

Pregnancy and Lactation-II

Chapter 83

Unit X1V

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Response of the mother's body to pregnancy

- mainly due to **higher** levels of hormones of pregnancy

ENLARGMENT OF SEXUAL ORGANS

- Uterus
- Ovaries
- Vagina → introitus opens more widely
- Breast

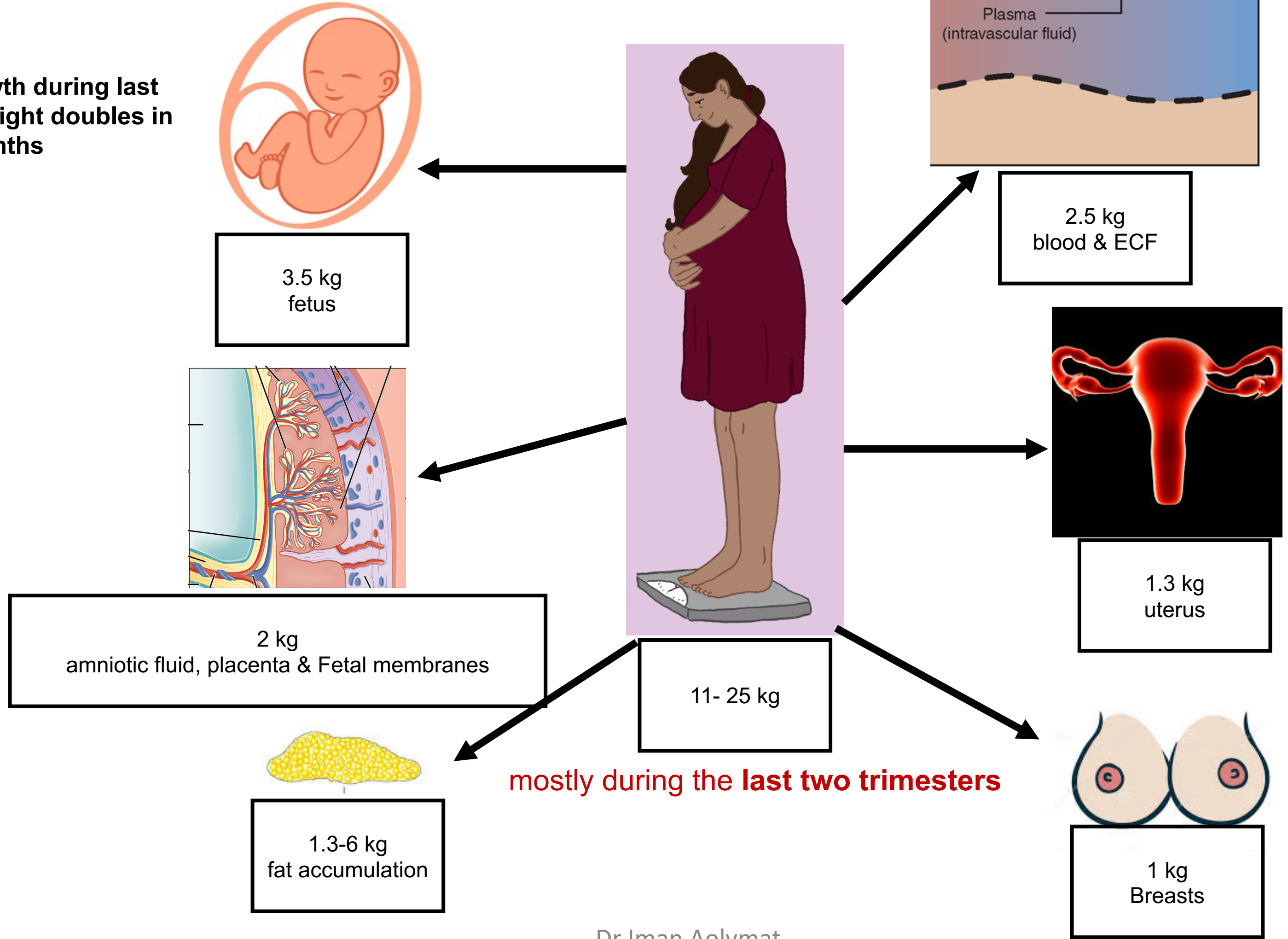
APPEARANCE

- Edema
- Acne
- Pigmentation
- Masculine or acromegalic features

Response of the mother's body to pregnancy

Weight gain

greatest growth during last trimester, weight doubles in the last 2 months



Response of the mother's body to pregnancy

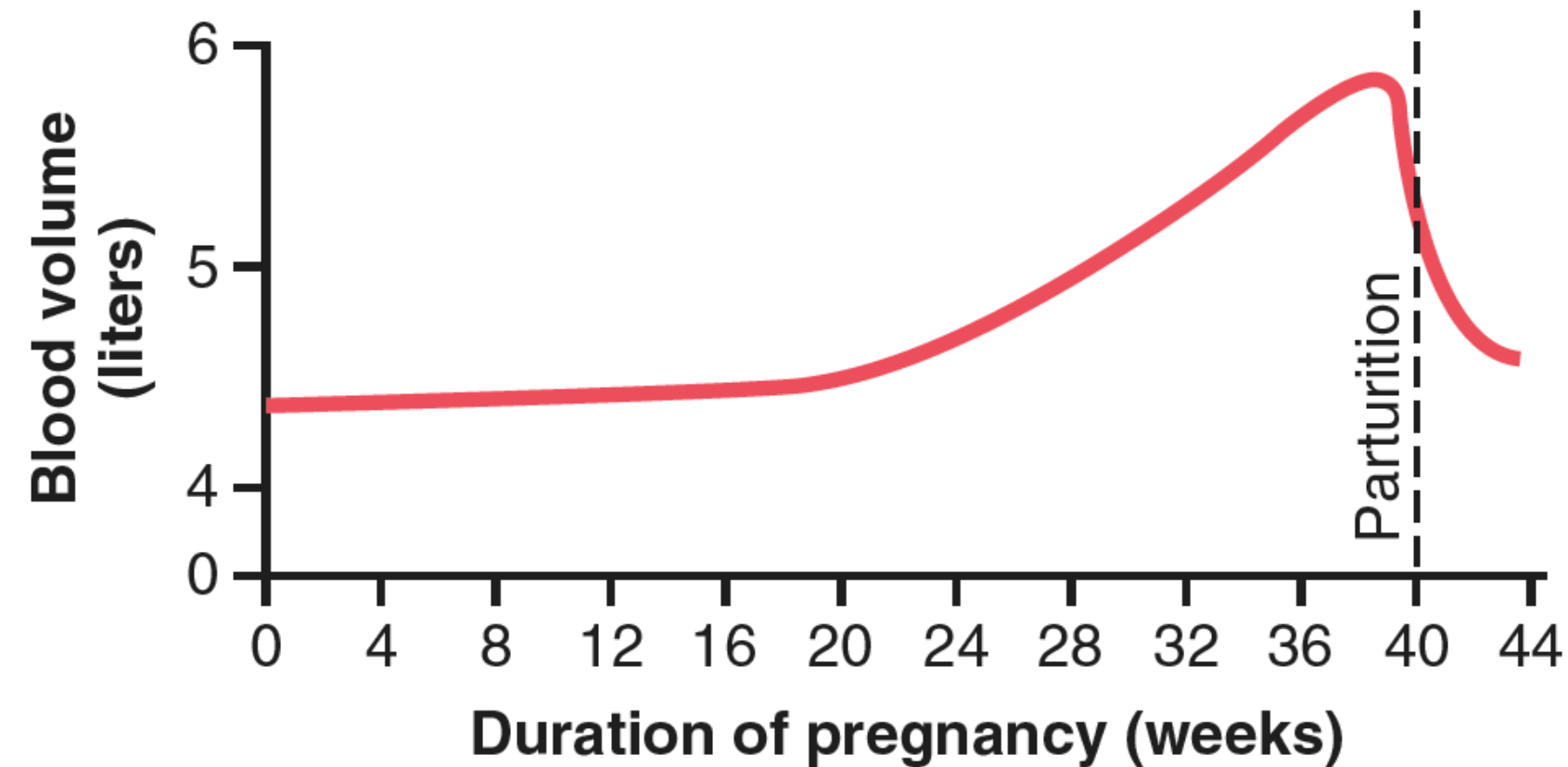
Nutrition during pregnancy

- Increased desire for food
- mother → less absorption of protein, calcium, phosphate, and iron → supply to the fetus
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- Nutritional and dietary needs change (need more iron, calcium, phosphates, vit D, vit K)
- vitamin K → prothrombin → to prevent hemorrhage (brain hemorrhage)
- Iron deficiency → hypochromic anaemia

metabolism during pregnancy

- increased thyroxine, adrenocortical hormones, and sex hormones
- increased basal metabolic rate 15% → second half of pregnancy
- extra load → more muscle activity → more energy
- Increased insulin secretion
- Increased insulin resistance → more glucose available

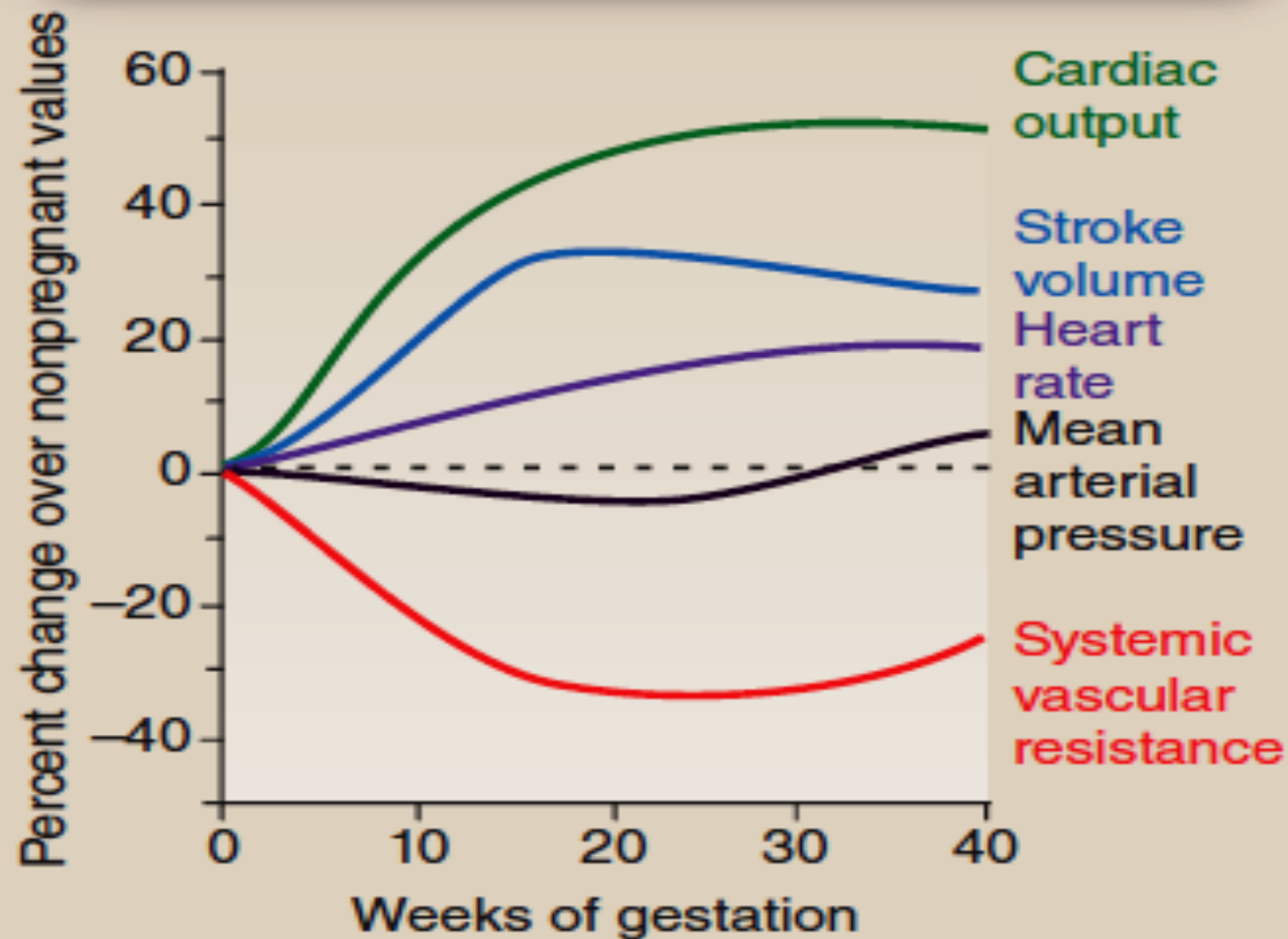
Changes in maternal circulation



- Increased **blood flow** through the placenta → 625 ml/min
- Increased maternal **cardiac output** → 30-40% (by 27th wk)
- The last 8 wks → cardiac output **falls** just above normal level
- Maternal blood volume is increased by 30% → mostly during the second half of pregnancy →
 - 1-↑ aldosterone & E → fluid retention
 - 2-Increased bone marrow activity
 - 1-2 L extra blood → $\frac{1}{4}$ lost through bleeding during delivery
- Edema due to increase in **venous pressure** in lower limbs → compression of the inferior vena cava by the uterus and the pressure of the fetal on the common iliac veins & Decrease plasma protein concentration

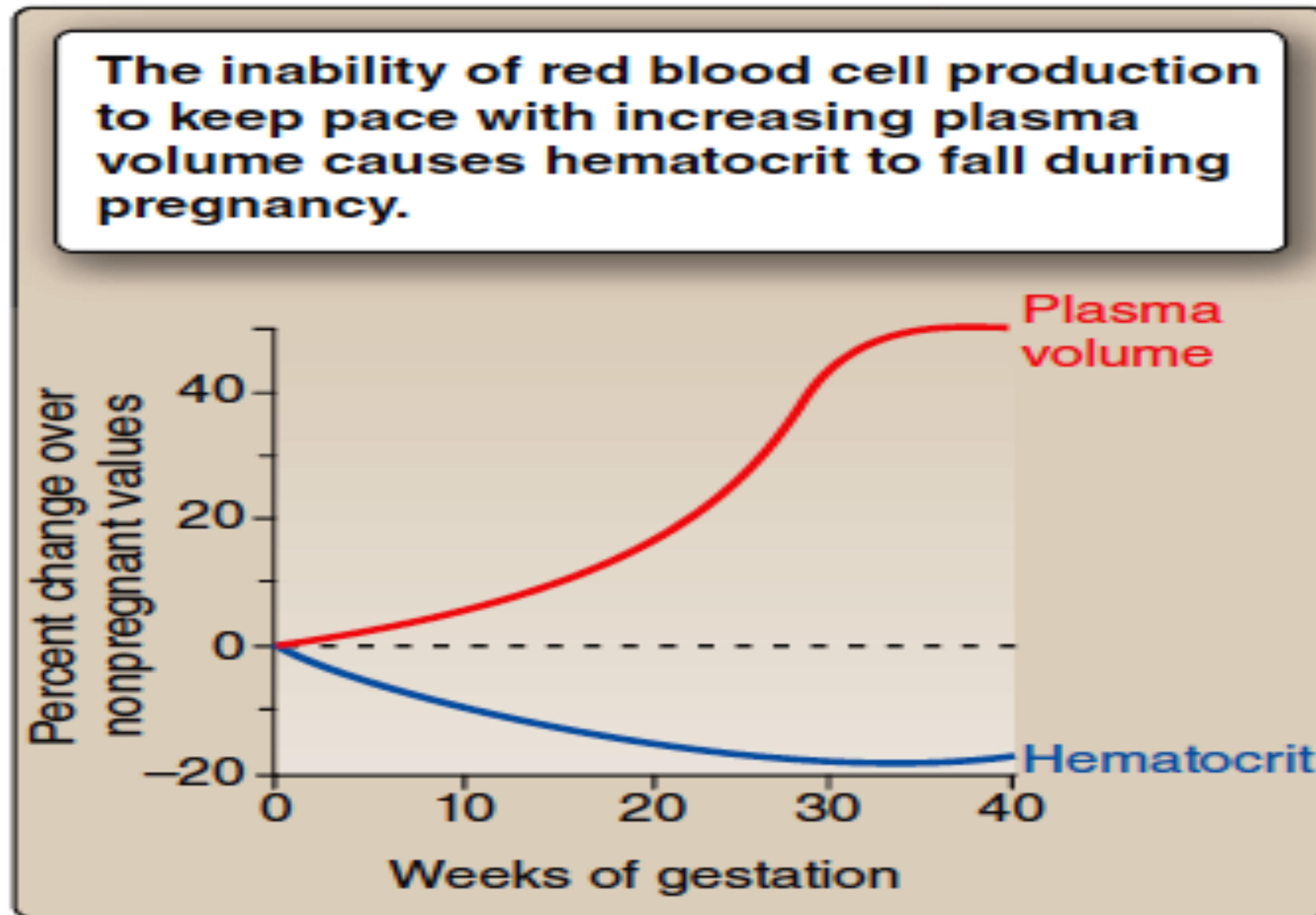
Changes in maternal circulation

Heart rate and stroke volume increase to maintain cardiac output and arterial pressure when systemic vascular resistance falls.



- ❖ Systemic arterial pressure declines slightly during pregnancy
- ❖ fall is greater for diastolic than for systolic pressures
- ❖ mean arterial pressure increase to pre-pregnancy levels by about 36 weeks.
- ❖ Systemic vascular resistance decreases due to release of NO and ednotheline

Changes in maternal plasma volume and Hematocrit during pregnancy



Respiration

- Increased alveolar ventilation → due to progesterone
- Increased tidal volume (40%) → causes dec in maternal plasma CO₂ -- slight alkalosis

Maternal kidney function

- Increased urine formation
- Increased tubular reabsorption → sodium, chloride and water by 50%
- Increased renal blood flow and GFR by 50% → renal vasodilation
- Causes of renal vasodilation
 - 1-NO
 - 2- Relaxin

Morning sickness

- 70% of pregnancies
- Onset 4-8 wks gestation
- improvement before 14-16 wks

- Mechanisms:
 - Relaxation of smooth muscle of stomach
 - ? Inc hCG

- Higher frequency of female fetus -- 56%

Pre-eclampsia

- Idiopathic **multisystem** disorder specific to human pregnancy
- **Characterized by:**
 - 1- maternal hypertension
 - 2- proteinuria
 - 3-generalized edema
- Disease of the placenta
 - Failure of trophoblast invasion of spiral arteries → Supply of both nutrients and oxygen to the placenta is disturbed
- Decreased RBF & GFR
- Leading cause of maternal and perinatal mortality

Pre-eclampsia

BP normalizes following delivery → faster with Caesarean section and D/C

cause: unknown; thought to be:

limited blood supply to uterine arteries → causing ischemia and endothelial damage with release of:

1- cytokine

A-tumor necrosis factor- α

B- interleukin-6

2-Placental factors that impede angiogenesis

A-soluble fms-related tyrosine kinase1(s-Flt1)

B- soluble endoglin

Eclampsia

fatal severe preeclampsia with :

- Seizure
- Coma
- Decreased kidney output
- Liver malfunction
- Extreme hypertension

Parturition/ labor /delivery

➤ Strong rhythmical uterine contraction

➤ **Stages of labor**

stage 1: labor →

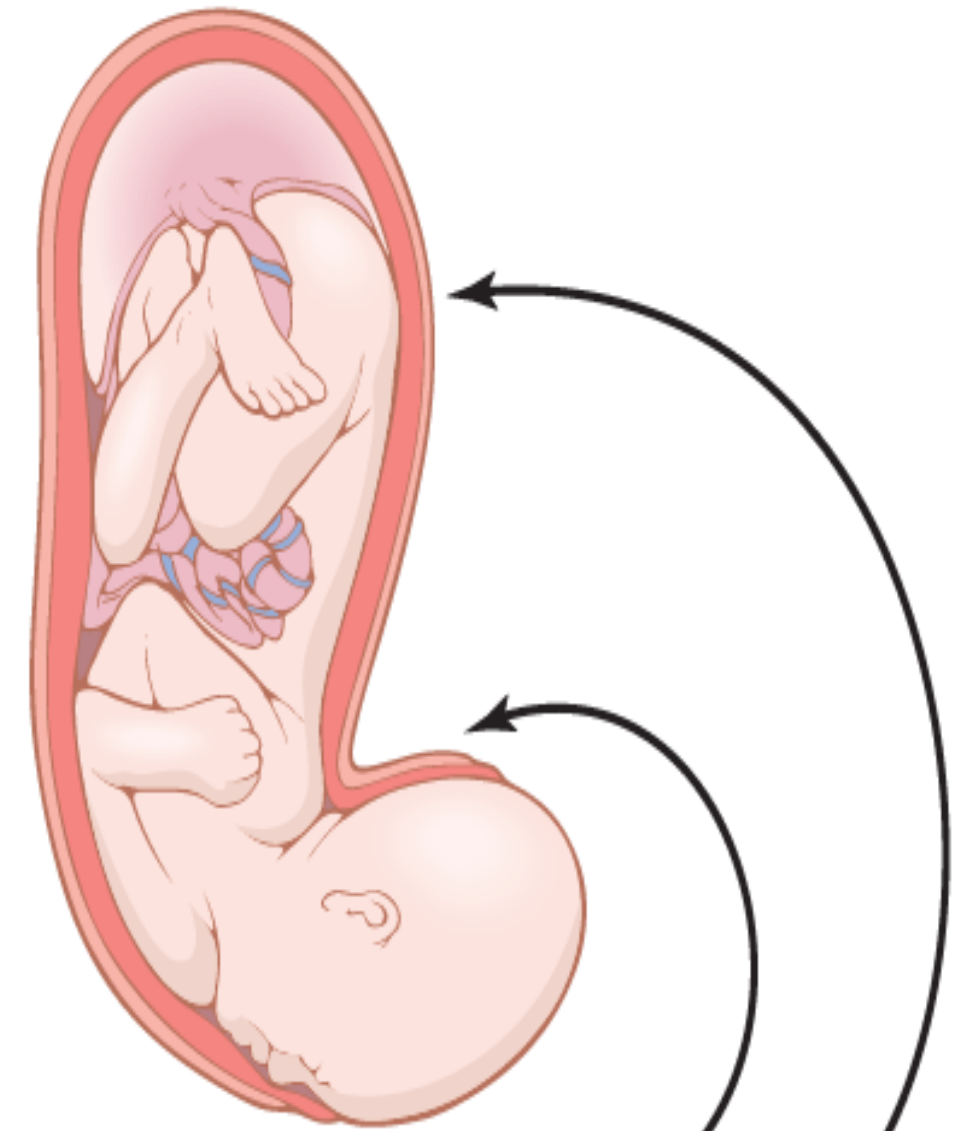
contractions → dilatation of the cervix and opening of vaginal canal

uterine → (stimulates more contractions positive feedback)

cervical → head stretching → more uterine contractions

stage 2: baby delivery

stage 3: placental detachment



1. Baby's head stretches cervix
2. Cervical stretch excites fundic contraction
3. Fundic contraction pushes baby down and stretches cervix some more
4. Cycle repeats over and over again

Parturition/ labor /delivery

Hormonal factors

Maternal

Oxytocin

PG

Catecholamines

Cortisol

Relaxin

Fetal

Oxytocin

Cortisol

PG

Placental

Estrogen

Progesterone

PG

Hormonal factors

1- E & P

↑ ↑ E

Sudden ↓ ↓ P at end of pregnancy

P inhibits prostaglandin E2

↑ E/P ratio →

+ contraction

+ synthesis and sensitivity of oxytocin receptors

+ PG

2- Oxytocin

+ uterine contraction

+ PG from decidua

3- Relaxin

secreted by placenta & mammary glands

Softening cervix

Relaxation of symphysis pubis ligaments

Dilatation of the cervix

+ oxytocin receptors

- inhibitory action of progesterone

Hormonal factors

4- PGE2

from the decidua → + Calcium concentration

5-Catecholamines

adrenaline and noradrenaline
+ uterine contraction

6- cortisol

+ uterine contraction
stress tolerance

Mechanical factors

stretch of uterine muscles
stretch of the cervix

lactation

Estrogen effect on the breast:

- 1- growth of ductal system
- 2- + stroma
- 3- fat deposition

Progesterone effect on the breast

growth of lobule-alveolar system

E & P → inhibit prolactin

Stages of breast development

1- puberty

- A-growth of mammary glands
- B-fat deposition

2- during pregnancy

- A-high estrogen
- B-complete development of glandular tissue

lactation

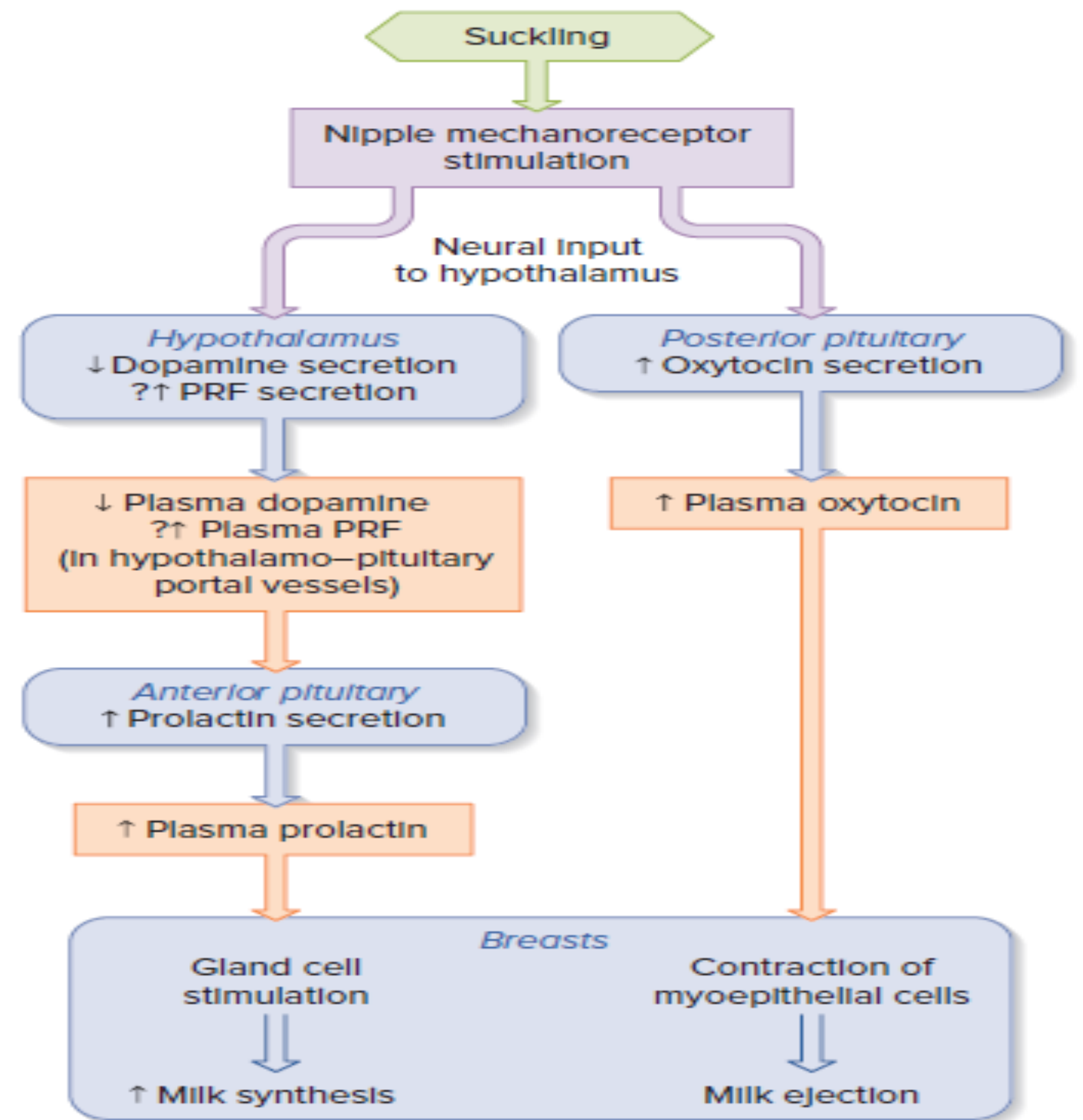
- **Prolactin**

- ❖ secreted by anterior pituitary gland
- ❖ + from the 5th week of pregnancy
- ❖ increases 10-20 times by delivery
- ❖ decreases after 7 to 9 months

- Human chorionic somatomammotropin → lactogenic effect
- First few days (1-7) → colostrum (very small amount) → Protein and lactose **almost no fat**
- Up to 1.5 L of milk/day- higher in twins- **high energy consumption**
- Milk formation requires increase in growth hormone, cortisol, parathyroid hormone and insulin → to increase amino acids, fatty acids, glucose and calcium

lactation

- suckling → hypothalamus → prolactin surge
- milk ejection from alveoli to ducts is caused by oxytocin
- Prolactin secretion is inhibited by the hypothalamus → prolactin inhibitory Factor
- Dopamine inhibits prolactin secretion
- Prolactin inhibits LH and FSH → inhibits menstruation for several months
- Enlargement of parathyroid gland to supply needed calcium and phosphate + bone decalcification



lactation

Table 83-1 Composition of Milk

	Constituent	Human Milk (%)	Cow's Milk (%)	
	Water	88.5	87.0	
	Fat	3.3	3.5	
50% higher	Lactose	6.8	4.8	
	Casein	0.9	2.7	
	Lactalbumin and other proteins	0.4	0.7	2-3 higher
Calcium & other minerals	Ash	0.2	0.7	

milk provides nutrients, antibodies & WBCs

The end