Adaptasi anatomi dan fisiologi dlm kehamilan

Dr. Kusuma Andriana SpOG

- وَوَصَّيْنَا الإِنْسَانَ بِوَالِدَيْهِ حَمَلَتْهُ أُمُّهُ وَهْنًا عَلَى وَهْنٍ وَفِصَالُهُ فِي عَامَيْنِ أَنِ اشْكُرْ لِي وَلِوَالِدَيْكَ إِلَيَّ الْمَصِيرُ
- Dan Kami perintahkan kepada manusia (berbuat baik) kepada dua orang ibu-bapaknya; ibunya telah mengandungnya dalam keadaan lemah yang bertambah-tambah, dan menyapihnya dalam dua tahun. Bersyukurlah kepada-Ku dan kepada dua orang ibu bapakmu, hanya kepada-Kulah kembalimu.

Tujuan

- Pemahaman ttg adapatasi ini ➔ untuk mengenali :
  - Perubahan anatomi dan fisiologi
  - Deteksi hal – hal patologis .

Anatomical adaptations

- Uterus
- Cervix
- Ovaries
- Fallopian Tubes
- Vagina & Perineum
- Breast

Physiological adaptations

- Cardio Vascular
- Hematologic
- Respiratory
- Gastrointestinal
- Hepatobiliary
- Urinary
- Neurological
- Musculoskeletal
- Endocrine
- Metabolic
- Weight Change
- Dermatological
- Ophthalmological
- Dental

Anatomical Adaptations

Uterus

	Non Pregnant Uterus	Pregnant Uterus
Muscular Structure	Almost Solid	Relatively thin – walled (≤ 1.5 cm)
weight	≈ 70 gm	Approx. 1100 gm by the end of pregnancy
Volume	≤ 10 mL	≈ 5 L by the end of preg.

There is progress increase in Uteroplacental blood flow during pregnancy (450 – 650 ml / min late in pregnancy).

Mechanism Of Uterine Enlargement

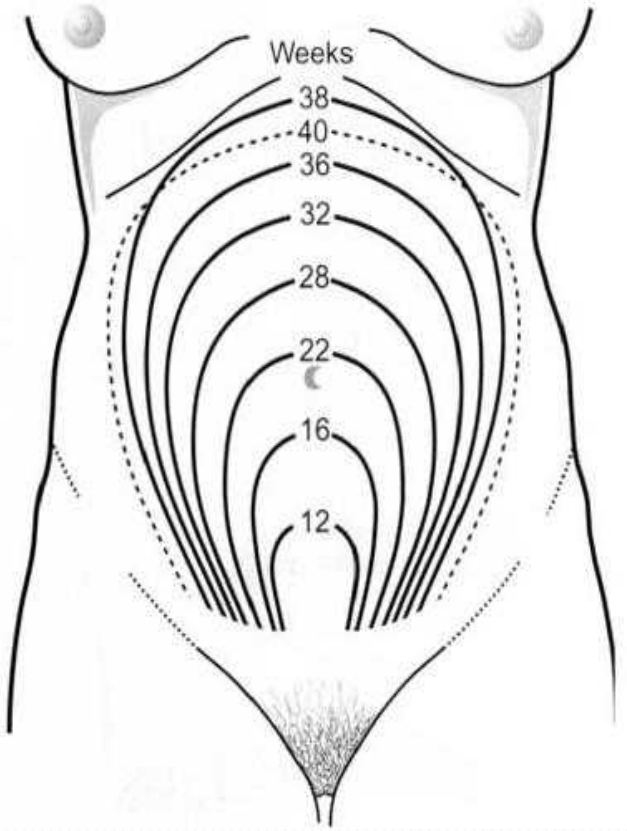
Stretching & marked hypertrophy of muscle cells.

Considerable increase in elastic tissue

Accumulation of fibrous tissue, particularly in the external muscle layer.

Uterine size, shape & position

- First few weeks, original peer shaped organ
- As pregnancy advances, corpus & fundus assumes a more globular form.
- By 12 weeks, the uterus becomes almost spherical .
- Subsequently, uterus increases rapidly in length than in width & assumes an ovoid shape.
- With ascent of uterus from pelvis, it usually undergoes Dextrorotation (caused by the rectosigmoid colon on the left side)



Cervix

- As early as 1 month after conception the cervix begins to undergo profound softening &cyanosis due to :
  - Increased vascularity & edema of the entire cervix.
  - Hypertrophy & hyperplasia of the cervical glands.
  - Endocervical mucosal cells produce copious amounts of a tenacious mucus that obstructs the cervical canal soon after conception(mucus plug)

Cervix

- During pregnancy the basal cells near the squamocolumnar junction are likely to be prominent in size, shape & staining qualities (estrogenic effect).

- These changes attribute to the frequency of less than optimal pap smears in pregnant women.

Ovaries

- Cessation of ovulation & arrest of maturation of new follicles.
- Single corpus luteum of pregnancy is found in ovaries of pregnant women that contributes to progesterone production maximally during the first 6 to 7 weeks of pregnancy (4 : 5 weeks postovulation)
- This explains the rapid fall in serum progesterone& the occurrence of spontaneous abortion upon removal of the corpus luteum before 7 wks.
- Increased diameter of the ovarian vascular pedicle from 0.9cm to approx. 2.6 cm at term.

Fallopian Tubes

- The musculature of the fallopian tubes undergoes little hypertrophy
- The epithelium of the tubal mucosa becomes somewhat flattened

Vagina & Perineum

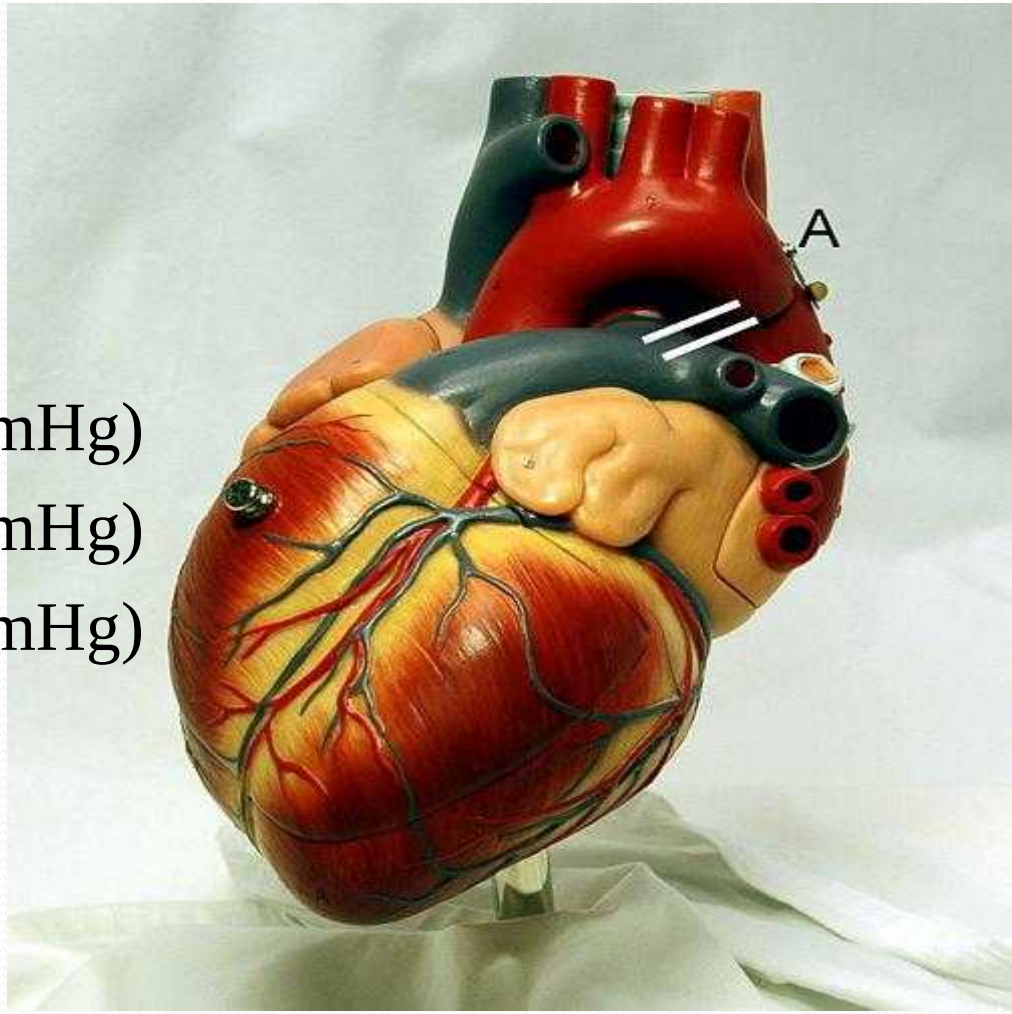
- Increased vascularity, hyperemia of the skin & muscles of the perineum & vulva.
- Softening of the underlying abundant connective tissue.
- Increased vascularity prominently affects the vagina resulting in the violet color characteristic of (chadwick sign).
- Considerable increase in the thickness of the vaginal mucosa, loosening of the connective tissue, hypertrophy of smooth muscle cells.

Breast changes

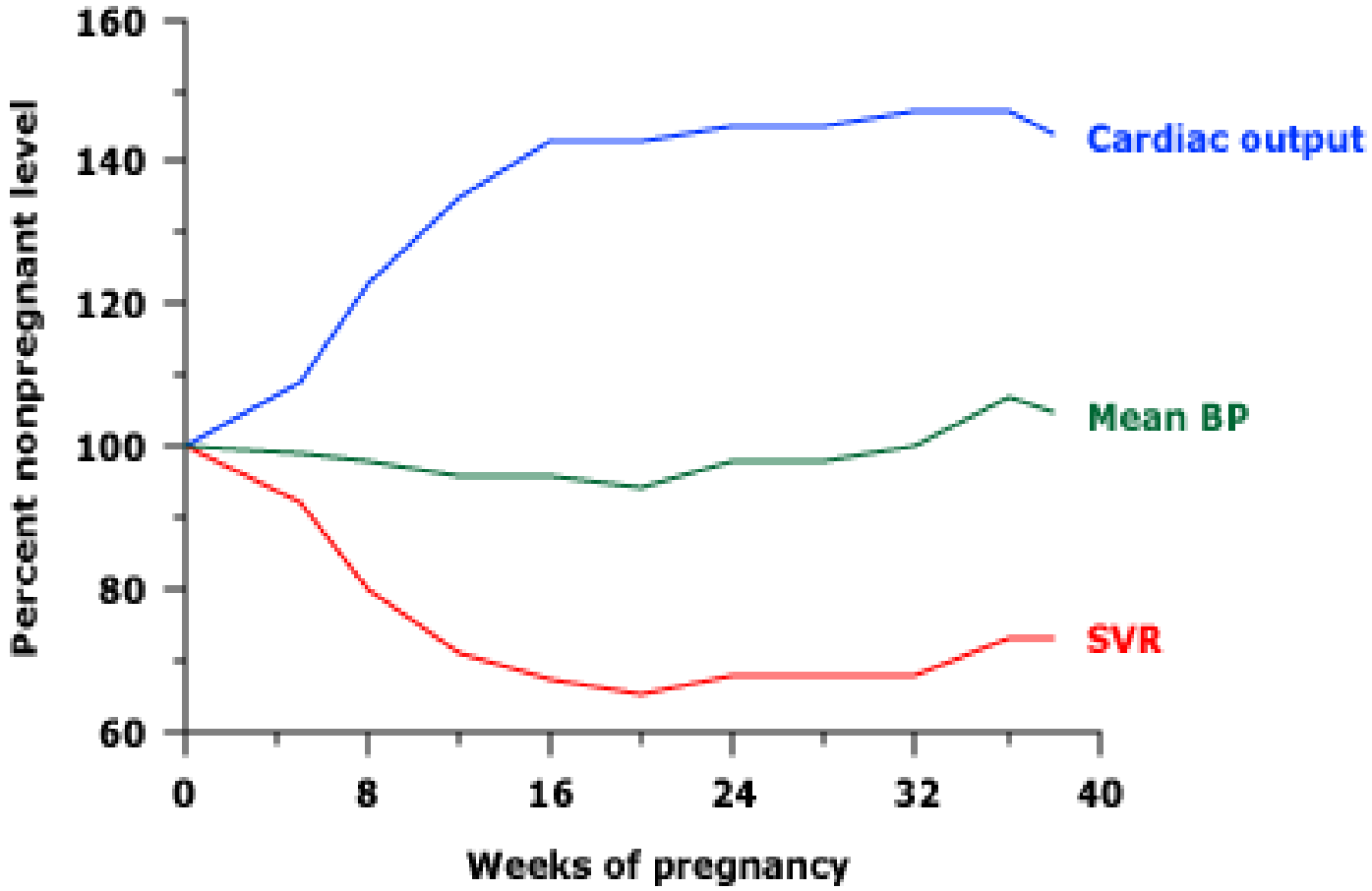
Physiological Adaptations

CardioVascular

- Stroke volume ↑ (30%)
- Heart rate ↑ (15%)
- SVR ↓ (5%)
- Systolic BP ↓ (10 mmHg)
- Diastolic BP ↓ (15 mmHg)
- Mean BP ↓ (15 mmHg)
- O2 Consumption ↑ (20%)



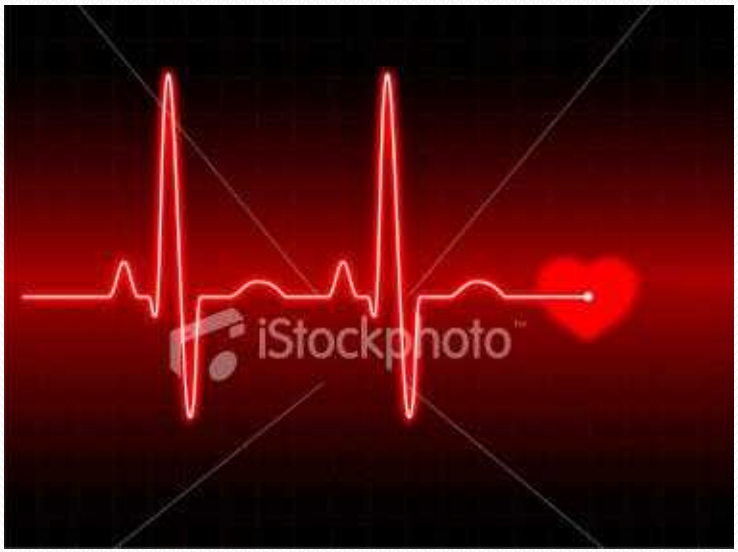
CardioVascular



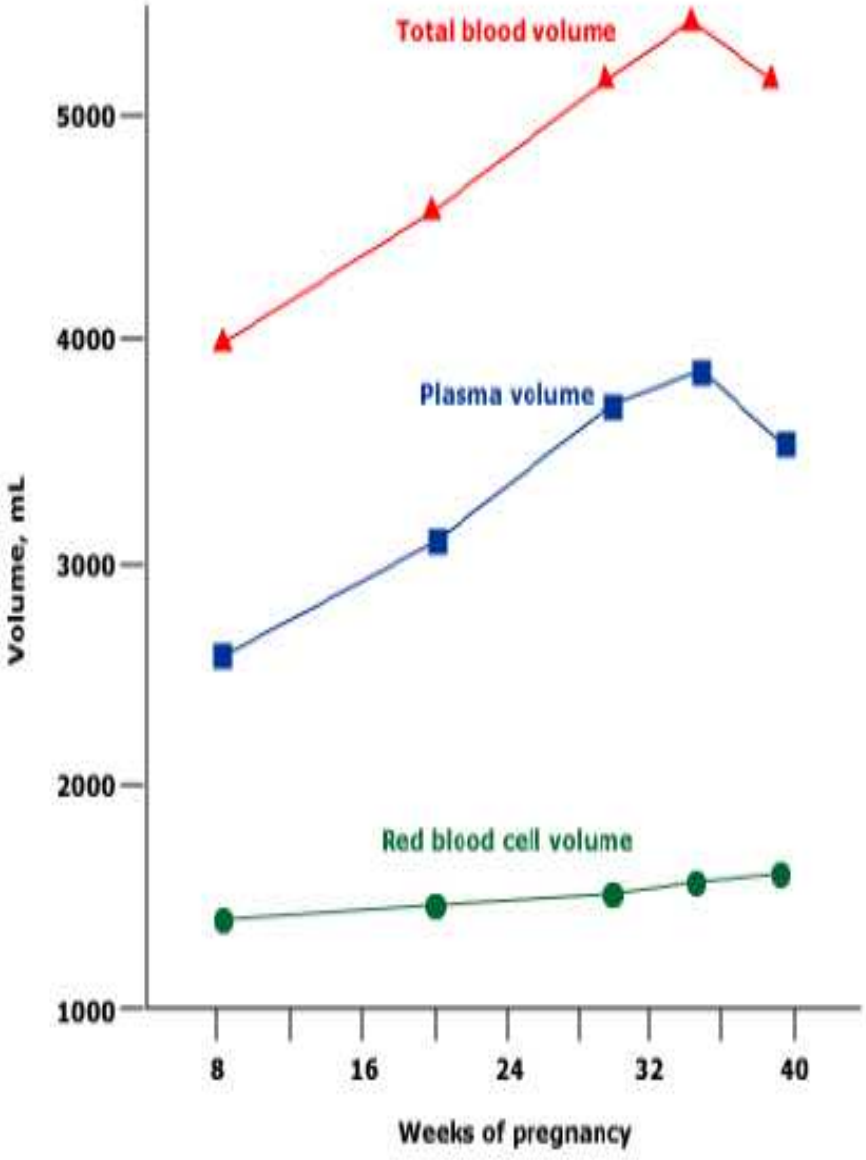
Change in CV System	Results/requirements
↑ blood volume 2600 to 3800 ml	Raised from early in pregnancy [8-9 wks)
↑ sel drh merah 1400 to 1650-1800 ml	Needs ready iron supply for optimal rise
↓ Hb and haematocrit	physiological anaemia of pregnancy
↑ resting cardiac output 4.5 to 6 l/min	Early rise maintained through pregnancy and labour. ↓ in puerperium
↑ heart rate 80 to 90 bpm	Needs ↑ stroke volume
↑ oxygen consumption by 30-50 ml/min	↑ cardiac output needed to distribute this
↓ in total peripheral resistance (TPR] to parallel rise in CO	Vasodilatation - also allows dissipation of heat produced by the fetus
Mid trimester ↓ blood pressure due to greater drop in TPR than ↑ in CO	Need to know blood pressure (BP) in first trimester when assessing a ↑ BP in preg
↑ incidence of heart murmurs due to ↑ flow across valves	Need to distinguish pathology from functional murmurs -consider antibiotics in labour for structural heart disease

ECG Changes

- Increased heart rate (↑ 15%)
- 15° left axis deviation.
- Inverted T-wave in lead III.
- Q in lead III & AVF
- Unspecific ST changes

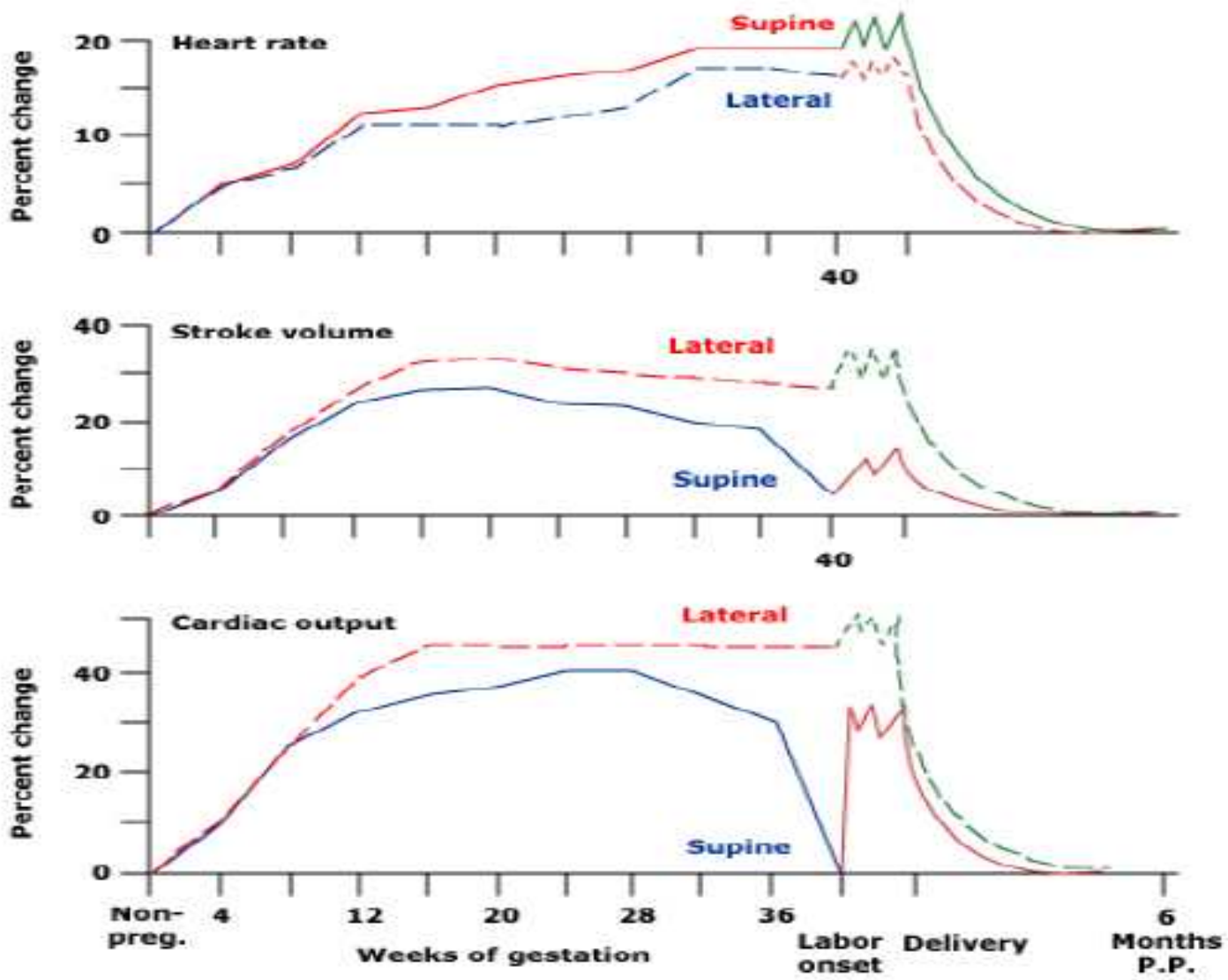


Hematological changes of normal pregnancy

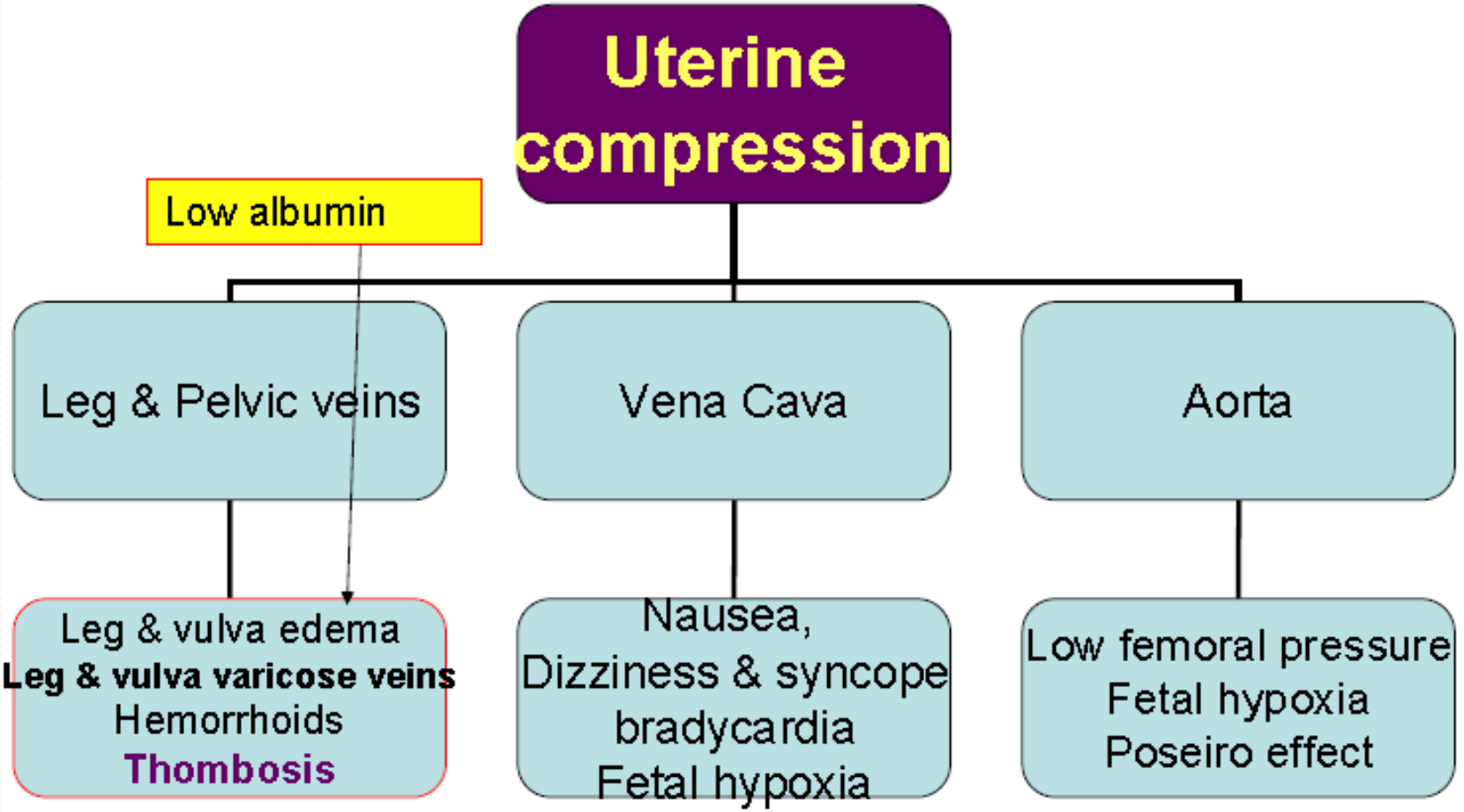


- **Total Blood volume ↑(40% -45 %) ➔ ok pe ↑ plasma + erytr**
- **Plasma volume ↑(± 50 %).**
- **Erythrocytes ↑ 20 – 35 %.**
- **PSEUDO ANEMIA**
- **Proteksi ibu dan fetus ktk terjadi ketdk seimbangan venous return ➔ posisi supinasi dan mengejan**
- **Melindungi dr dampak kehilangan drh saat partus**

Sistem Hemodinamik Pada Kehamilan



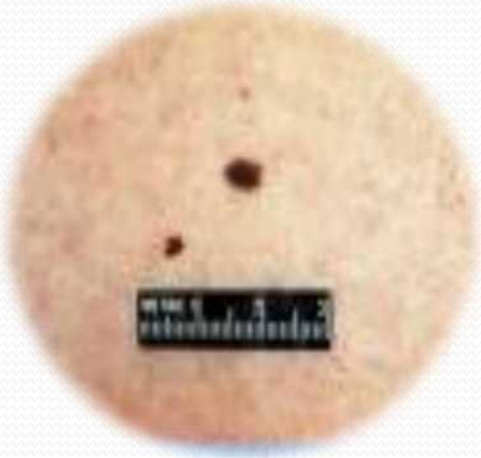
Mechanical Circulatory Effects



Vascular

- Vascular spider

  Minute, red elevations on the skin common on the face, neck, upper chest, and arms, with radicles branching out from a central lesion. The condition is often designated as nevus,angioma, or telangiectasis.



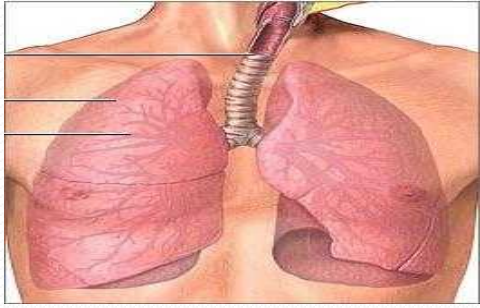
- Palmar erythema .

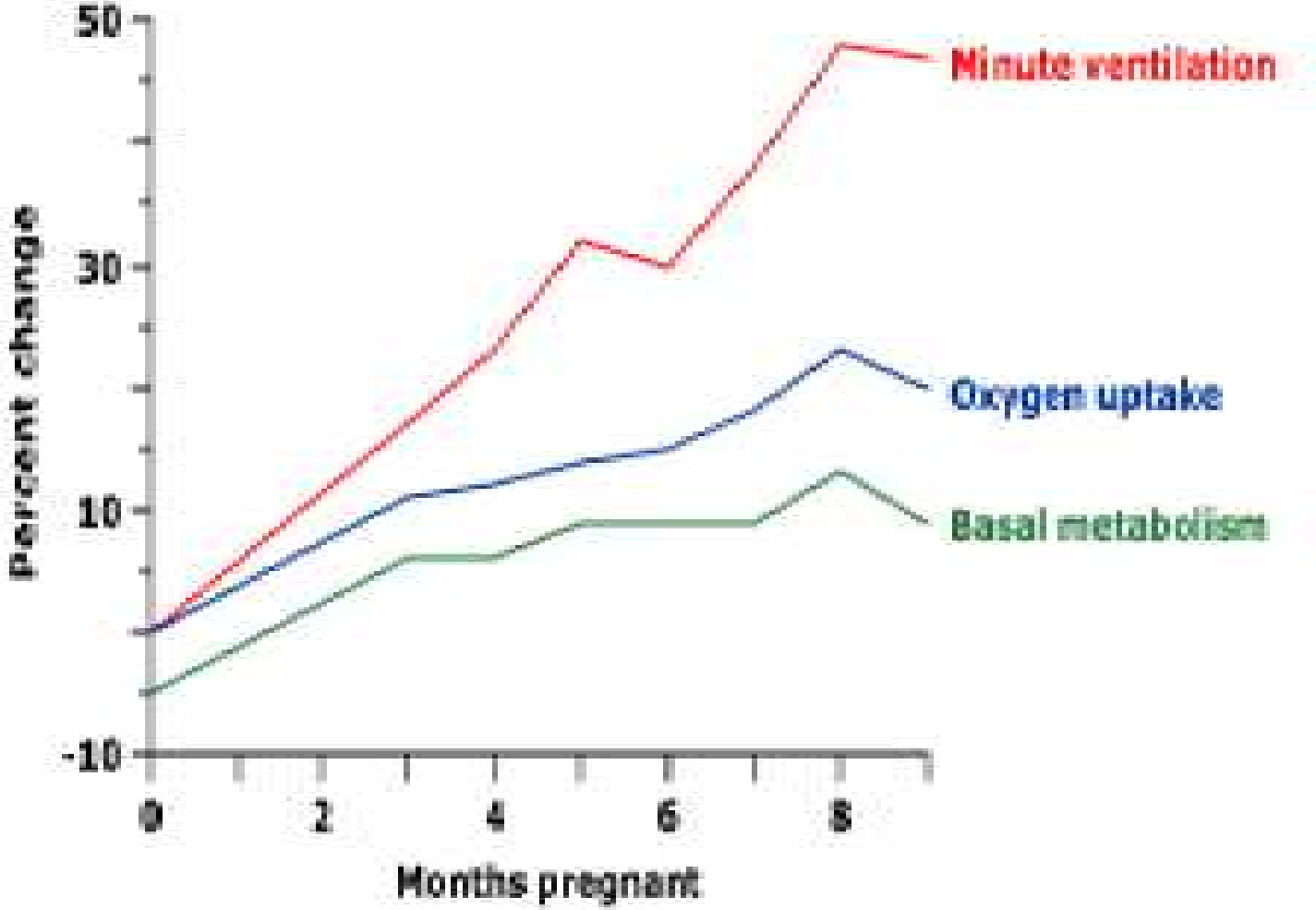
- The two conditions are of no clinical significance and disappear in most women shortly after pregnancy(estrogen)

Respiratory

- **Mechanical effect of enlarging uterus**
- **Increased oxygen consumption**
- **Stimulant effect of Progesterone**
- **Increased minute volume thru tidal volume**
- **Hyperventilation results in a reduced maternal PCO2 (respiratory alkalosis) facilitates transport of CO2 from fetus to mum but *impair release of oxygen from* maternal blood to the fetus (Bohr effect).**
- **Increase in blood pH, stimulates increase in 2,3- diphospho-glycerate in maternal RBC. This counteracts the Bohr effect by shifting the oxygen dissociation curve back to the right, facilitating oxygen release to the fetus**
- **Dyspnea in 60-70%**

Pulmonary Function





Pulmonary Function

- FRC ⬇ approximately 20 percent during the latter half of pregnancy, due to a decrease in both expiratory reserve volume and residual volume & due to the elevated diaphragm
- Lung compliance remains unaffected.
- Airway conductance is increased and total pulmonary resistance is reduced, possibly as a result of progesterone action.

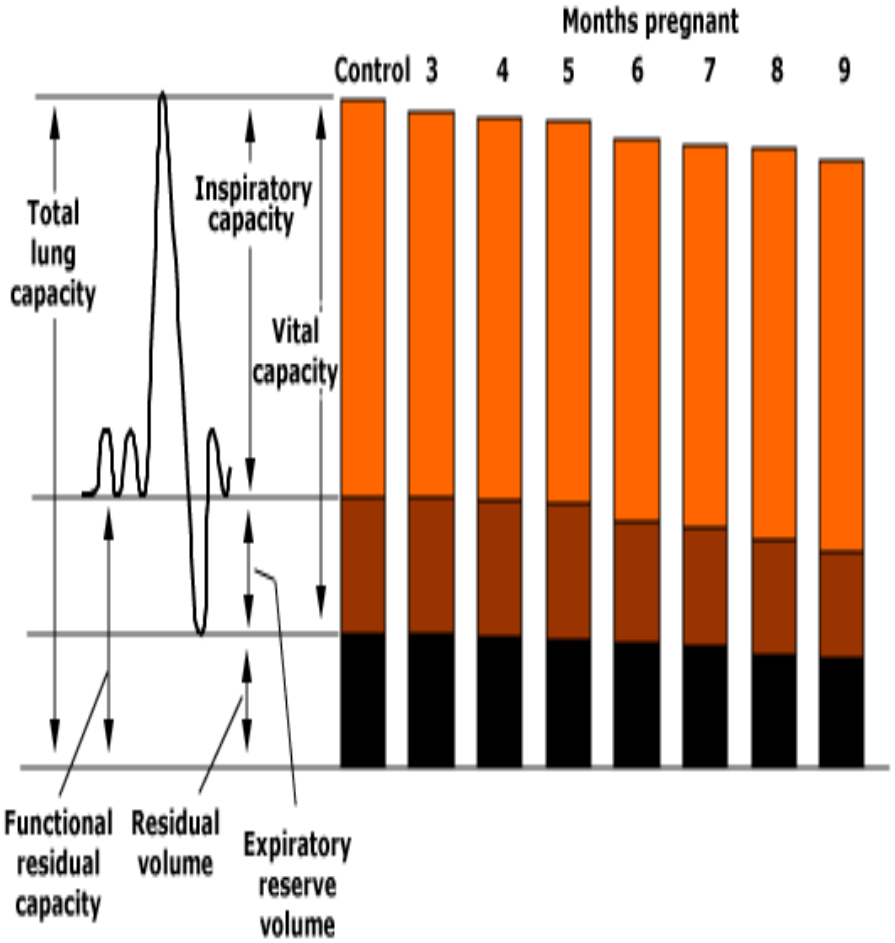
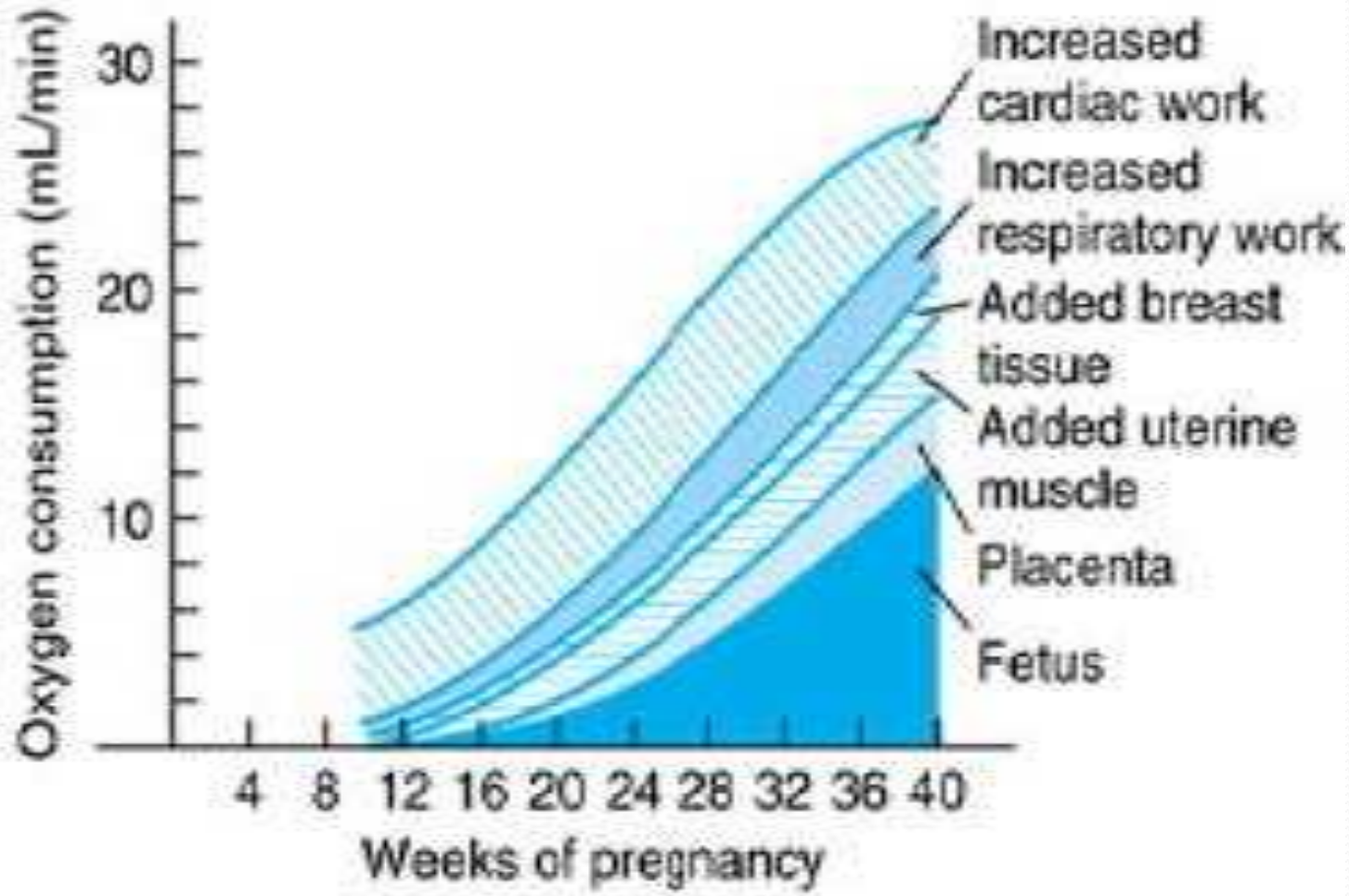


TABLE Ventilatory Function in Pregnant Women Compared with the Postpartum Period

	During Pregnancy			
Factor	***10 Weeks***	***24 Weeks***	***36 Weeks***	**Postpartum *6-10 Weeks***
Respiratory rate	15-16	16	16-17	16-17
Tidal volume (mL)	600-650	650	700	550[a]
Minute ventilat. (L)			10.5	7.5[a]
Vital capacity (L)	3.8	3.9	4.1	3.8
Insp. capacity (L)	2.6	2.7	2.9	2.5
Expir. reserve vol (L)	1.2	1.2	1.2	1.3
Residual volume (L)	1.2	1.1	1.0	1.2[a]

[a] *Significant increase or decrease compared with pregnant women.*

Components of increased oxygen consumption during pregnancy.



Gastrointestinal Changes

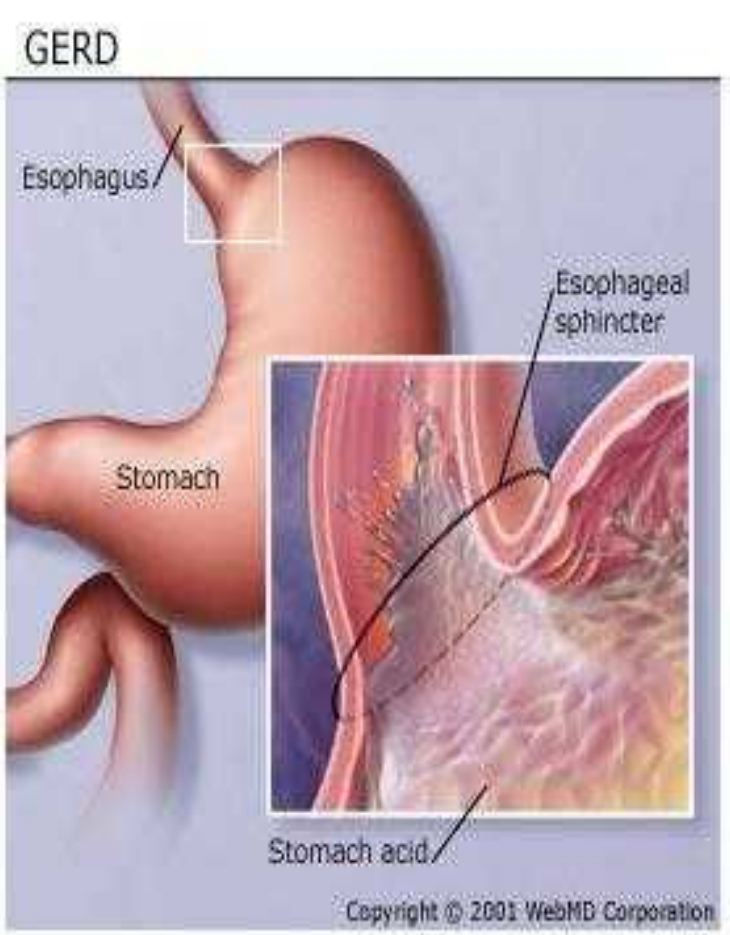
- Morning sickness
- Stomach and intestines are displaced,
- Appendix is displaced upwards
- Delayed gastric emptying increase regurgitation risk
- Esophageal pressures are lower and intragastric pressures higher
- Esophageal peristalsis is lower
- Gums hyperemic and softened
- Impaired gallbladder contraction
- Intrahepatic cholestasis

Nausea & Vomiting

Gastrointestinal

- Due to relaxation of smooth muscle & high progesterone levels of pregnancy.

- Pyrosis (heartburn) is common & is caused by reflux of acidic secretions into lower esophagus & decreased tone of sphincter.

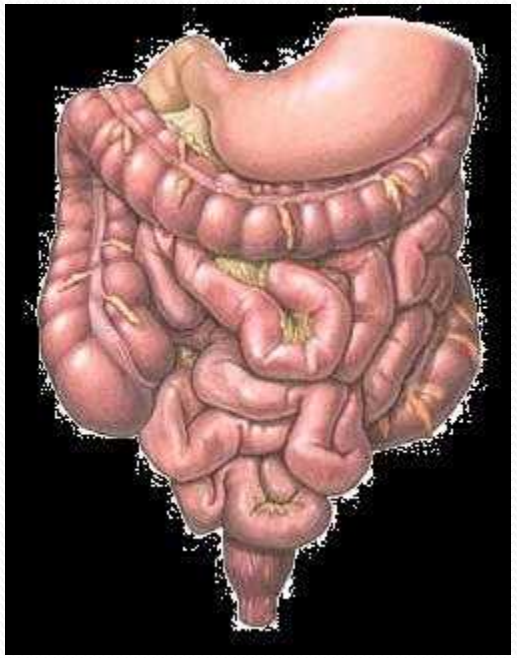


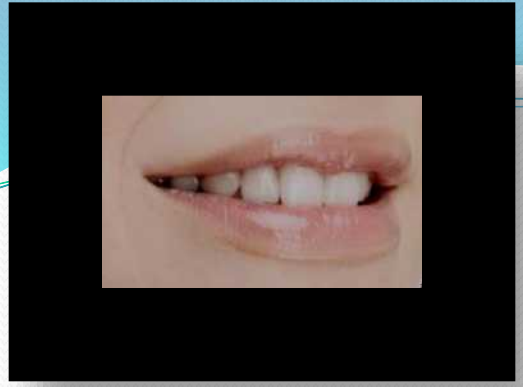
Gastrointestinal

- Slight reduction in gastric secretion and gastric motility result in slow emptying and may lead to nausea.
- ↓ motility in small intestine lead to ↑ time of absorption
- ↓ motility of large intestine lead to ↑ time for water absorption but also tends to induce constipation

Gastrointestinal

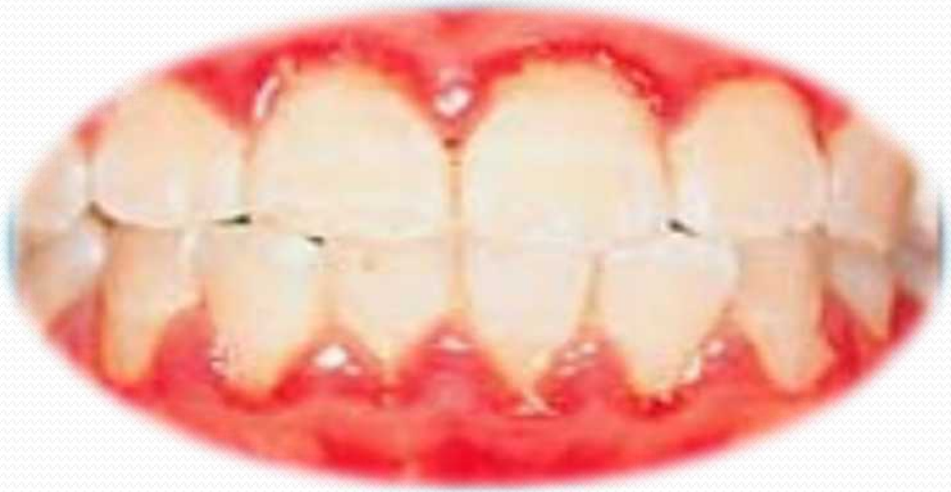
- Growth of conceptus and uterus leads to increase appetite and thirst.
- In late pregnancy pressure of the uterus reduces capacity for large meals leads to frequent small snacks





Dental

- Gums may become hyperemic & soft during pregnancy (epulis gravidarum) and may bleed if mildly traumatized as with a toothbrush ➔ regresses spontaneously after delivery



Liver and Gall bladder

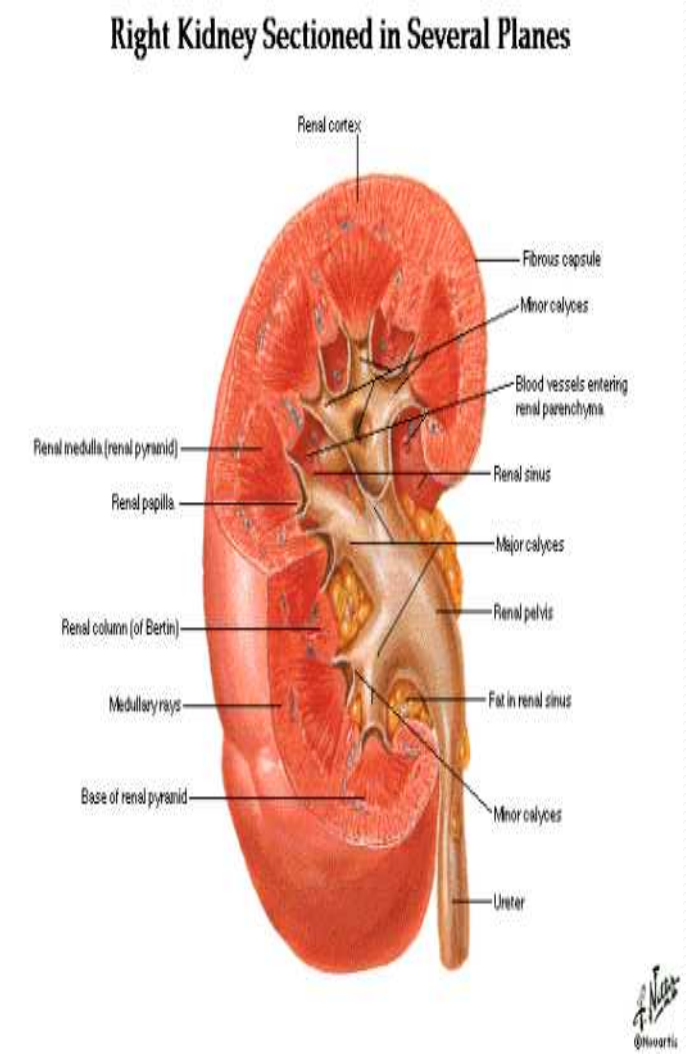
- **Liver function tests**
  - Serum alkaline phosphatase ⇑
    - Placental production – heat stable
  - Serum aminotransferase – unchanged
  - Serum bilirubin – unchanged
  - Serum albumin ⇓
  - Lipids – major increase ⇑ ⇑ ⇑

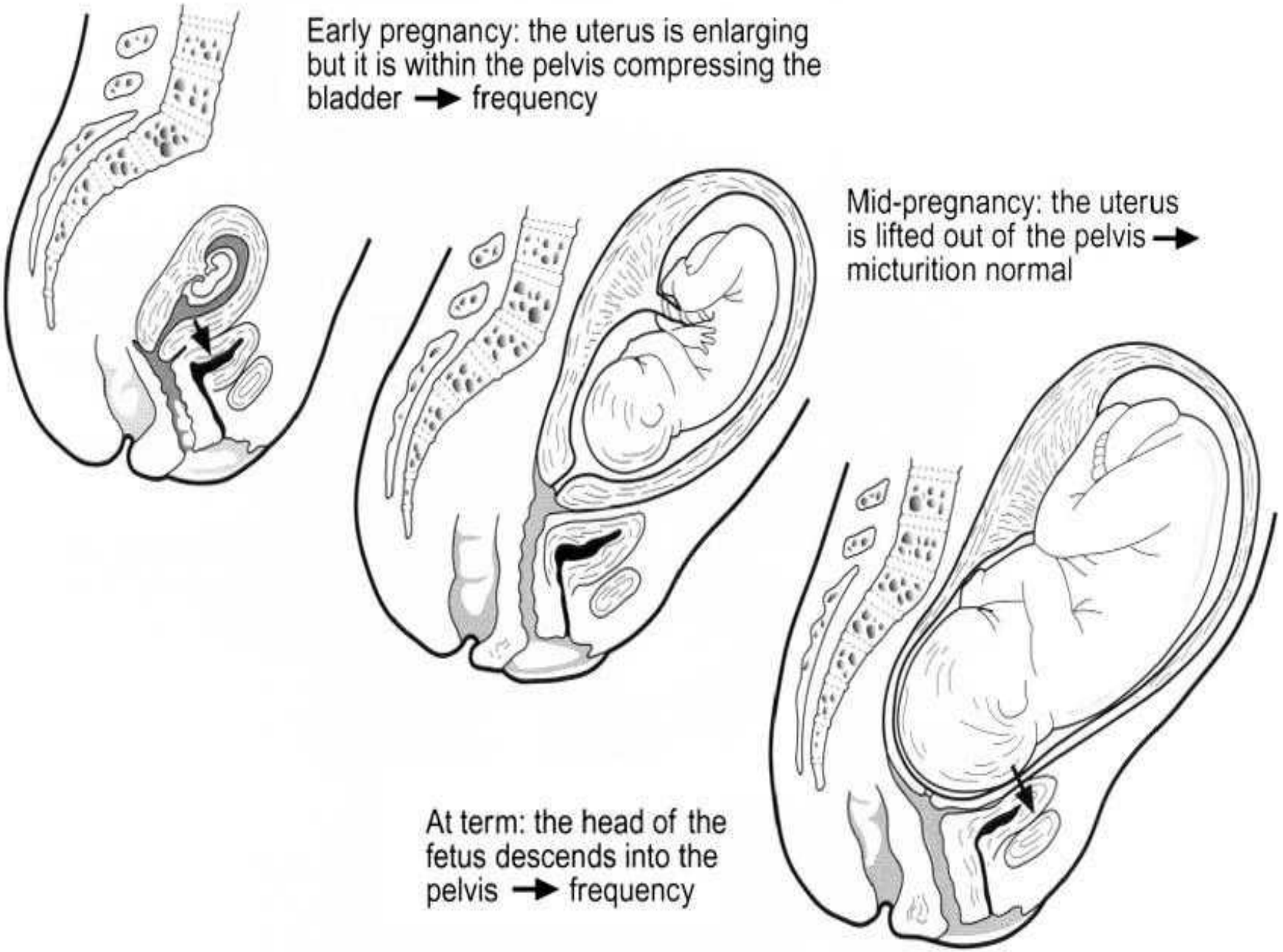
- **Gall bladder**
  - ⇓ motility and delayed emptying
  - Fasting and residual bile volume ⇑

"fat fertile females" predisposed to gall stone formation

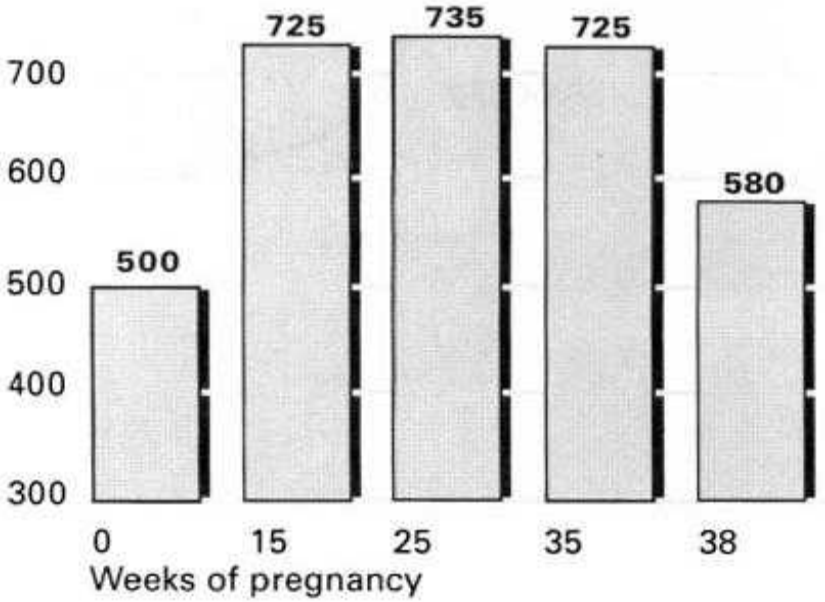
Urinary system

- Perubahan pd ginjal & ureter ➔ Hydronephrosis dan hydroureter ringan.
- Residu urine me ⬆ ➔ predisposisi UTI.
- Sering BAK di trim 1 dan 3 ⬆

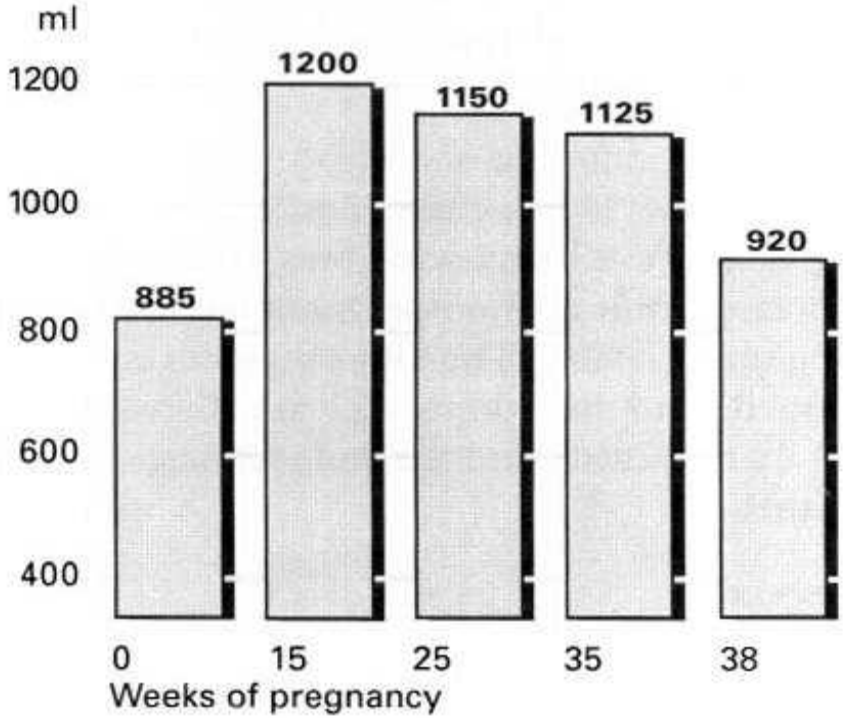



Early pregnancy: the uterus is enlarging but it is within the pelvis compressing the bladder → frequency
Mid-pregnancy: the uterus is lifted out of the pelvis → micturition normal
At term: the head of the fetus descends into the pelvis → frequency

Urinary system



Renal plasma flow per minute is greatly increased



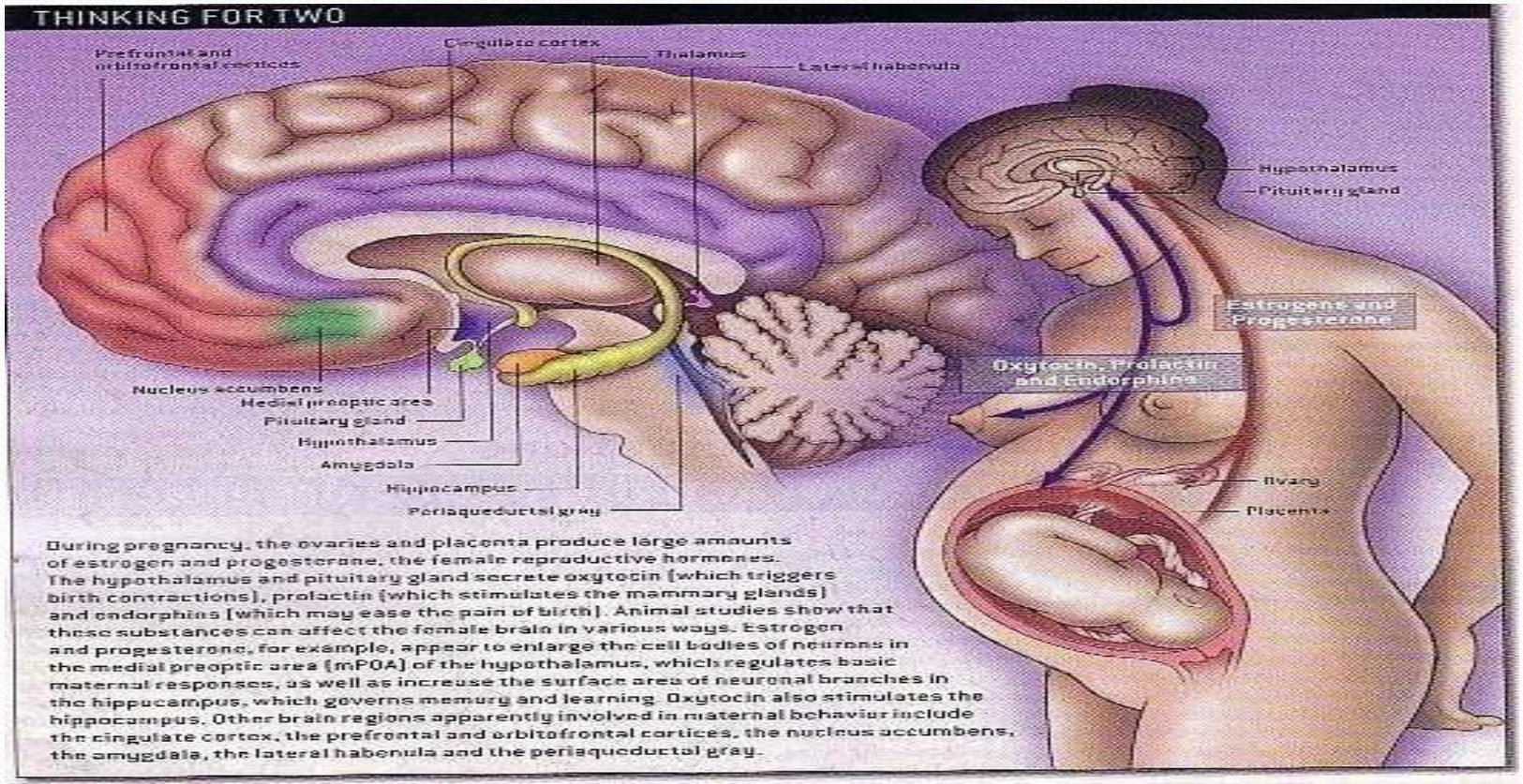
Total renal blood flow runs almost parallel with plasma flow but with increasing haemodilution the red cell volume/dl decreases and this alters the figures

Renal Changes in Normal Pregnancy

Increased renal size	Renal length 1 cm greater on Xray	Postpartum decreases in size mistaken for parenchymal loss
Dilatation of pelves, calyces, and ureters	Resembles hydronephrosis on ultrasound or IVP (more marked on right)	mistaken for obstructive uropathy; retained urine leads to collection errors; upper UTI more virulent; "distention syndrome" elective pyelography at least 12 weeks postpartum
Increased renal hemodynamic	Glomerular filtration rate and renal plasma flow up 50%	Serum creatinine and BUN decrease protein, AA, & glucose excretion increase
Changes in acid–base metabolism	Renal bicarbonate threshold decreases; progesterone stimulates respiratory center	Serum bicarbonate and Pco2 are 4–5 mEq/L and 10 mm Hg lower, a Pco2 of 40 mm Hg represents CO2 retention
Renal water handling	Osmoregulation altered: osmotic thresholds for AVP release and thirst decrease; hormonal disposal rates increase	Serum osmolality decreases 10 mOsm/L (serum Na 5 mEq/L); increased metabolism of AVP cause transient diabetes insipidus

Neurological

Women often report problems with attention, concentration, & memory throughout pregnancy & early postpartum period



Neurological

- In a longtudinal study done by keenan &colleagues (1998) investigating memory in pregnant women by a matched control group, they found (pregnancy related decline in memory limited to 3rd trimester un attributable to depression ,anxiety ,sleep deprivation or any other physical changes associated with pregnancy

Neurological

- Zeeman and co-workers (2003) used MRI to measure cerebral blood flow across pregnancy in 10 healthy women.
- They found that mean blood flow bilaterally in the middle and posterior cerebral arteries decreased progressively from 147 and 56 ml/min when non pregnant to 118 and 44 ml/min late in the third trimester, respectively.
- The mechanism and clinical significance of this decrease, and whether it relates to the diminished memory observed during pregnancy is unknown.

Musculoskeletal

- Progressive lordosis ➔ compensates for the anterior position of the enlarging uterus.
- Increased mobility of sacroiliac, sacrococcygeal &pubic joints(not correlated to increased levels of maternal estrogen, progesterone & relaxin levels.
- Joint mobility causes low back pain which is bothersome late in pregnancy.

Endocrine system

Pituitary gland

- **Pituitary gland enlarges.**
- **Growth Harmon is marked increase.**
- **Prolacutor Harmon is marked increase.**
- **lipotrophin.**
- **lipotrophin , endorphin and lipotrophin are increased.**

- **There is moderate enlargement of the thyroid gland**

*** T B G ↑**

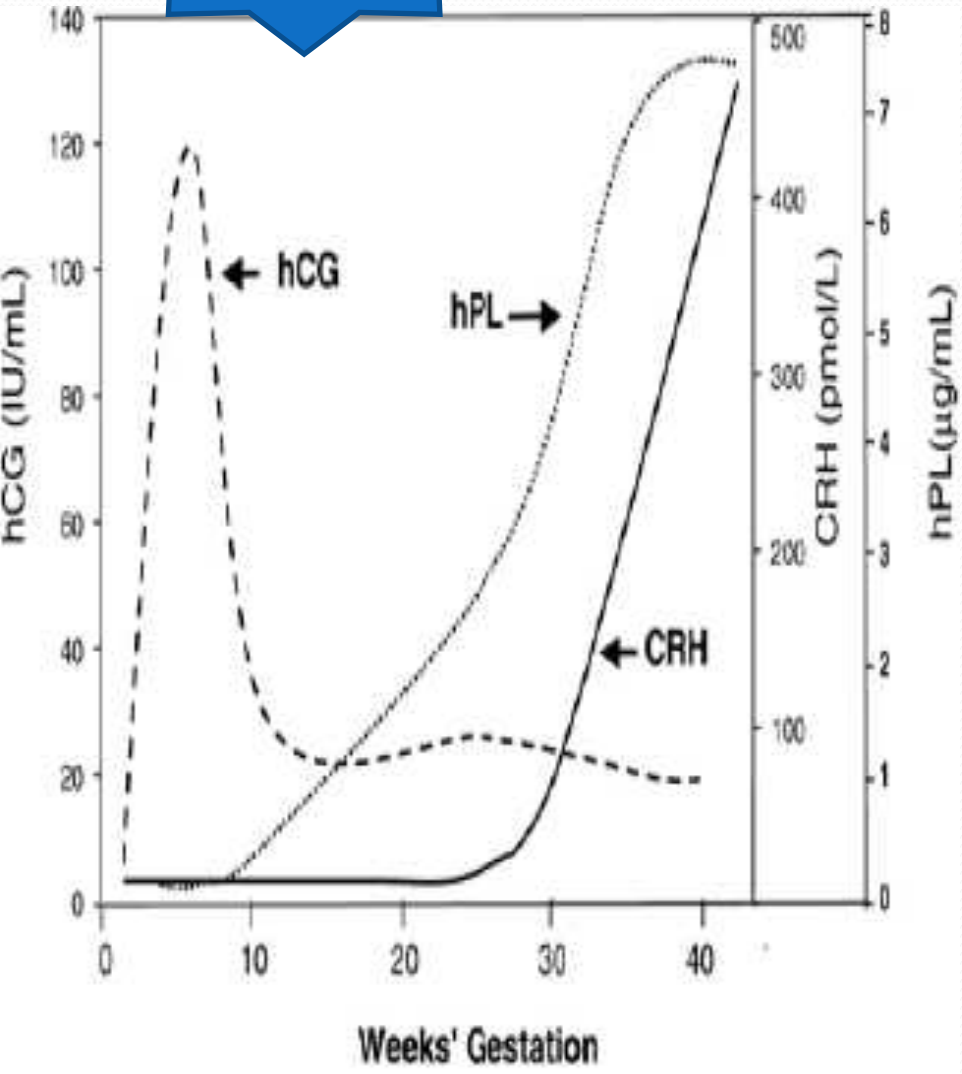
*** T_4 ↑ (but free T_4 no change)**

*** T_3 ↑ (but free T_3 no change)**

*** T S H (no change)**

hCG

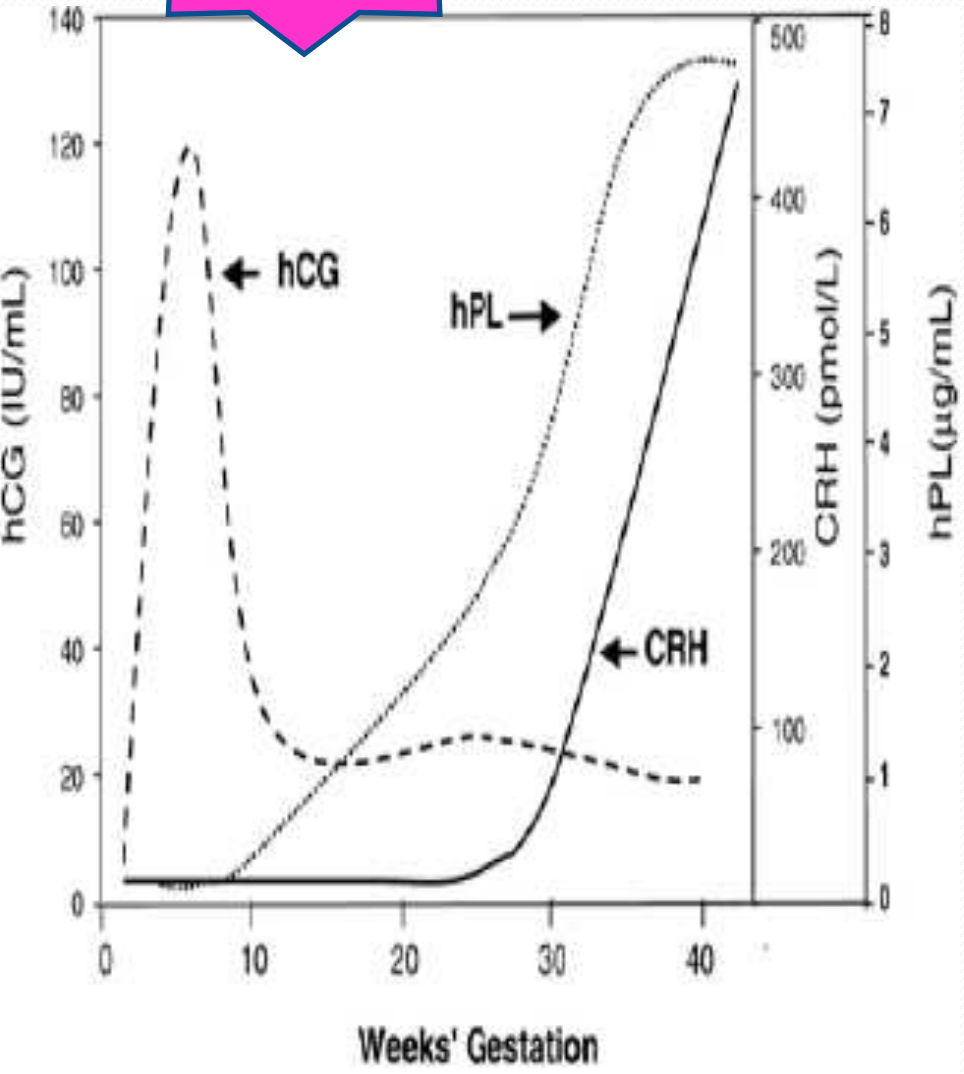
HORMON



- Disekresi oleh trofoblas
- α hCG ≃ LH & TSH
- (+) 8 hr stl fertilisasi, puncak hr ke 60 -90
- Memelihara corp luteum sd UK 8 mgg
- Stimulasi steroid placenta
- Stimulasi produksi :
  - fetal steroid adrenal
  - Fetal testes testosterone

hPL

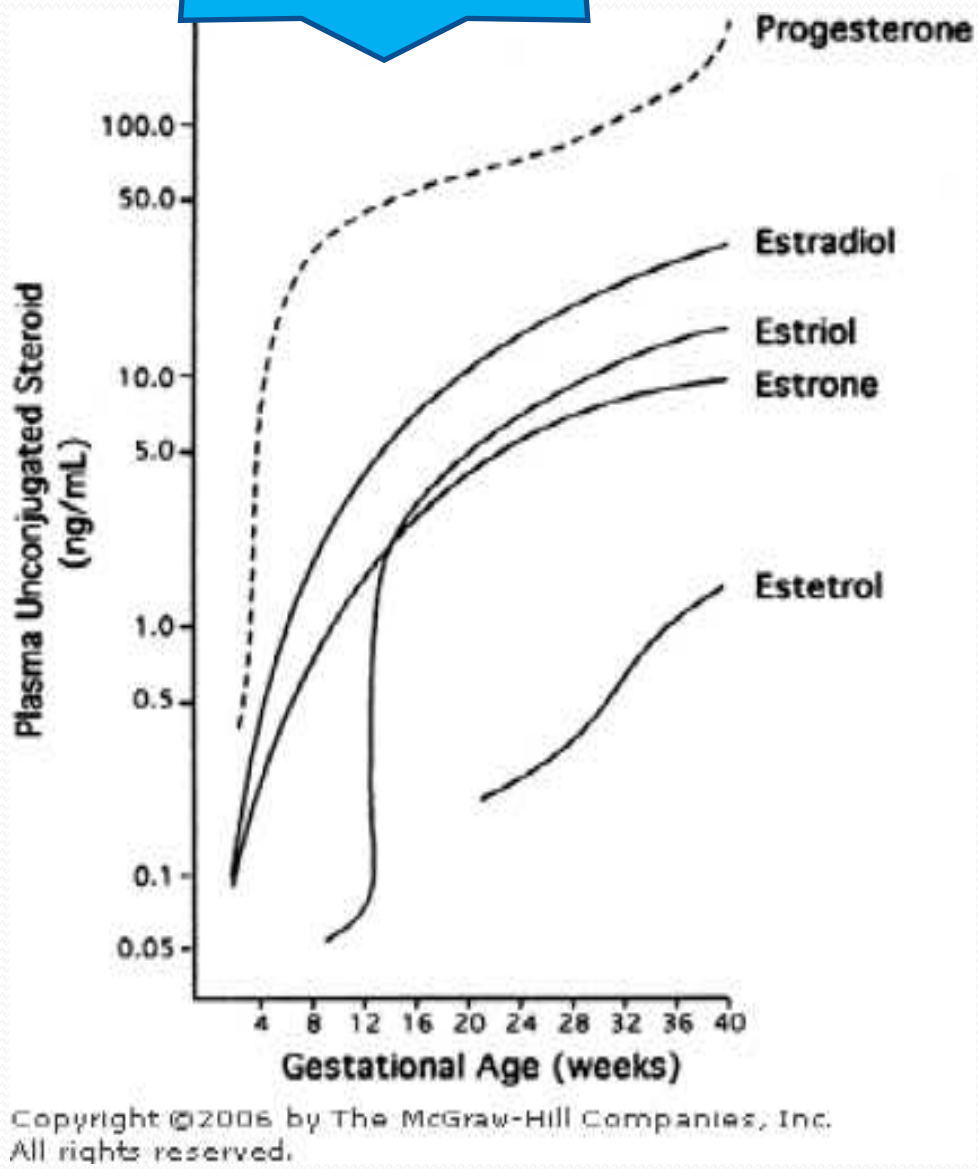
HORMON



- Disekresi oleh sinsitiotrofoblas
- = GH
- Distimulasi insulin & ILGF-1 ; inhibisi oleh PGE2 & PGF2
- Maternal lipolisis & ↑ FFA ➔ energi u/ metab maternal
- Sbg anti insulin ➔ glukosa dan AA di transp ke fetus
- Hormon yg berpotensi angiogenic ➔ bantu pbt vacs fetal

Progest

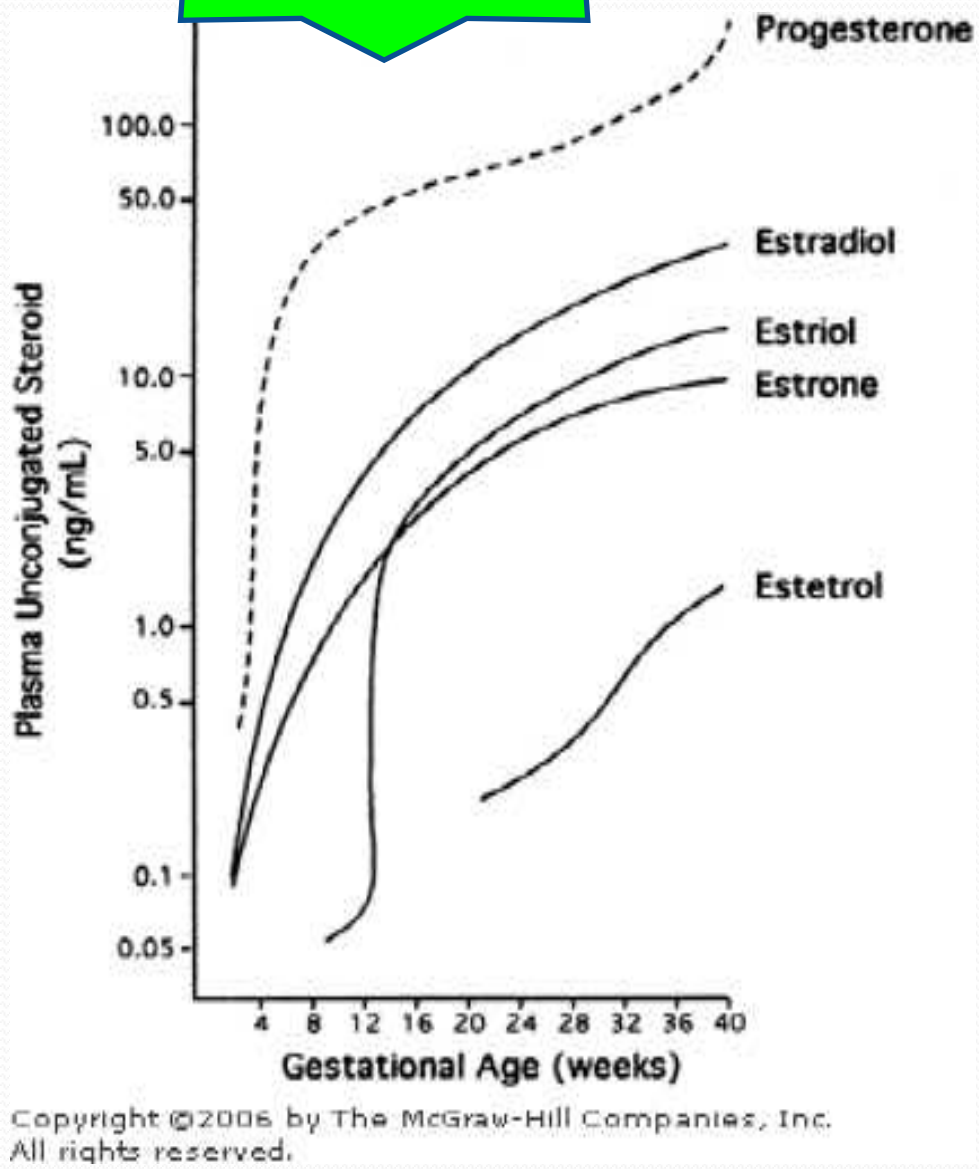
HORMON



- Diproduksi oleh corp luteum sd UK 7-8 mgg kmd o/ plac
- Terus me↑ sp partus
- **PENENANG UTERUS**
- Membantu toleransi imun pd hasil konsepsi

Estrogen

HORMON



- Disekresi oleh ovarium pd awal kehamilan kmd o/ plac
- Berfungsi :
  - Stimulasi uterus
  - Me↑ aliran drh ke uterus
  - Relaksasi lig pelvid ➔ prepare partus
  - Support breast develop
  - Support fetal develop
  - Retensi Na & air me ↑

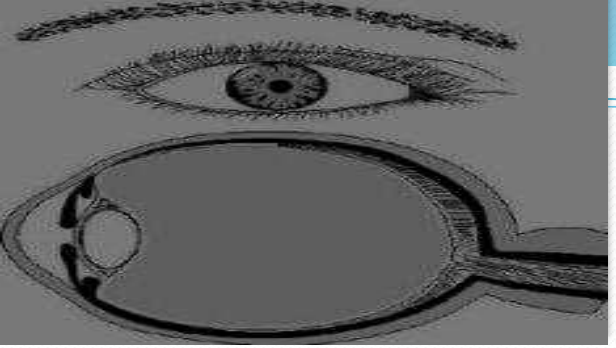
Dermatological

- Reddish, slightly depressed streaks commonly develop in the skin of the abdomen and sometimes in the skin over the breasts and thighs.

Striae gravidarum

Dermatological

- The midline of the abdominal skin “linea alba” becomes markedly pigmented, assuming a brownish-black color to form the linea nigra.
- Irregular brownish patches of varying size appear on the face and neck ➔ chloasma or melasma gravidarum



Ophthalmic

- ↓ intraocular pressure due to ↑ vitreous outflow.
- ↓ corneal sensitivity especially, late in gestation.
- Slight ↑ in corneal thickness thought to be due to edema.
- That's why pregnant women may have discomfort with previously comfortable contact lenses.
- ↑ frequency of Krukenberg spindles (hormonal).
- Visual function remains unaffected except for transient loss of accomodation

Weight Changes

- Metabolic changes, accompanied by fetal growth, result in an increase in weight of around 25% of the non-pregnant weight.

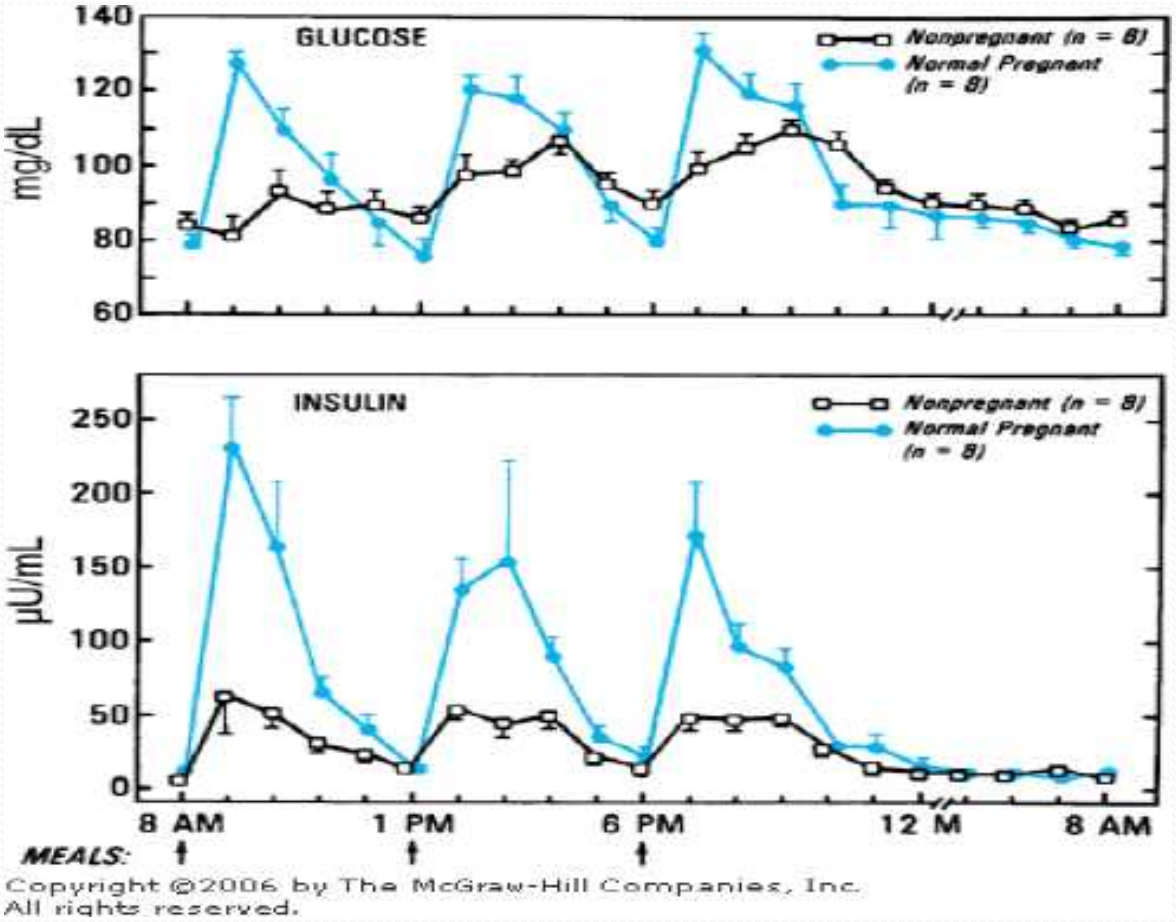
- Approximately 12.5 kg in the average woman.

Weight Changes

- Per(+) bervariasi antar perempuan ➔ per (+) nyata pada trim II ➔ 0.5 kg/mgg
- Mendekati aterm BB sedikit ↓
- Per (+) ok

Fetus	3,400
Placenta	650
Amniotic fluid	800
Uterus	970
Breasts	405
Blood	1,450
Extravascular fluid	1,480
Maternal stores (fat)	3,345
Total	12,500 grams

METABOLIC CHANGES



Increased lipolysis with free fatty acids
Tendency to ketones (accelerated starvation)
FFA for mum, glucose & amino acids for fetus

EARLY PREGNANCY:

↑ Fasting insulin

Fasting glucose ↓

↑ Glyocogen synthesis & storage

Gluconeogenesis ↓

2nd HALF PREGNANCY:

↑ Insulin resistance

↑ post-meal glucose

ANTI-INSULIN EFFECT:

HPL

Cortisol

Cytokines

Progesterone; Estrogens

Water metabolism

Al term

- **The water content of the felus , placenta and amniotic fluid 3.5L.**
- **The increase in the material blood value and the size of the uterus and the breast 3L.**

Protein metabolism

- **500 g of protein is added to the uterus, breasts, maternal blood.**
- **500 g of protein in the foetus and placenta.**

Maternal Albumin

Week of Gestation	10	20	30	40
Serum Albumin g/L	32	29	28	28

Carbohydrate Metabolic

* Pregnancy is potentially diabetogenic. Normal pregnancy is characterized by mild fasting hypoglycemia, postprandial hyperglycemia and hyper insulinemia.

* There is a cell hypertrophy , hyperplasia and hyper secretion (estrogen , progesterone and human placental lactogen).

* cell sensitivity to glucose challenge is increased significantly in normal pregment woman , but that the α cell sensitivity to a glucose stimulus is unaltered.

Mineral Metabolism

- The requirements / iron during pregnancy are considerable are often exceed the amount available.
- Calcium, Magnesium levels
- Serum phosphorus level. No change
- Copper and ceruloplasmi

Acid Base Equilibrium

* The pregnant woman hyper ventilates respiratory alkalosis pco_2 results in minimum increase in blood PH shift oxygen dissociation to the left affinity maternal hemoglobin oxygen (bohr effect).
* Hyperventilation maternal PCO_2 facilitates transport of Co_2 from the ferules.
* PH (minimum) 2,3 diphosphoglycreate in materal RBCS counter the bohr Effect.

Iron metabolism

- Iron stores: the total iron content of normal adult woman ranges from 2 – 2.5 g.
- Iron Requirements normal pregnancy about 1000 mg.
  - 300 mg (to the fetus and placenta)
  - 200 mg (excre ted)
  - 500 mg (for increase in the RBCS)
- So the daily iron requirement 6 – 7 mg / day.

* **The amount of iron absorbed from diet together with that mobilized from stores is usually insufficient to meet the demands imposed by pregnancy.**

Immunological changes

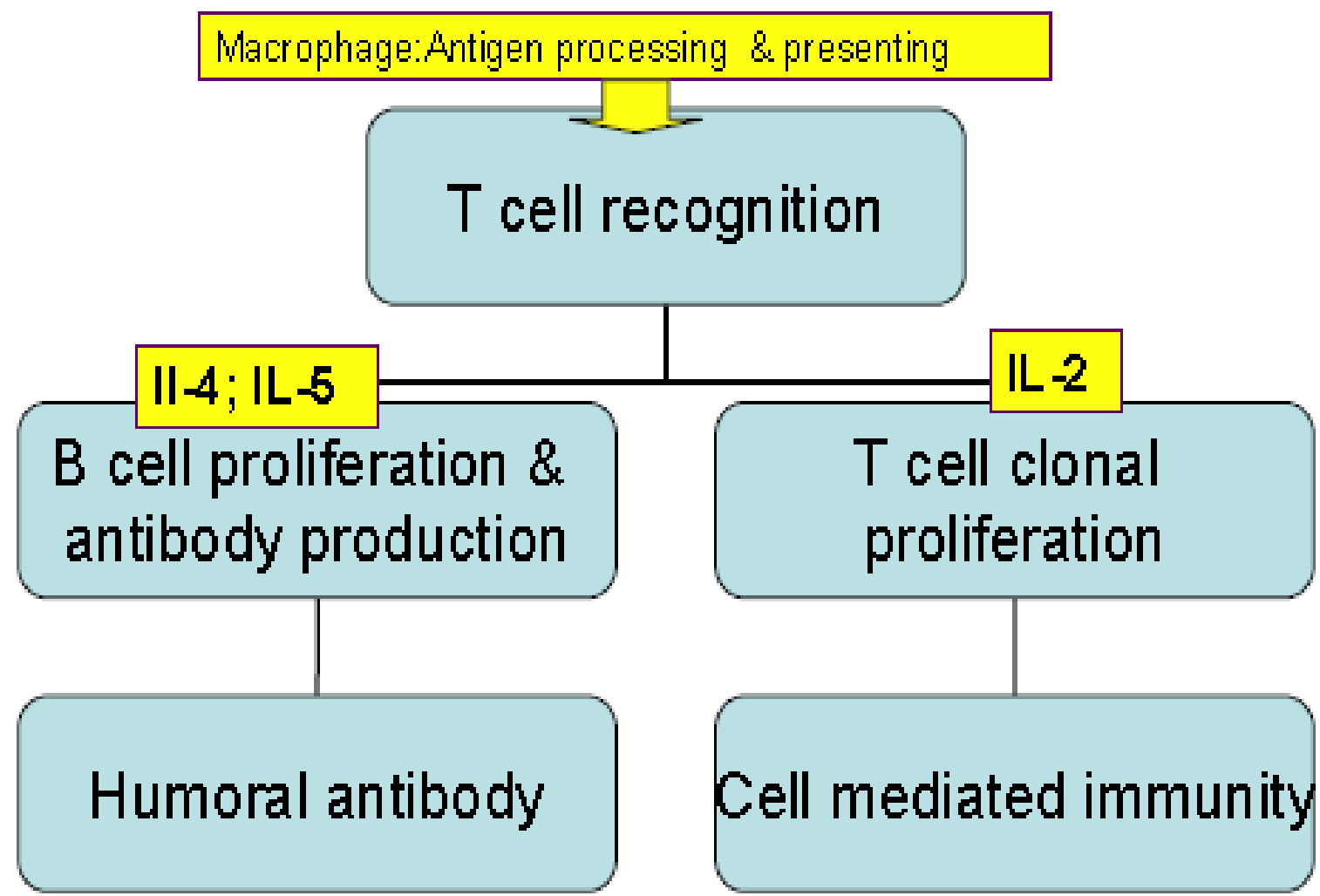
Paradoxes of Pregnancy

- Immunity to sperm and seminal fluid
- How the embryo evades the maternal immune system
- The nature of the materno-fetal immunological interface that allows implantation and growth of the fetus
- Maternal immune response to fetal antigens

Immunological and leukocyte functions

- **In normal pregnancy there is suppression of variety of hum oral and cellularly mediated immunological**
- **Depressed in leukocyte functions**
- **Number of leukocyte count 5000 – 12000 ml**
- **C – reactive protein ↑**
- **The activity of leukocyte alkaline phosphates is ↑.**

ADAPTIVE IMMUNITY



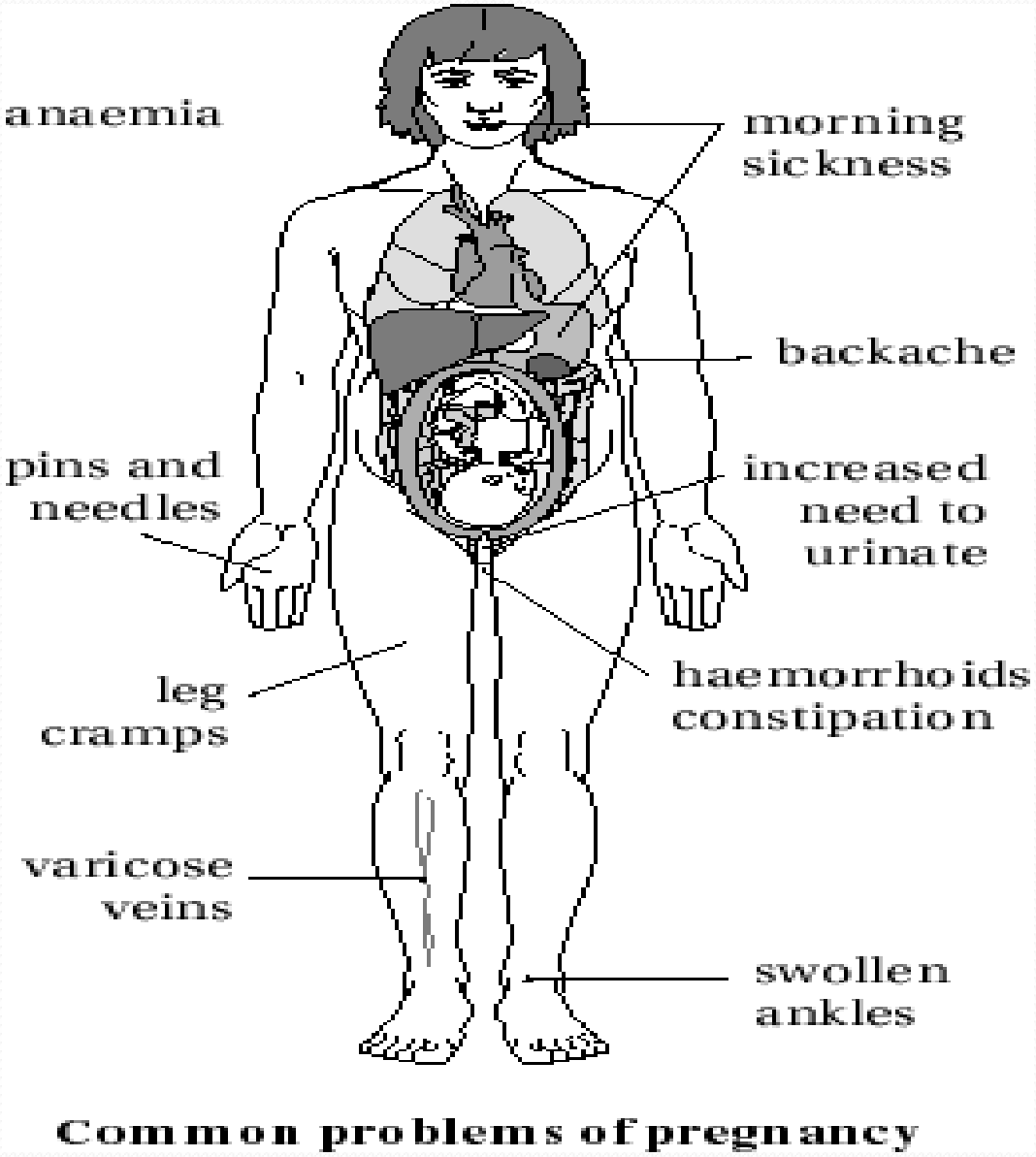
Lederman, RP. Psychosocial Adaptation in Pregnancy, 2nd Ed. 1996

- Developmental Tasks of Pregnancy
  - acceptance of pregnancy
  - identification with motherhood role
  - relationship to the mother
  - relationship to the husband/partner
  - preparation for labor
  - processing fear of loss of control & loss of self esteem in labor

Adolescents: PSYCHOSOCIAL FACTORS THAT INFLUENCE TRANSITION TO MOTHERHOOD (kaiser, 2004)

- Gaining acceptance of the pregnancy in the family system
- Awareness of the need to develop a sense of responsibility
- Planning for a future that includes the baby
- Viewing self as a mother

Changes in Pregnancy



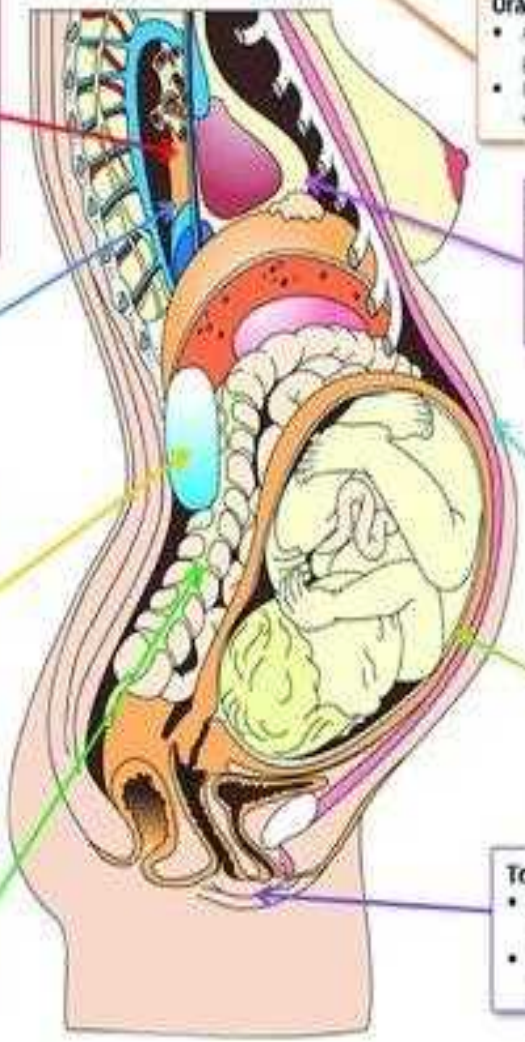
Impact of pregnant physiology

Cardiac
- Increased heart rate (Clark et al., 1989)
- Increased renal and uterine blood flow (Frederiksen, 2001)
- Increase in total body water, blood volume and capillary hydrostatic pressure
- → Clinically this could necessitate higher initial and maintenance dose of hydrophilic drugs to obtain therapeutic plasma levels
- Reduced serum albumin protein concentrations
- → Increase in unbound active drug

Respiratory
- Increased vascularity and edema of upper respiratory mucosa (Taylor, 1961)
- → Inhaled medications may be more readily absorbed by pregnant patients (Pacheco et al., 2013)

Renal
- Dilation of urinary collecting system and urinary stasis
- → Predisposes pregnant women to UTIs (Rasmussen and Nielsen, 1988)
- Increased renal blood flow and glomerular filtration rate
- → Increase renal clearance and elimination rates and reduce drug half-lives (Pacheco et al., 2013; Davison and Dunlop, 1980)
- Sodium and water retention leading to volume expansion
- → Reduction in serum concentrations of hydrophilic drugs

Gastrointestinal
- Delayed gastric emptying and prolonged small bowel transit time (Cappell and Garcia, 1998)
- → Alter bioavailability of oral drugs (Parry et al., 1970)
- Increase in gastric pH and reduced gastrointestinal motility
- → Reduce or delay absorption of drug



Route of phage administration

Oral
- Activity on gastrointestinal and potential genitourinary pathogens
- Issue of stability in low pH acidic stomach environment (Jończyk et al., 2011)

Inhaled
- Activity on respiratory bacterial pathogens
- Large surface area for absorption
- Phage stability and titre when aerosolised may vary (Leung et al., 2016)

Intravenous
- Circulation to reach a number of body sites
- Greater immune exposure can result in antibody formation and clearance unless target bacteria are found (Speck et al., 2016)

Placental phage transfer
- Placental transfer of phage reported, however, this may be phage-specific (Kulanga ra et al., 1959; Uhr et al., 1963)
- Treatment of the neonate in utero may be a possibility.

Topical or Localised
- Provides high titre dose to site of infection for rapid clearance
- Suitable for localised infections and reduces impact of immune clearance (Dabrowska et al., 2005)

بسم الله الرحمن الرحيم

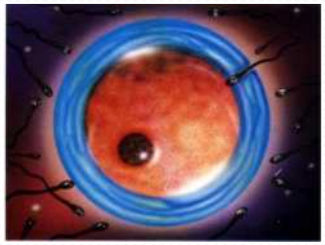
{يَاأَيُّهَا النَّاسُ إِنْ كُنْتُمْ فِي رَيْبٍ مِنْ
الْبَعْثِ فَإِنَّا خَلَقْنَاكُمْ مِنْ تُرَابٍ ثُمَّ مِنْ
نُطْفَةٍ ثُمَّ مِنْ عَلَقَةٍ ثُمَّ مِنْ مُضْغَةٍ مُخَلَّقَةٍ
وَغَيْرِ مُخَلَّقَةٍ لِنُبَيِّنَ لَكُمْ وَنُقِرُّ فِي
الأَرْحَامِ مَا نَشَاءُ إِلَى أَجَلٍ مُسَمًّى ثُمَّ
نُخْرِجُكُمْ طِفْلاً ثُمَّ لِتَبْلُغُوا أَشُدَّكُمْ
وَمِنْكُمْ مَنْ يُتَوَفَّى وَمِنْكُمْ مَنْ يُرَدُّ إِلَى
أَرْذَلِ الْعُمُرِ لِكَيْلاَ يَعْلَمَ مِنْ بَعْدِ عِلْمٍ
شَيْئًا وَتَرَى الأَرْضَ هَامِدَةً فَإِذَا أَنزَلْنَا
عَلَيْهَا الْمَاءَ اهْتَزَّتْ وَرَبَتْ وَأَنْبَتَتْ مِنْ
كُلِّ زَوْجٍ بَهِيجٍ} (الحج/5).

KESEMPURNAAN CIPTAAN

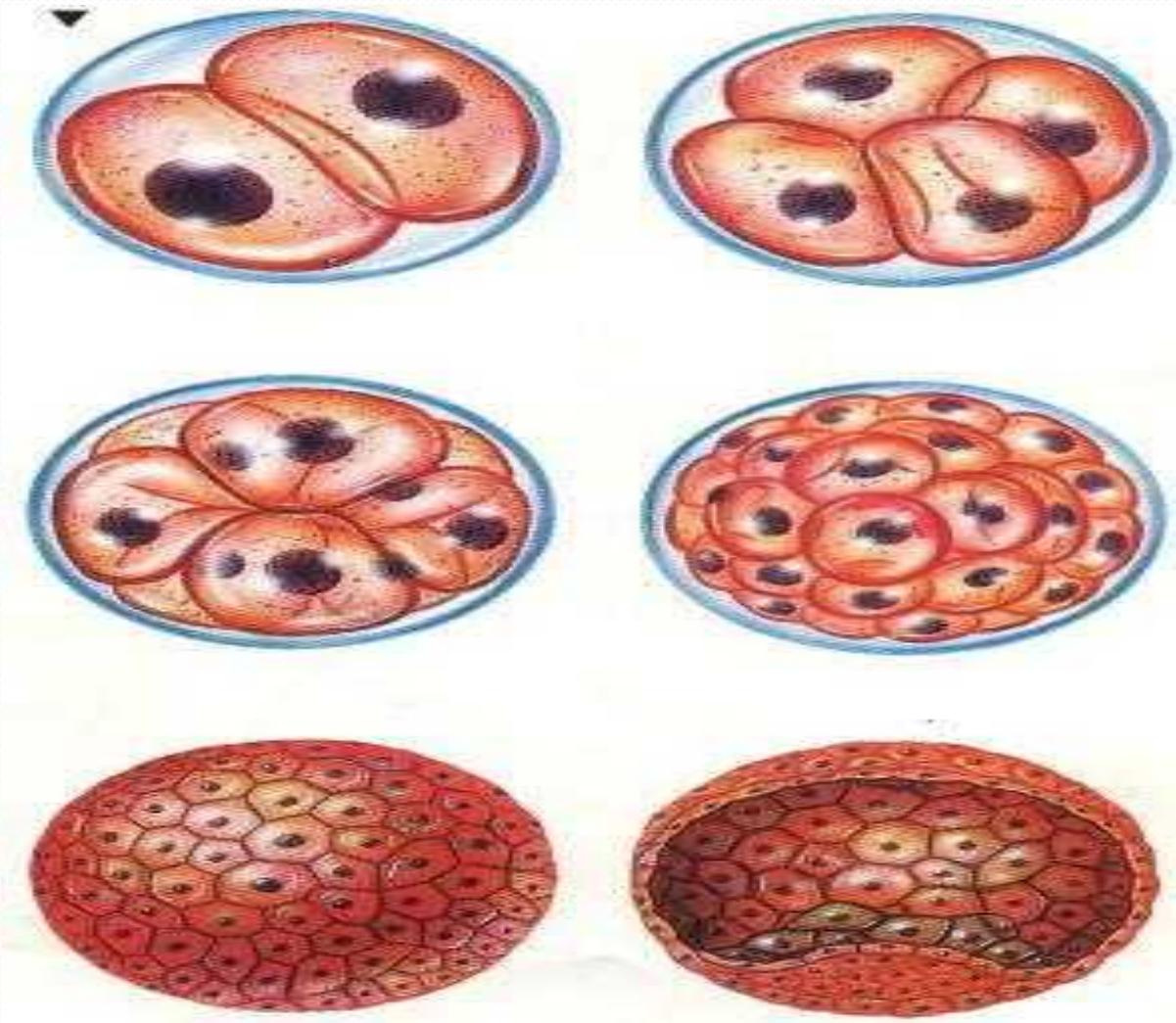
QS AL HAJJ : 5

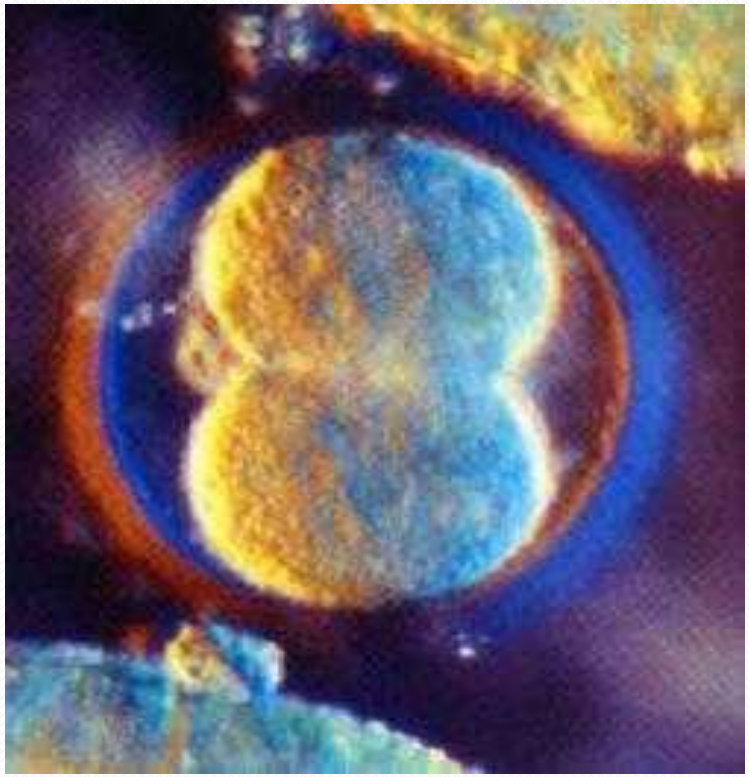
Hai manusia bila kau dalam keraguan ttg hari kebangkitan dr kubur maka ketahuilah ssgnya Kami tlh menciptakan kamu dr tanah, kmd dari setetes mani, kmd dari segumpal darah, kmd, dari segumpal daging yg. sempurna dan t` sempurna agar Kami jelaskan pdmu & Kami tetapkan dlm rahim sp. Waktu yg sudah ditentukan kmd. Kami keluarkan kamu sbg. bayi. kmd berangsur-angsur sp. Dws, dan diantara kamu ada yg. Diwafatkan dan ada yang dipanjangkan umurnya sampai pikun……

SETETES MANI

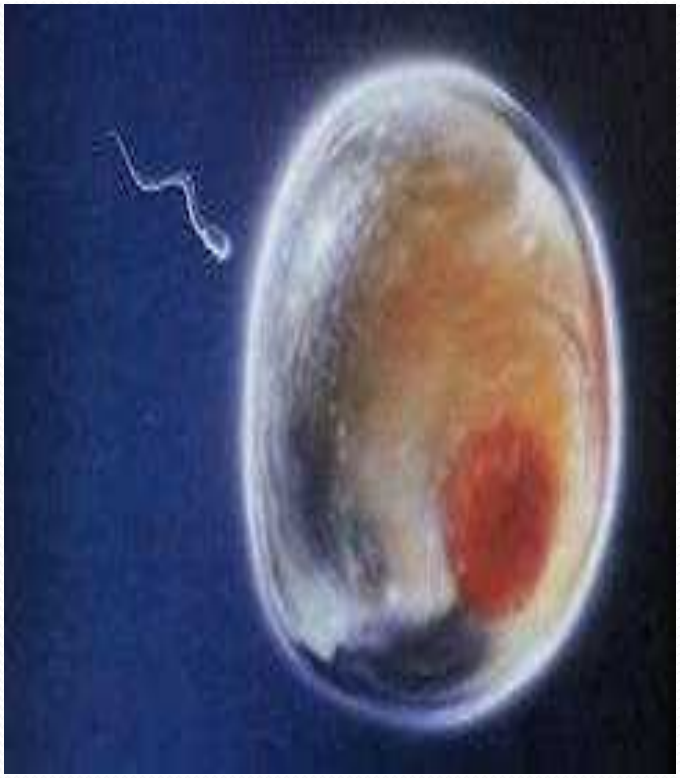


SEGUMPAL DARAH



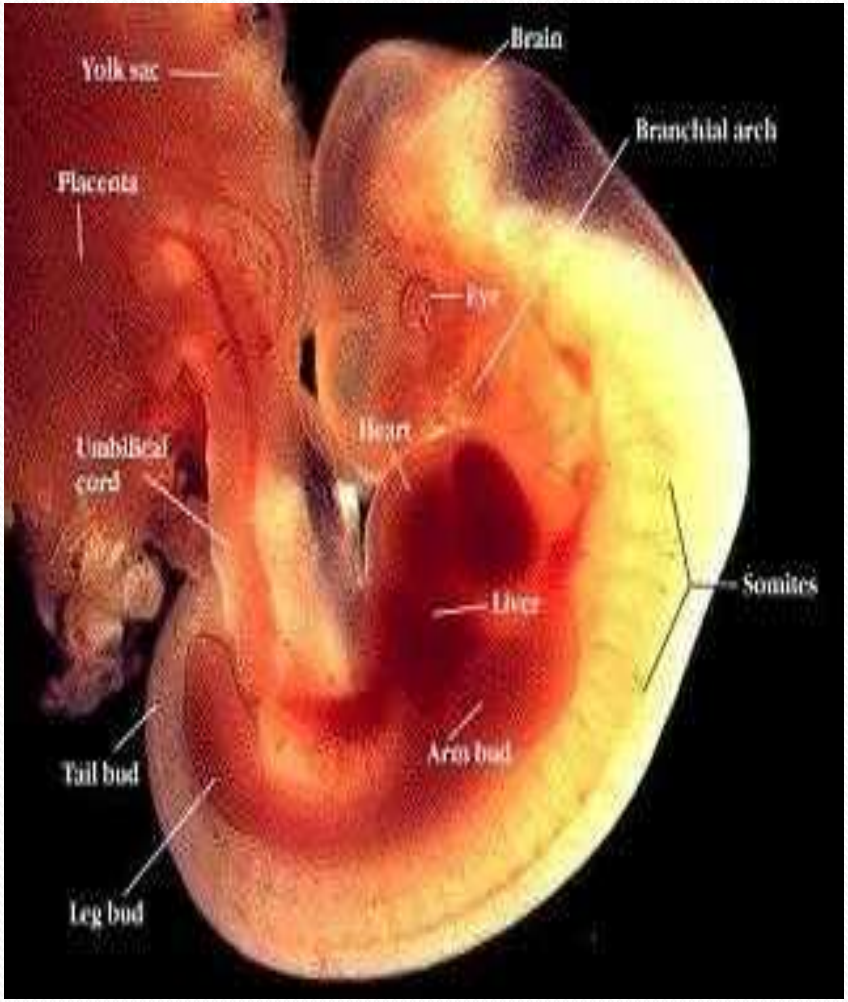


2 MINGGU



3 MINGGU

SEGUMPAL DAGING DALAM RAHIM

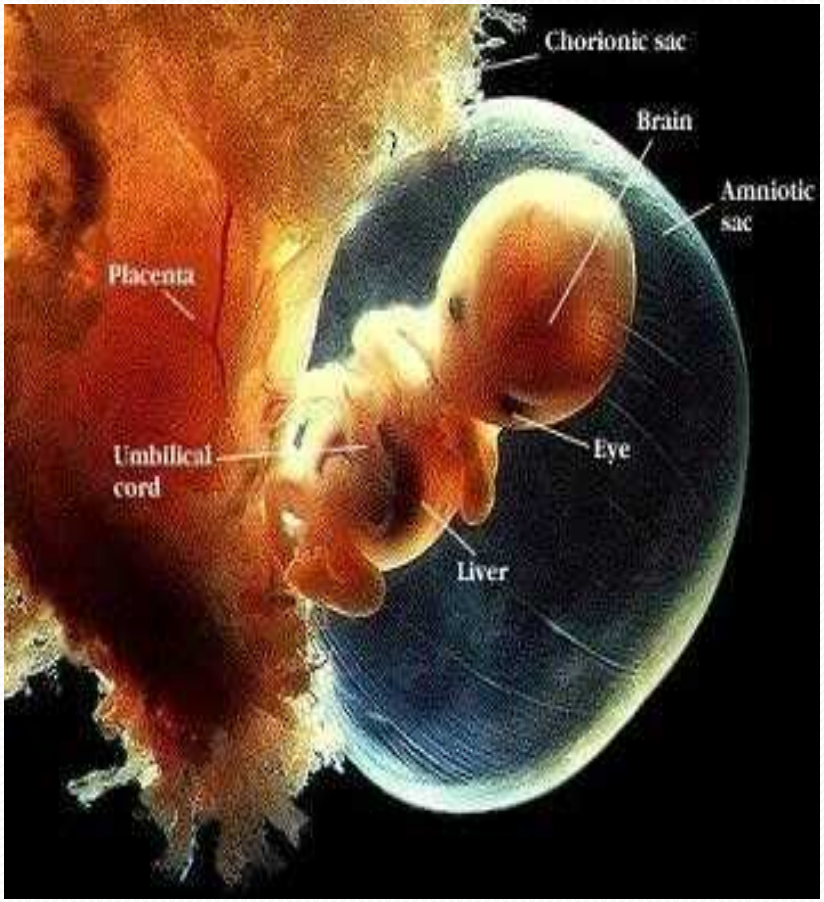


5 MINGGU

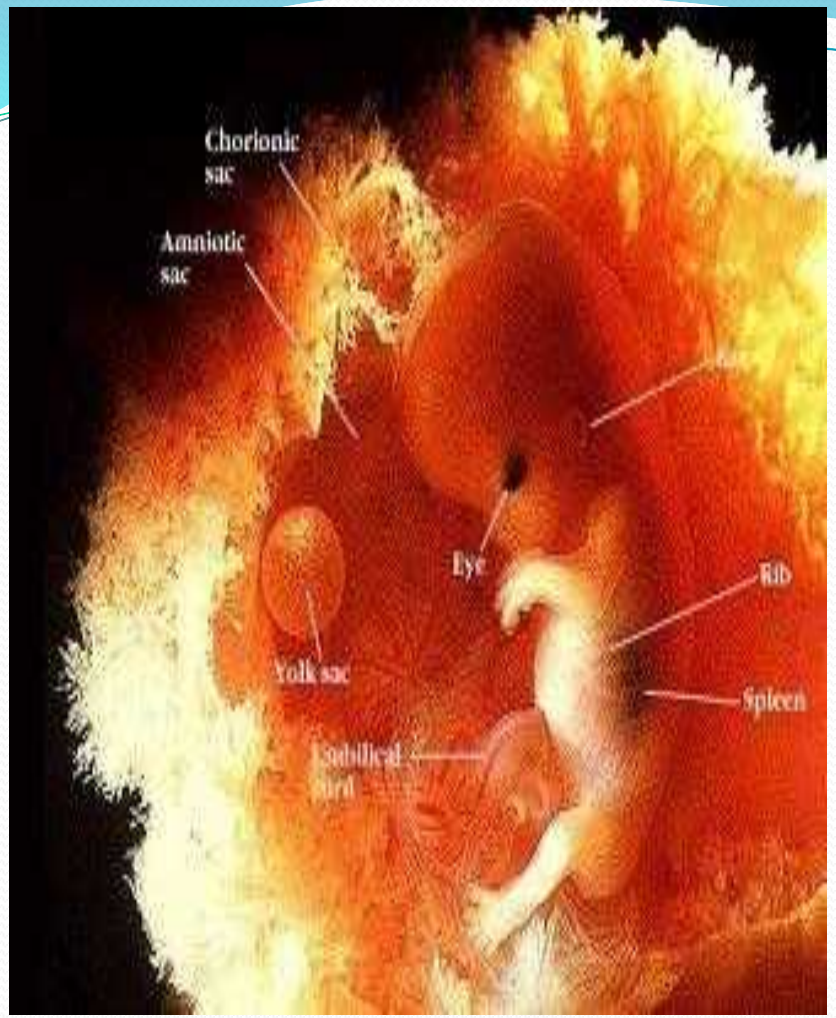
6 MINGGU

SEGUMPAL DAGING DALAM RAHIM

7 MINGGU

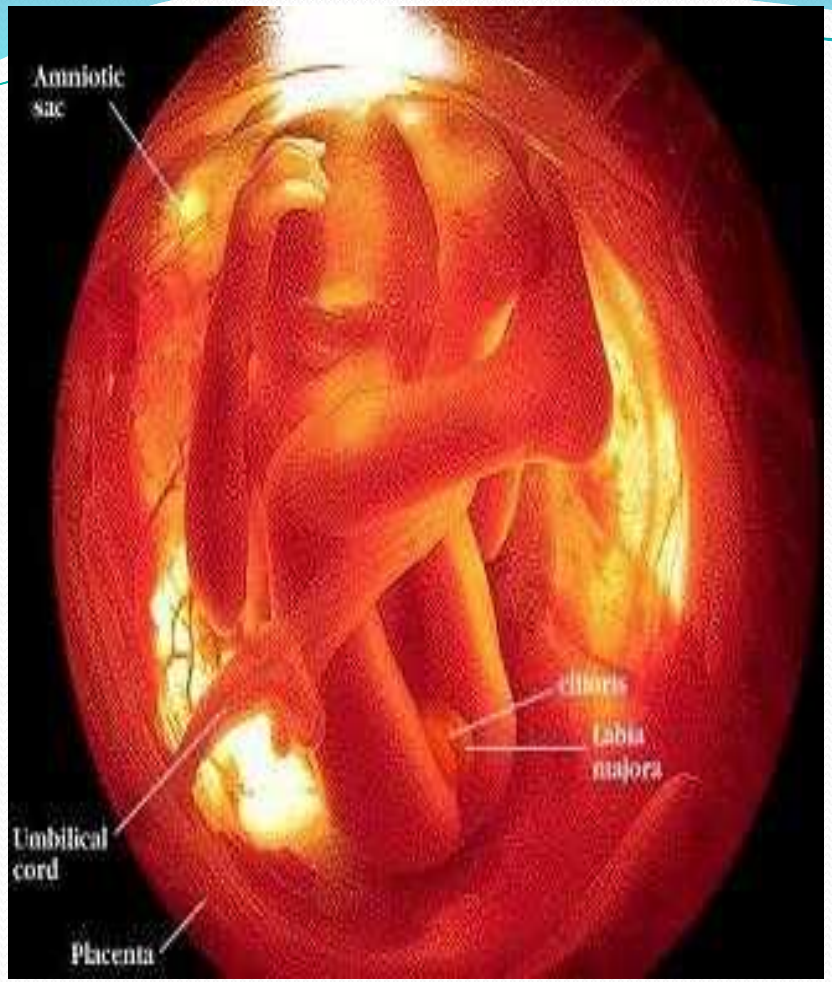


8 MINGGU

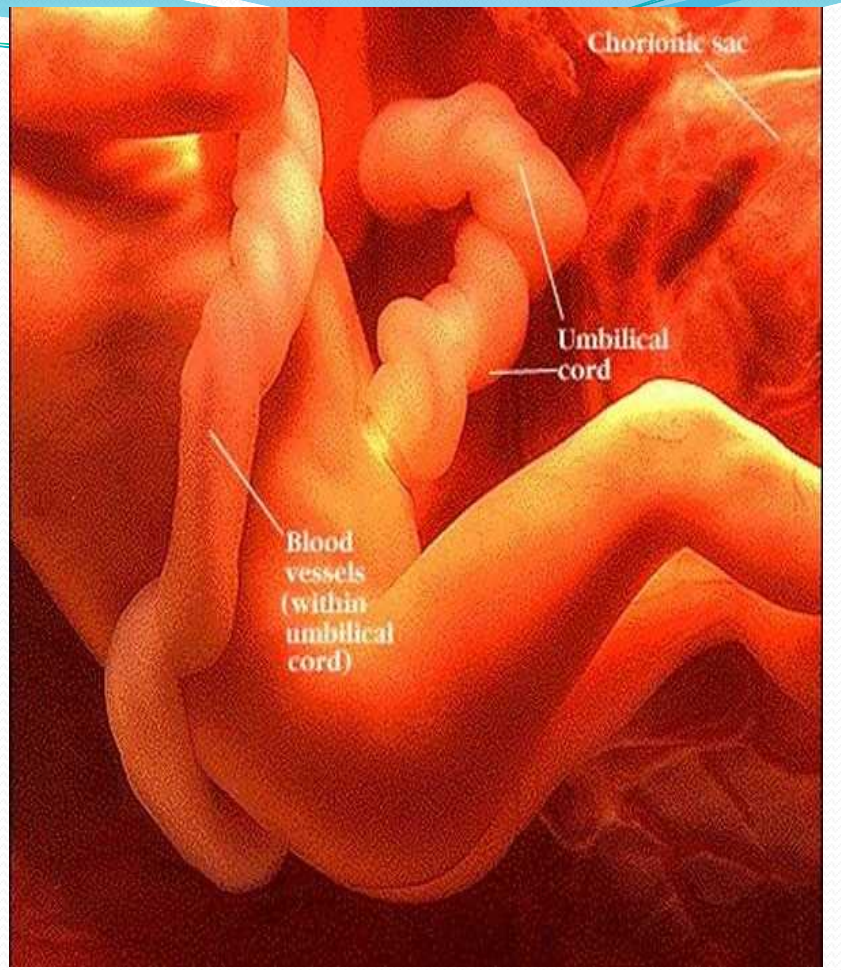


12 MINGGU

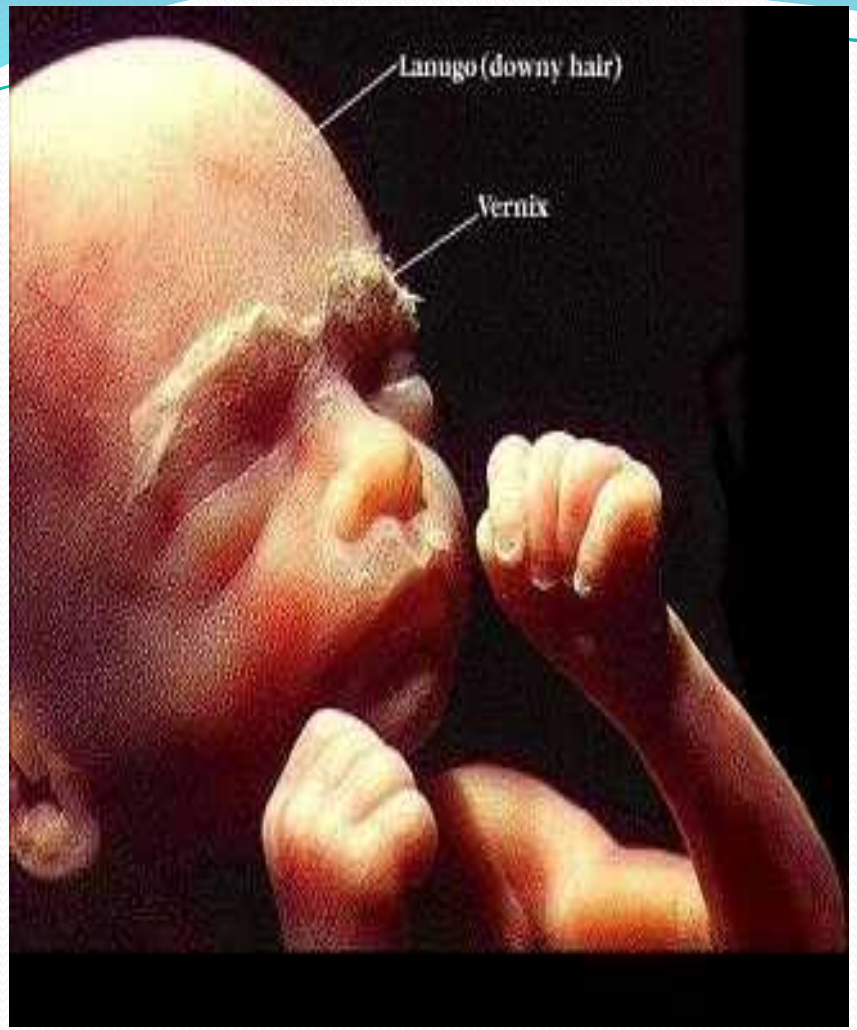
14 MINGGU



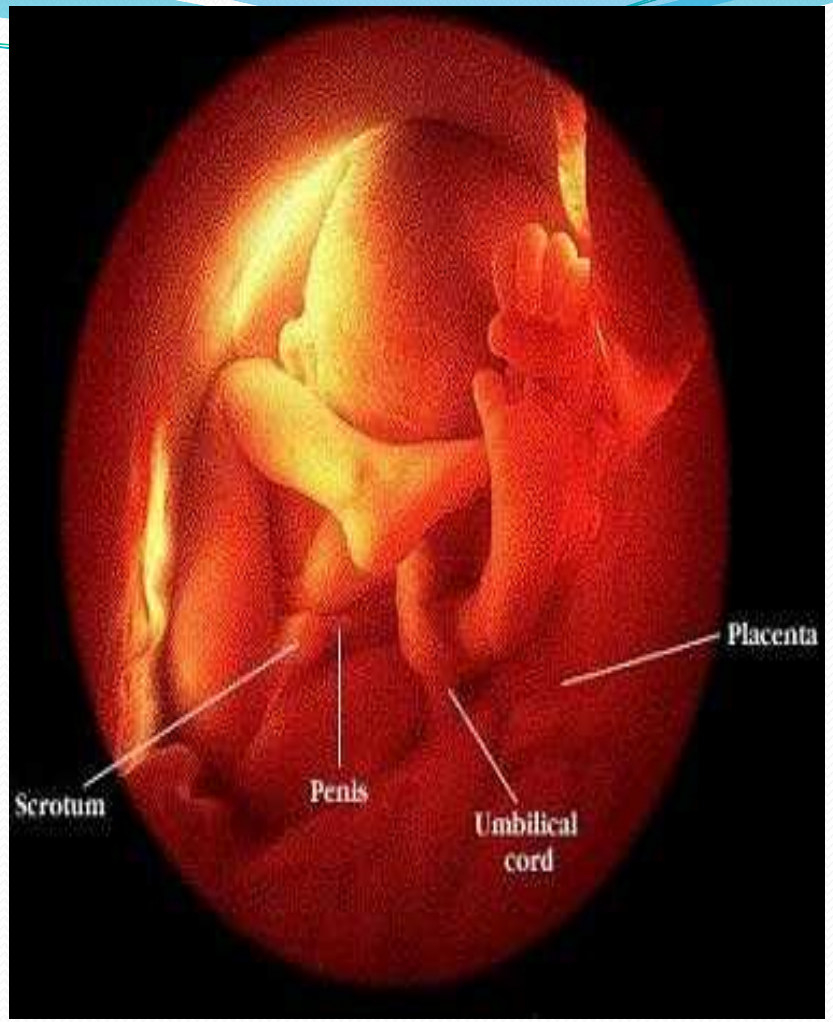
20 MINGGU



28 MINGGU



30 MINGGU



32 MINGGU

PERJALANAN PANJANG KITA

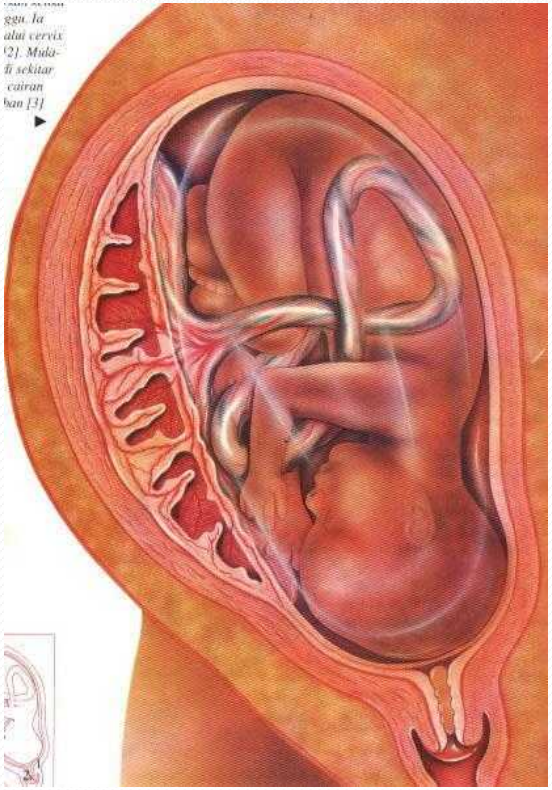
FETAL DEVELOPMENT

From zygote to full term.

For McGraw-Hill Publishing

© Cynthia Turner

SAMPAI BATAS WAKTU



Terima Kasih

Wassalaamu `alaikum Wr Wb