Definition
  - Uterine contractions that lead to expulsion of the fetus to extrauterine environment
  - Towards the end of pregnancy the uterus become progressively more excitable and develops strong rhythmic contractions that lead to expulsion of the fetus.

Small group activity

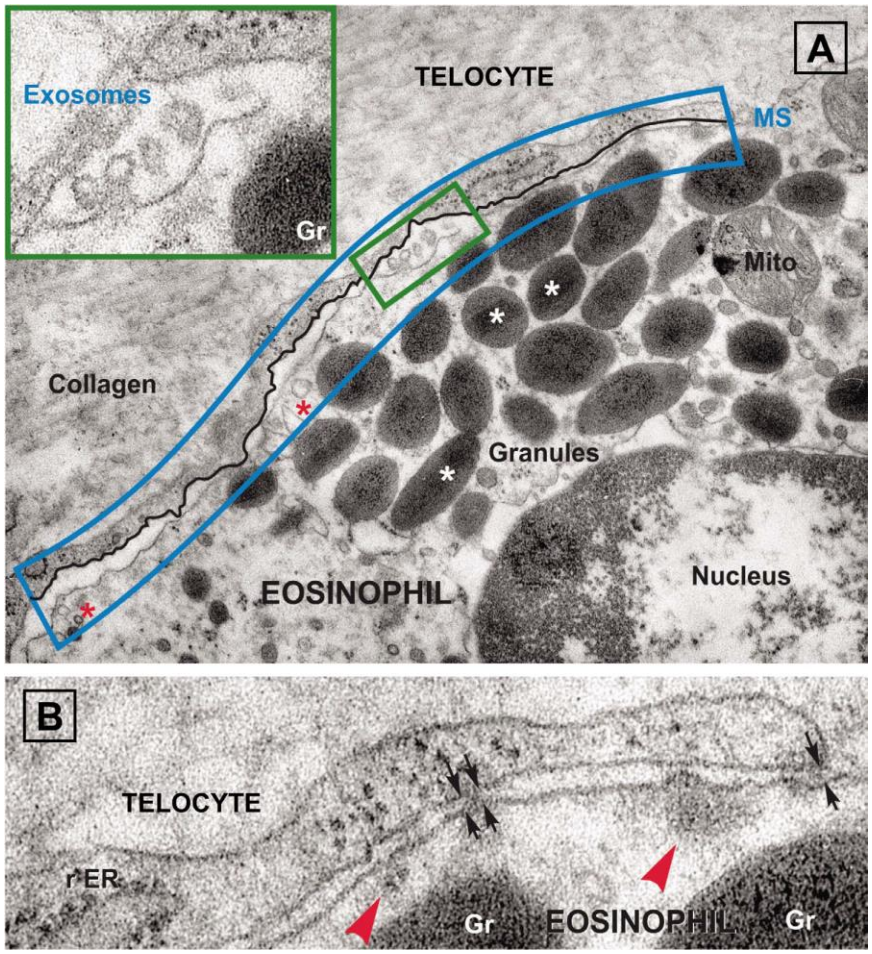
- Does non pregnant uterus contract?

Parturition

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



Telocytes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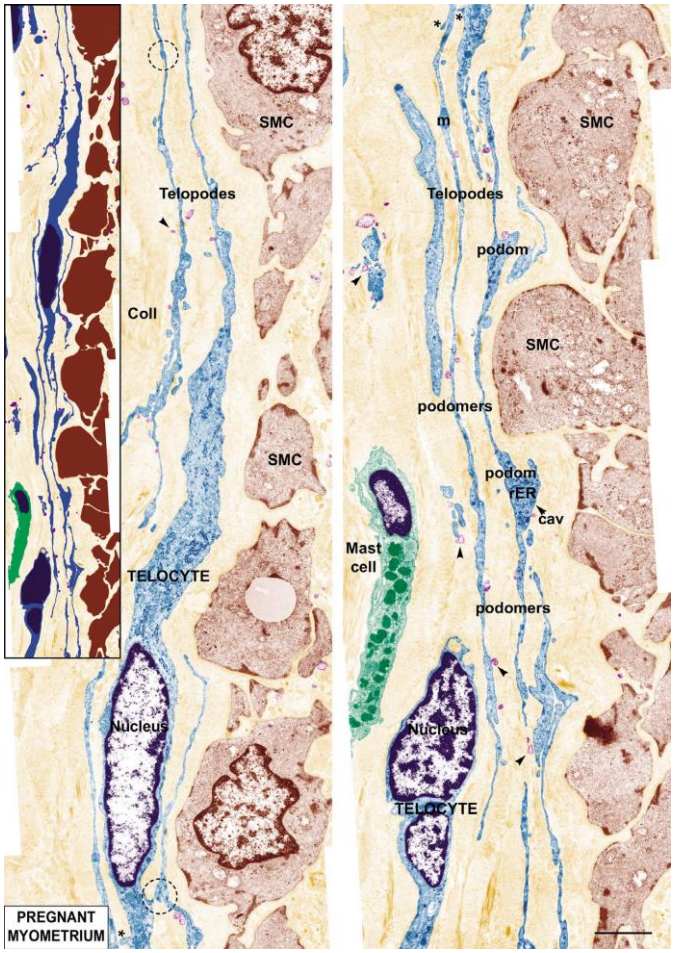
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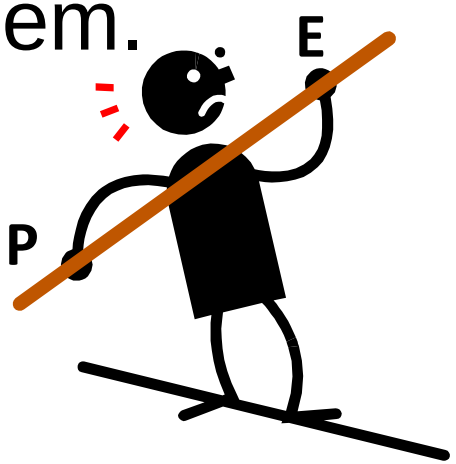
Hormonal changes

- 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
  - ▲ Oxytocin receptors.
  - ▲ Prostaglandins



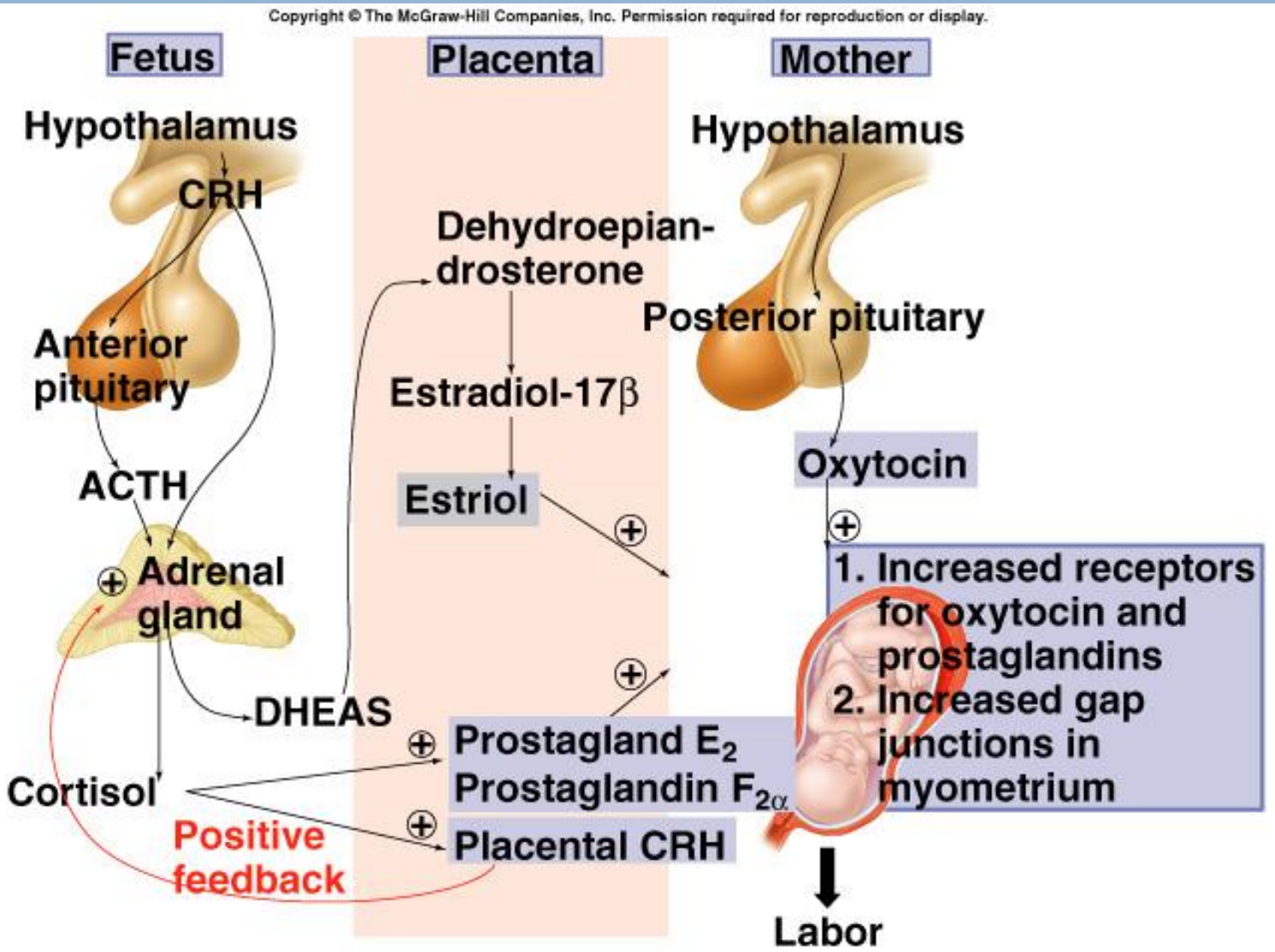
Hormonal changes

- 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

Initiation of Labor

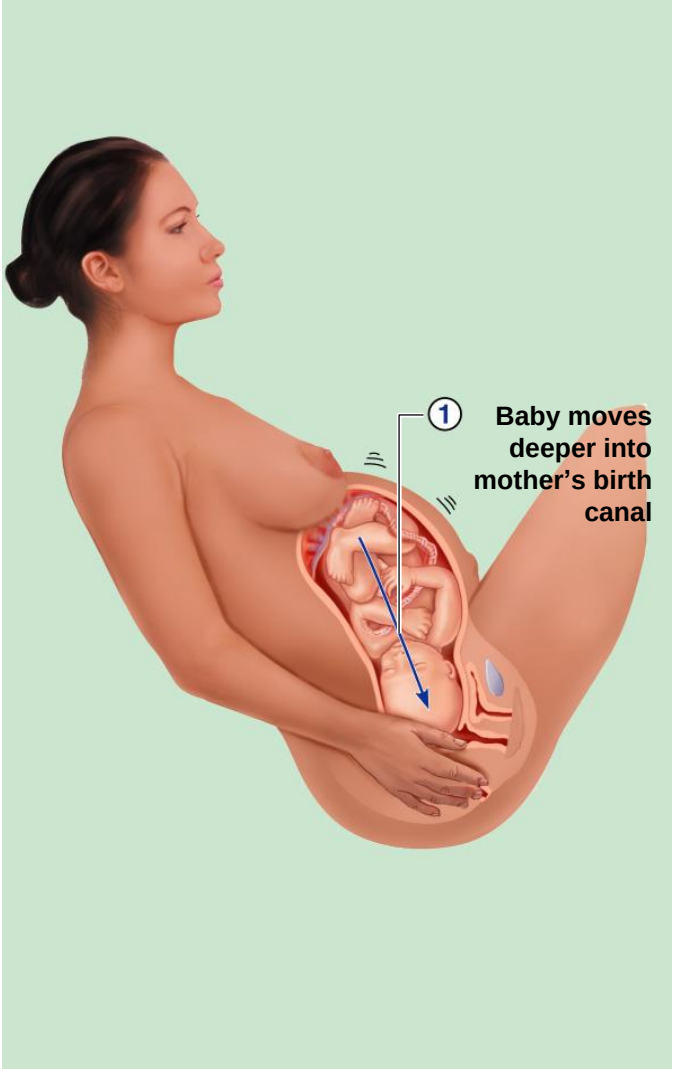


Figure 16.19, step 1

Initiation of Labor

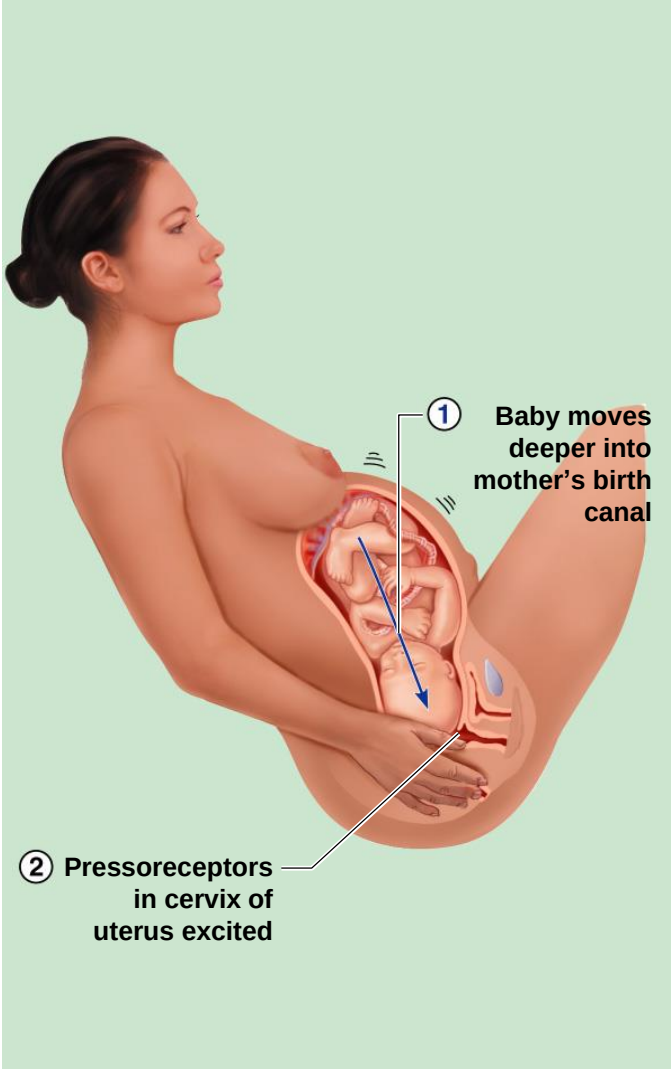


Figure 16.19, step 2

Initiation of Labor

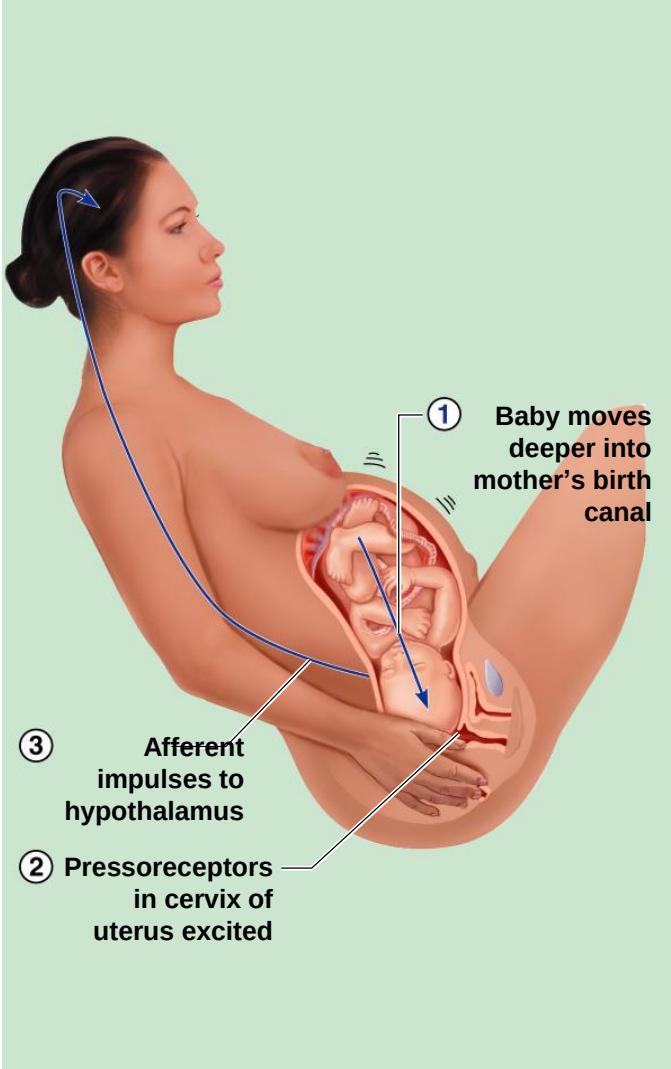


Figure 16.19, step 3

Initiation of Labor

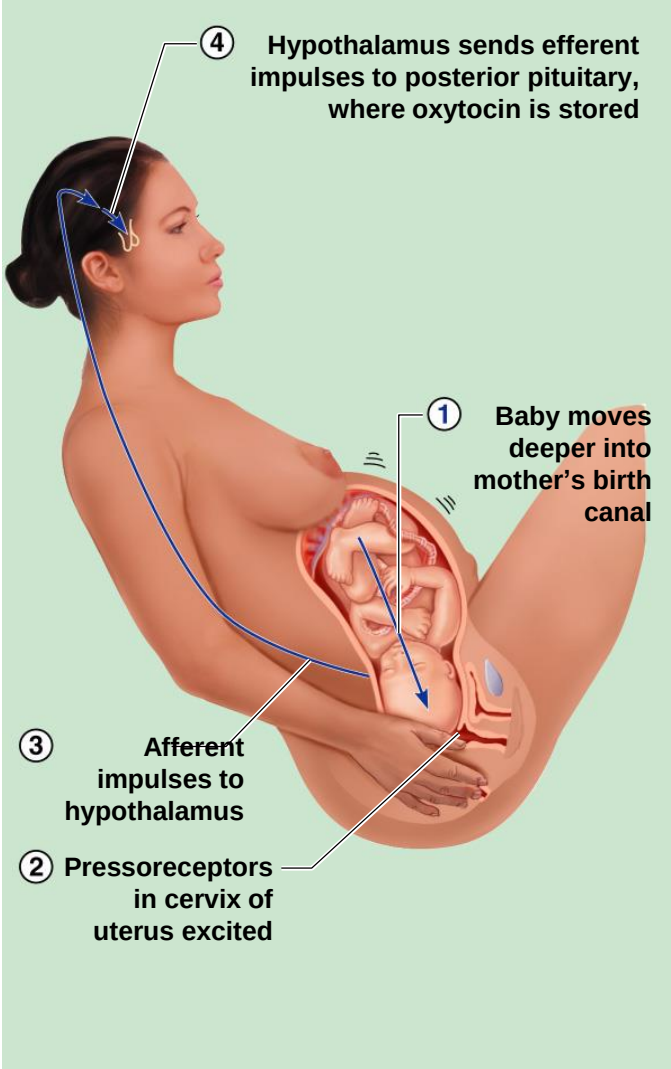


Figure 16.19, step 4

Initiation of Labor

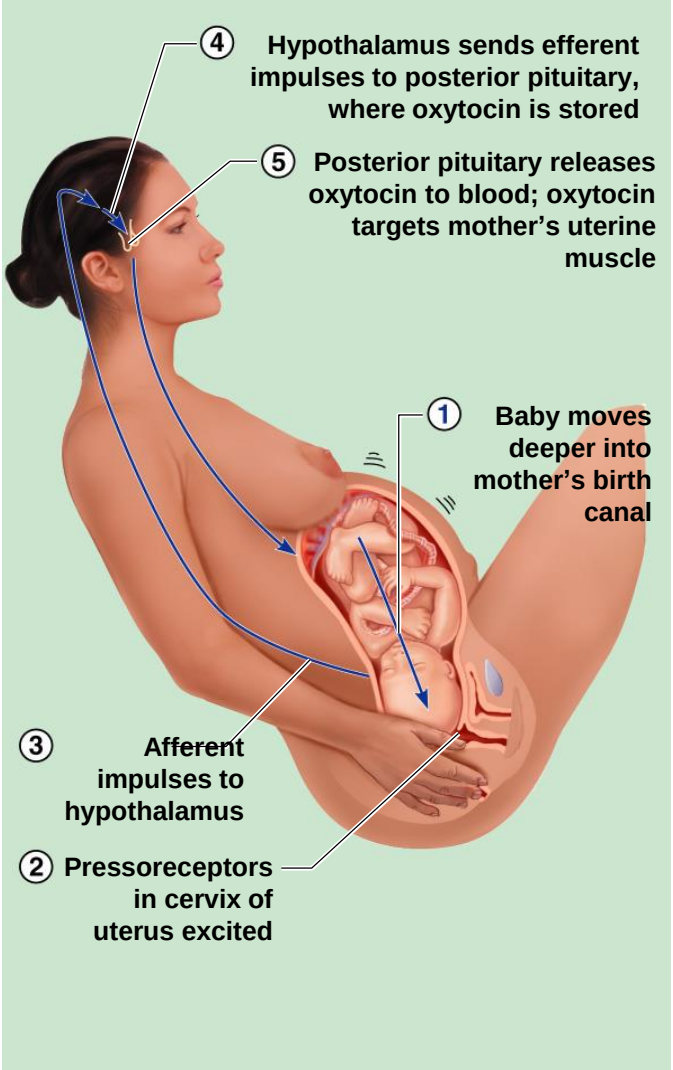


Figure 16.19, step 5

Initiation of Labor

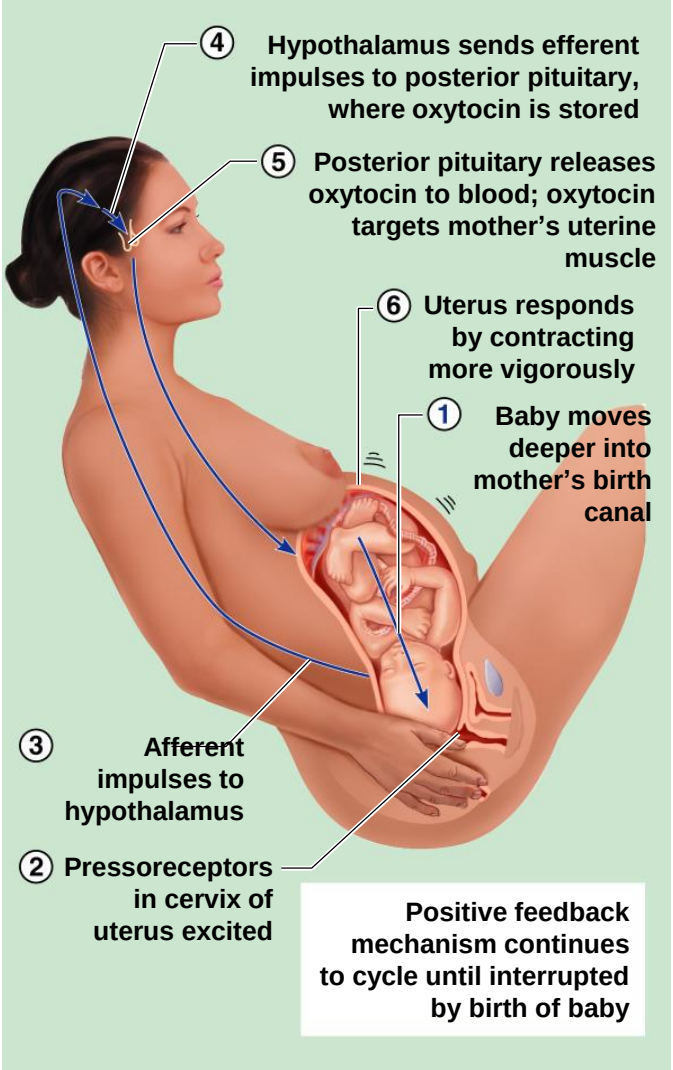
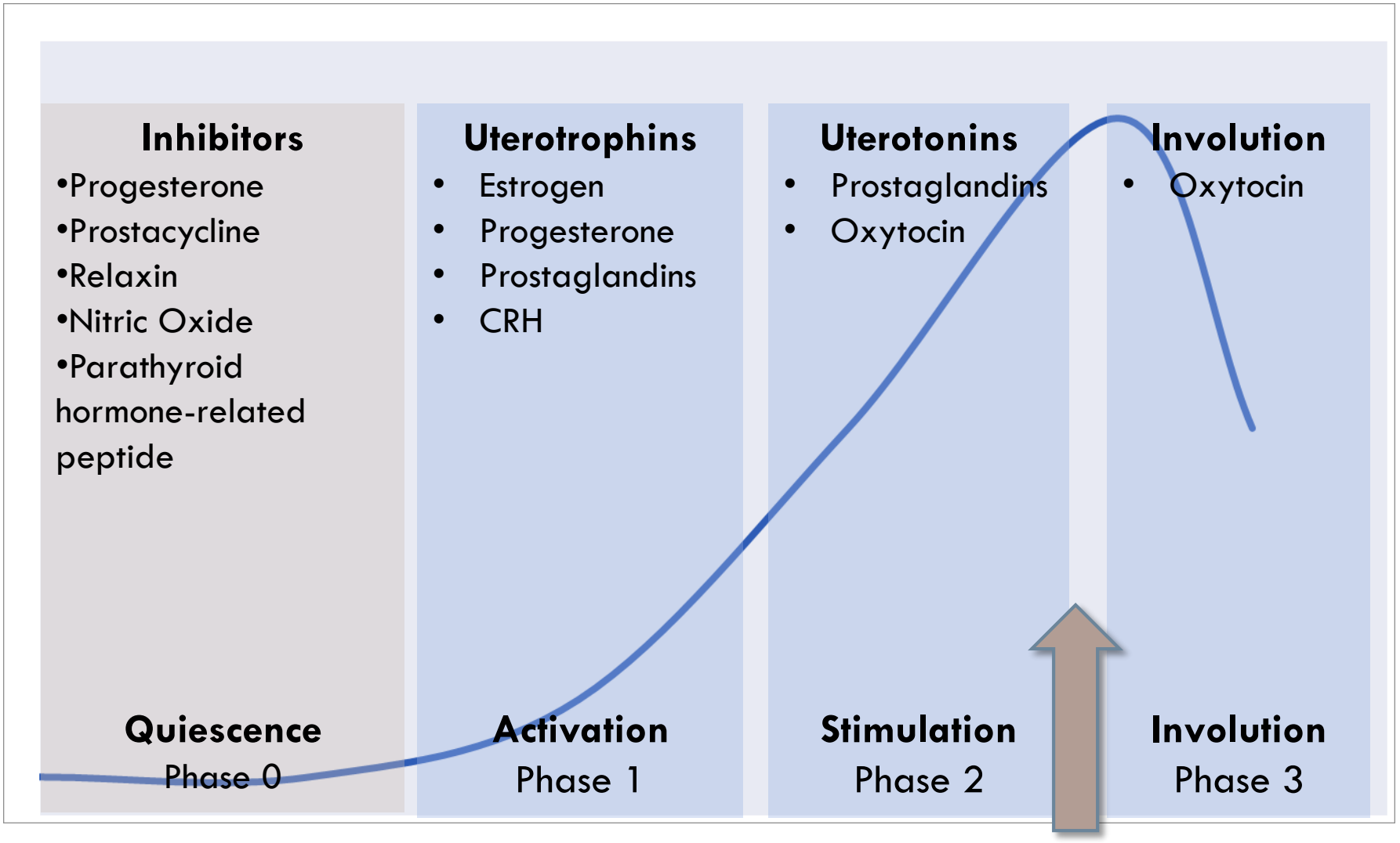


Figure 16.19, step 6

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

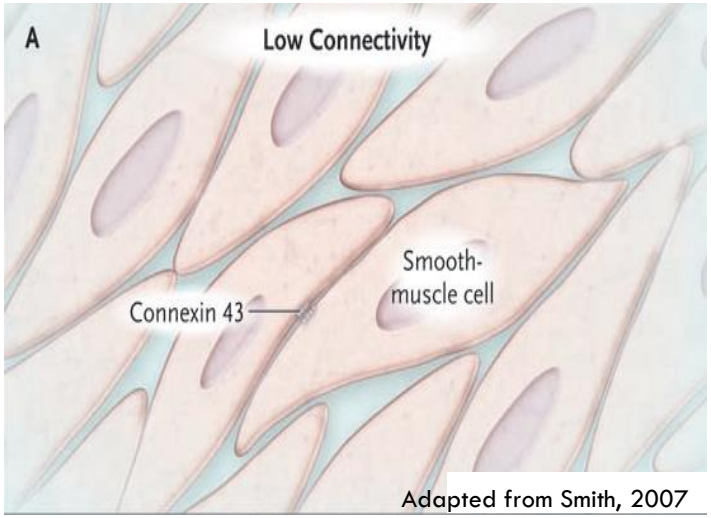
Uterine Activity During Pregnancy



Phases of parturition

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

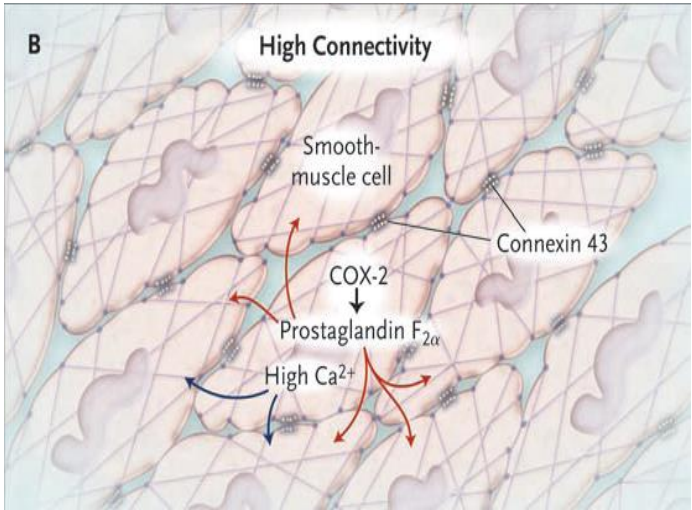
    cause uterine relaxation



Adapted from Smith, 2007

Phases of parturition

- **Phase 1 (activation)**
  - Occurs in third trimester
  - Promote a switch from quiescent to active uterus
  - Increase excitability & responsiveness by
    - Increase expression of gap junctions
    - Increase G protein-coupled receptors
      - Oxytocin receptors
      - PGF2 alpha 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 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 minuets
- As labor progress: 1 contraction/ 1-3 minutes
- Abdominal wall muscles contract
- Rhythmical contractions allows blood flow

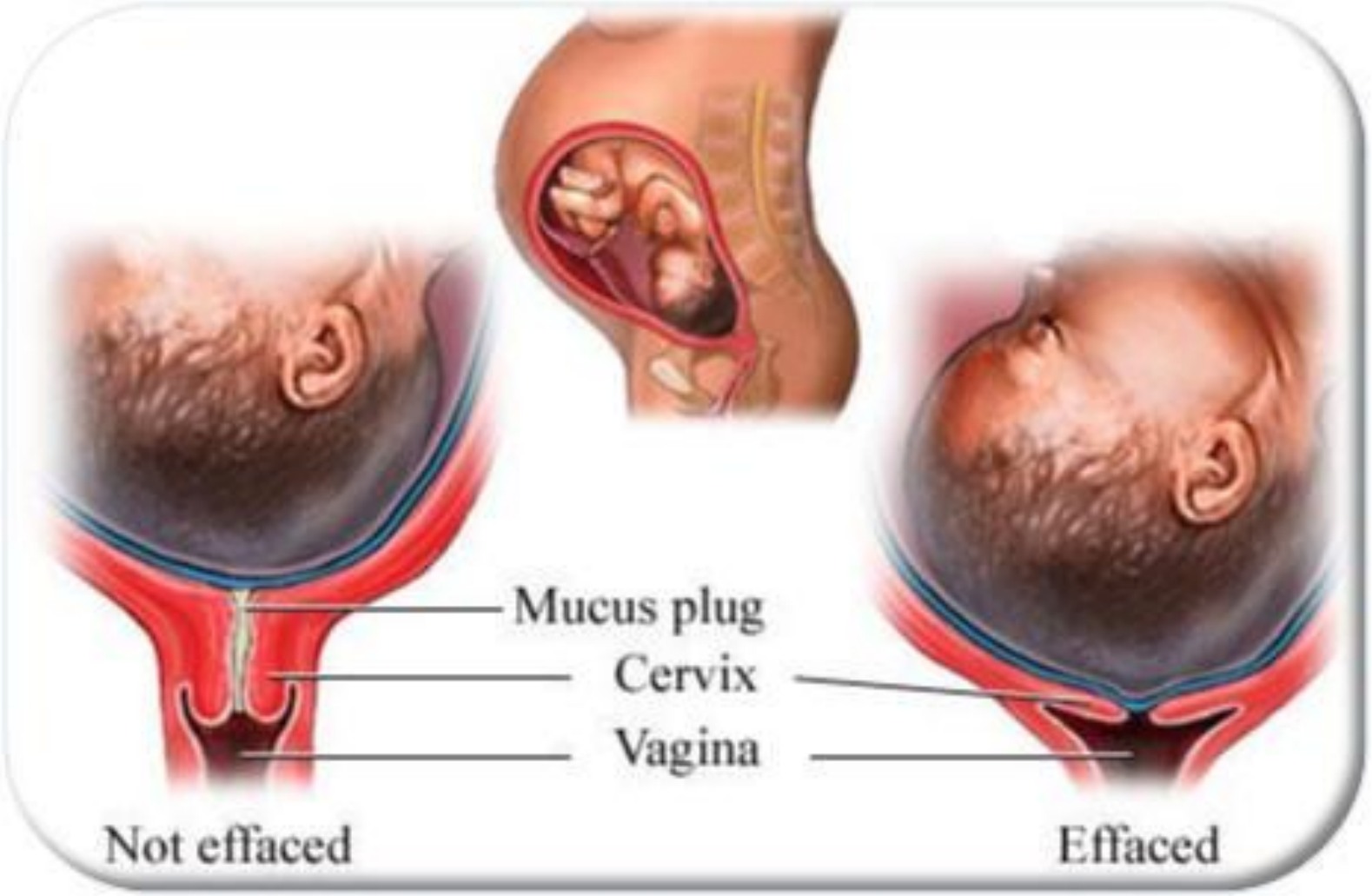
Onset of labor

- 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

- 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

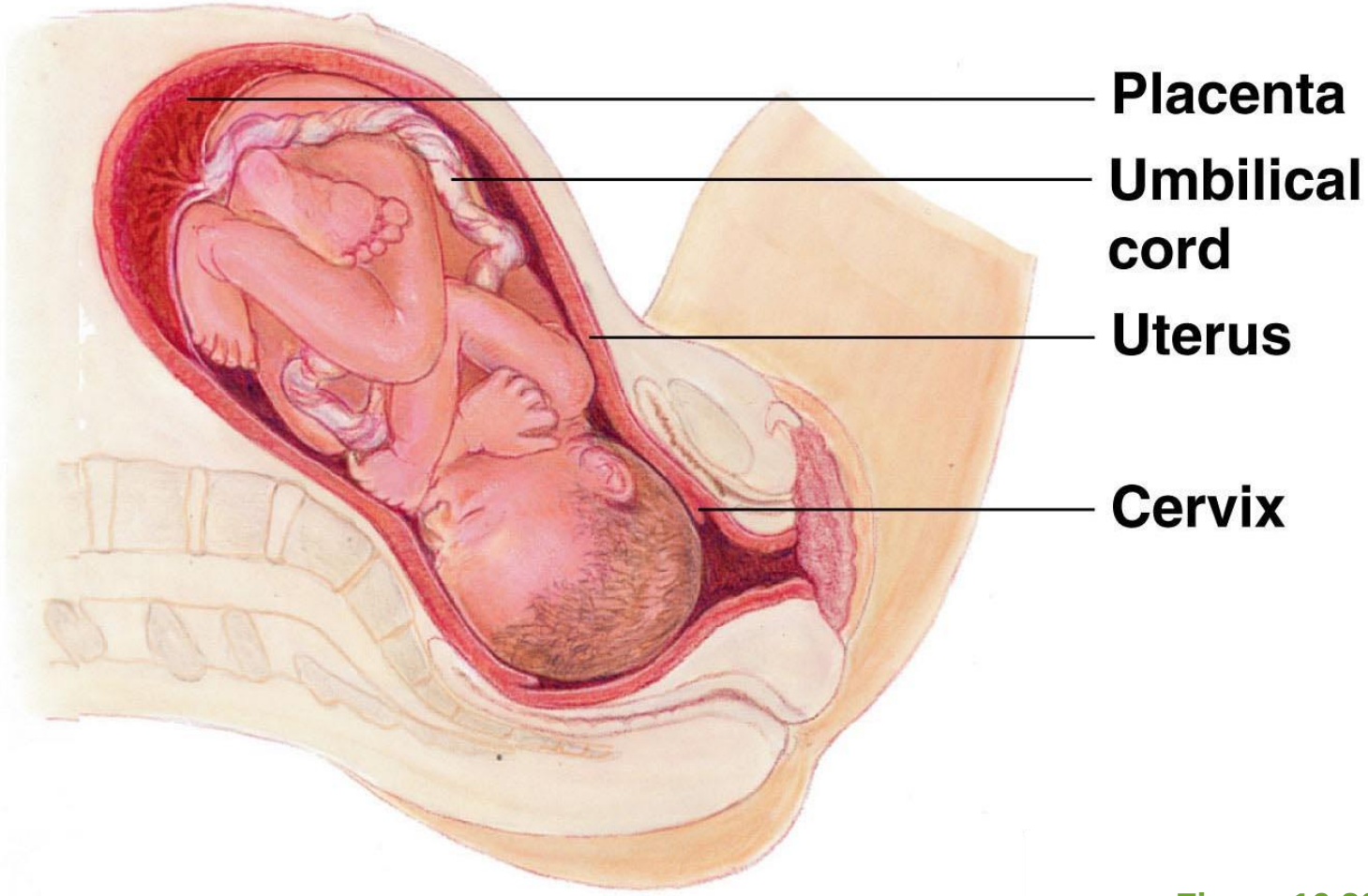
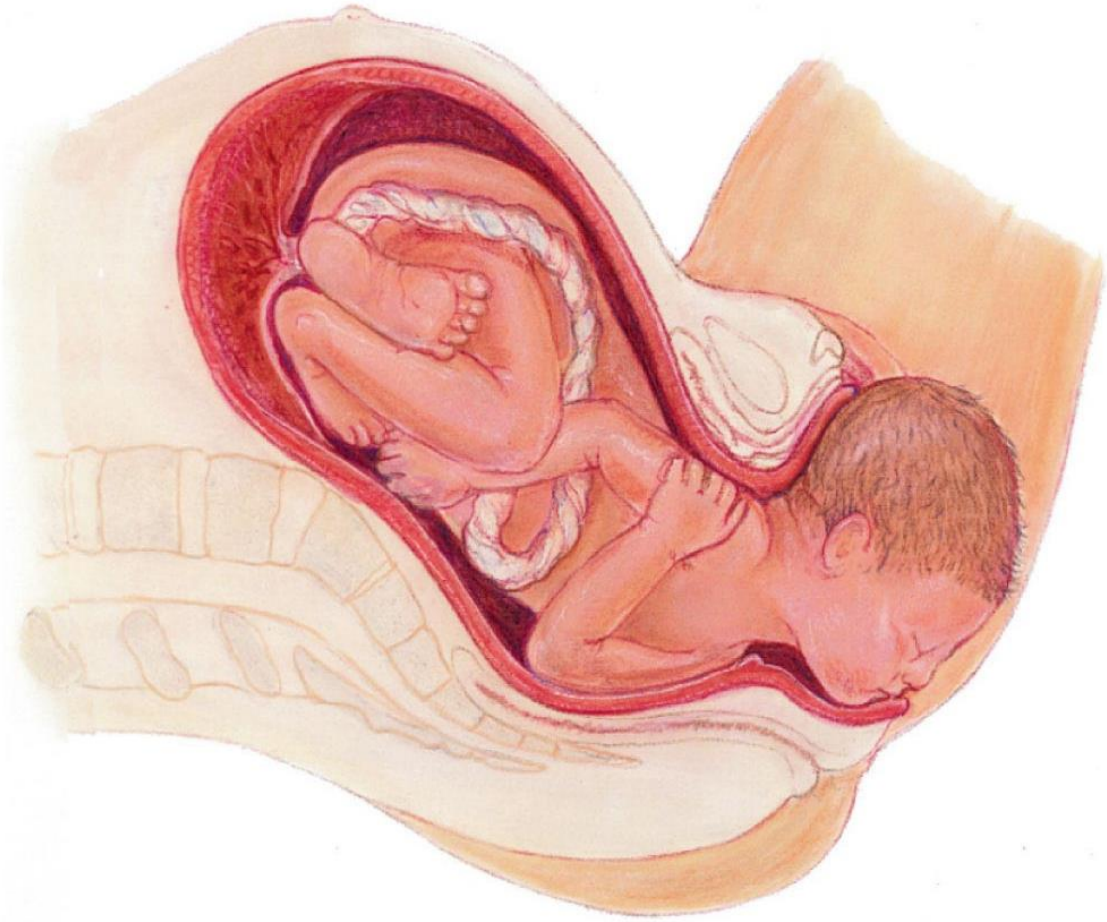


Figure 16.20 (1 of 3)

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



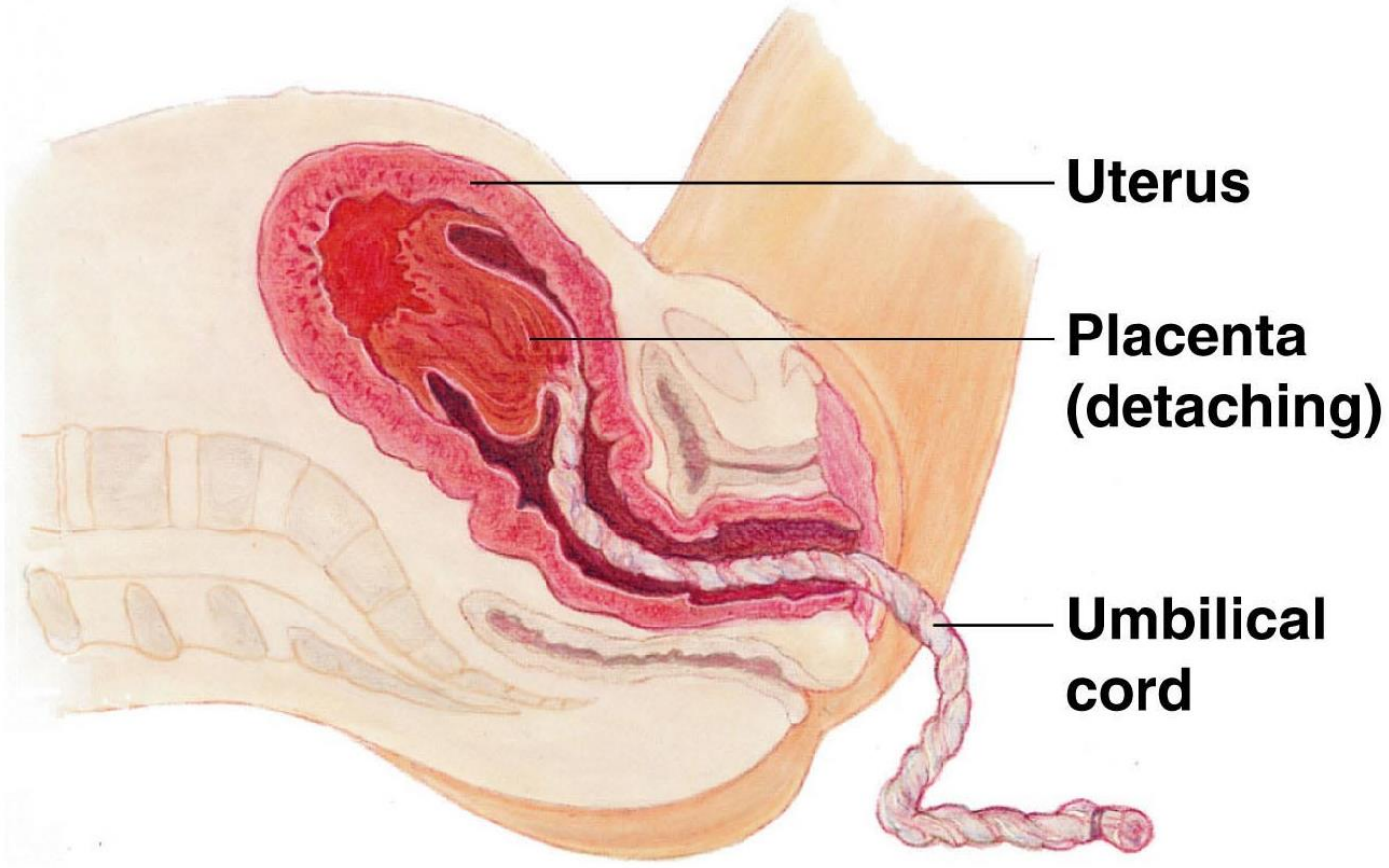
② Expulsion: delivery of the infant

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**

Figure 16.20 (3 of 3)

New arrival

{فَأَجَاءهَا الْمَخَاضُ إِلَى جِذْعِ النَّخْلَةِ قَالَتْ يَا لَيْتَنِي مِتُّ قَبْلَ هَذَا وَكُنتُ نَسْياً مَّنسِيّاً {23} فَنَادَاهَا مِن تَحْتِهَا أَلَّا تَحْزَنِي قَدْ جَعَلَ رَبُّكِ تَحْتَكِ سَرِيّاً{24} وَهُزِّي إِلَيْكِ بِجِذْعِ النَّخْلَةِ تُسَاقِطْ عَلَيْكِ رُطَباً جَنِيّاً{25} فَكُلِي وَاشْرَبِي وَقَرِّي عَيْناً } سورة مريم..