

Physiology of Pregnancy

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Physiology of Pregnancy

Overview

- ▶ **Definition**
 - ▶ Pregnancy
 - ▶ Gestation
- ▶ **Changes**
 - ▶ Endocrine
 - ▶ Physiological
 - ▶ Behavioural
- ▶ **Why do they happen?**
- ▶ **How they might go wrong**



How is pregnancy ‘diagnosed’?



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Diagnosis of Pregnancy

- ▶ **History and examination**
 - ▶ Amenorrhoea
 - ▶ Nausea & vomiting
 - ▶ Malaise
 - ▶ Breast tenderness
 - ▶ Cervical & uterine changes
- ▶ **Laboratory investigation**
 - ▶ β -hCG ('biochemical pregnancy')
 - ▶ Progesterone
- ▶ **Ultrasonography**



Clinical vs. Biochemical Pregnancy



Physiology of Pregnancy

Overview

- ▶ **Changes**

- ▶ Endocrine

- ▶ Physiological

- ▶ Cardiovascular, renal, respiratory, metabolic, GI

- ▶ Behavioural

- ▶ **Evolutionarily driven**

- ▶ Support pregnancy and lactation

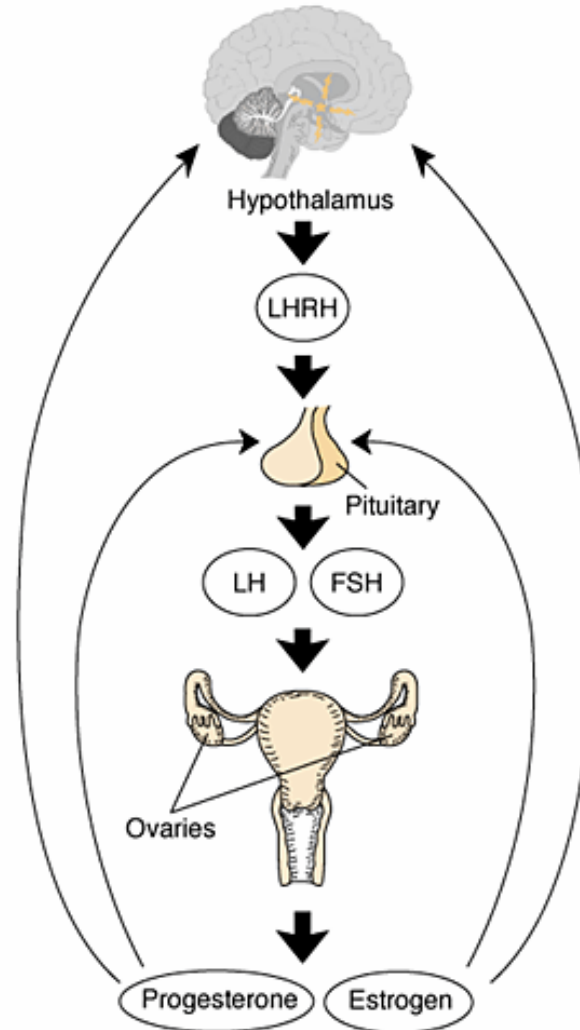
- ▶ Ensure viability of fetus



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Endocrine changes

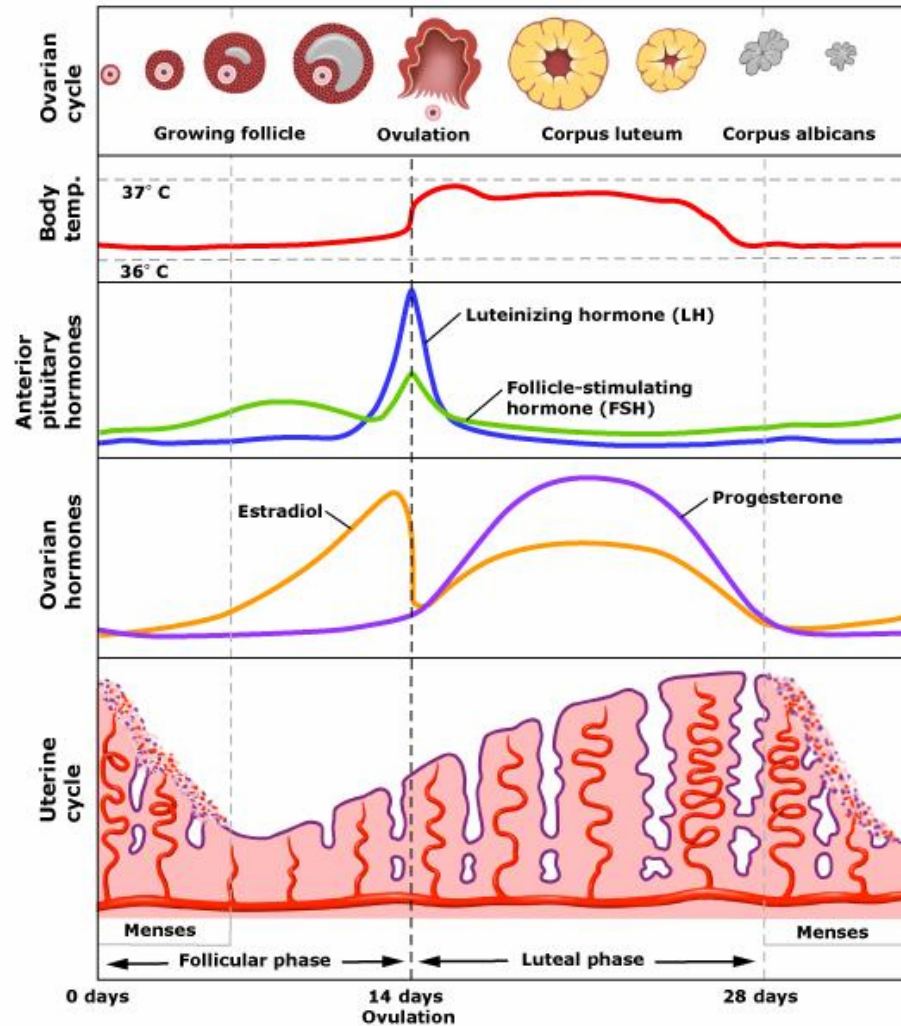
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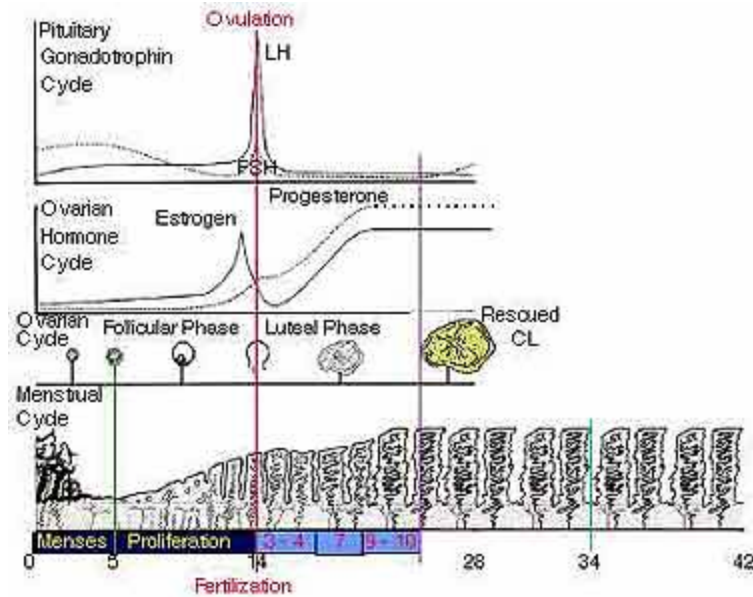
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Endocrine changes



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Endocrine changes



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Endocrine – Oestrogen + progesterone

- ▶ Gradual increase throughout pregnancy
- ▶ Stimulate uterine & mammary tissue growth
- ▶ Progesterone:-
 - ▶ Most important hormone in pregnancy
 - ▶ Initially from Corpus Luteum then → placenta (12-16 weeks)
 - ▶ Maintains endometrium + suppresses uterine contraction
 - ▶ Suppresses milk secretion
 - ▶ Increases uterine size
- ▶ Oestrogen:-
 - ▶ Increase uterine blood flow + vessel growth



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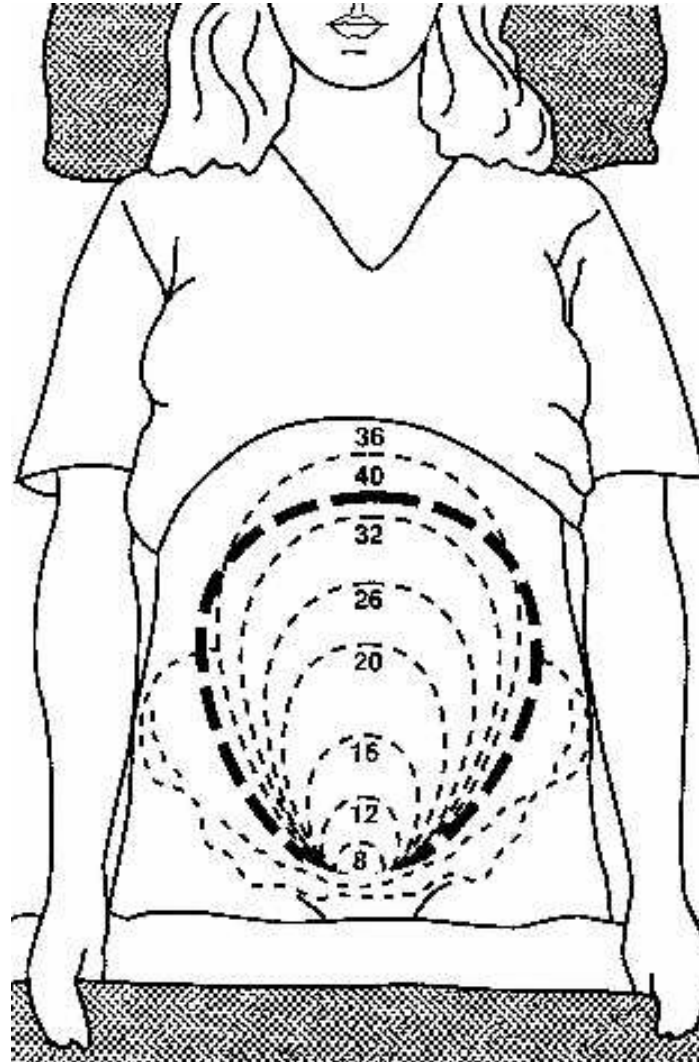
Endocrine

- ▶ A 24 year-old pregnant woman comes in for a health-check-up. The midwife palpates her abdomen and feels the fundus of the uterus at the level of the patients umbilicus. 'Ahh', she says. 'You must be ___ weeks pregnant!'.



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Endocrine



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Endocrine – Problems

- ▶ **BUT..**
- ▶ hPL and progesterone antagonise insulin → gestational diabetes → fetal and maternal complications
- ▶ **Fetal:**
 - ▶ Preterm labour
 - ▶ Impaired maturation – eg. lungs
 - ▶ Increased birthweight → ↑ dystocia and birth trauma risk
 - ▶ Fetal distress + sudden fetal death
- ▶ **Maternal:**
 - ▶ ↑ UTI/wound infections
 - ▶ ↑ Pre-eclampsia risk



Key point 1

Always monitor for pre-eclampsia

- Hypertension
- Proteinuria
- Headaches/visual disturbances

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Overview

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- ▶ Support pregnancy and lactation

- ▶ Ensure viability of fetus



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Physiological changes – Cardiovascular

- ▶ ↑ Cardiac output



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Physiological changes – Cardiovascular

- ▶ What is the normal cardiac output?
 - ▶ About 5 litres/minute in women
- ▶ How much does it change in pregnancy?
 - ▶ It rises by about 40%
- ▶ Why?



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Physiological changes – Cardiovascular

- ▶ **↑ Cardiac output**
 - ▶ ↑ Heart rate; ↑ Stroke volume
- ▶ **↑ Blood volume**
 - ▶ ↑ Plasma volume; ↑ Red blood cells
- ▶ **↓ Systemic vascular resistance**
 - ▶ Progesterone-induced
 - ▶ Low resistance placental circulation



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Cardiovascular changes – Problems

- ▶ **↑ Cardiac output + ↑ Blood volume**
 - ▶ Cardiac failure
 - ▶ Hypertension + pre-eclampsia
 - ▶ Anaemia
 - ▶ \uparrow Plasma volume $>$ \uparrow RBC
 - ▶ \uparrow Requirements – Iron and folate
 - Fetal growth
 - Uterine growth
 - \uparrow RBCs



Key point 2

Always check for anaemia in pregnancy

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Dietary advice

▶ Iron

- ▶ Meat (esp. liver and kidney)
- ▶ Eggs
- ▶ Green vegetables

▶ Folate

- ▶ Green vegetables
- ▶ Fish



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Cardiovascular changes – Problems

- ▶ ↑ Cardiac output + ↑ Blood volume
 - ▶ Cardiac failure
 - ▶ Hypertension + pre-eclampsia
 - ▶ Anaemia
 - ▶ ↑ Plasma volume > ↑ RBC
 - ▶ ↑ Requirements – Iron and folate
 - Fetal growth
 - Uterine growth
 - ↑ RBCs
- ▶ *Aorto-caval compression

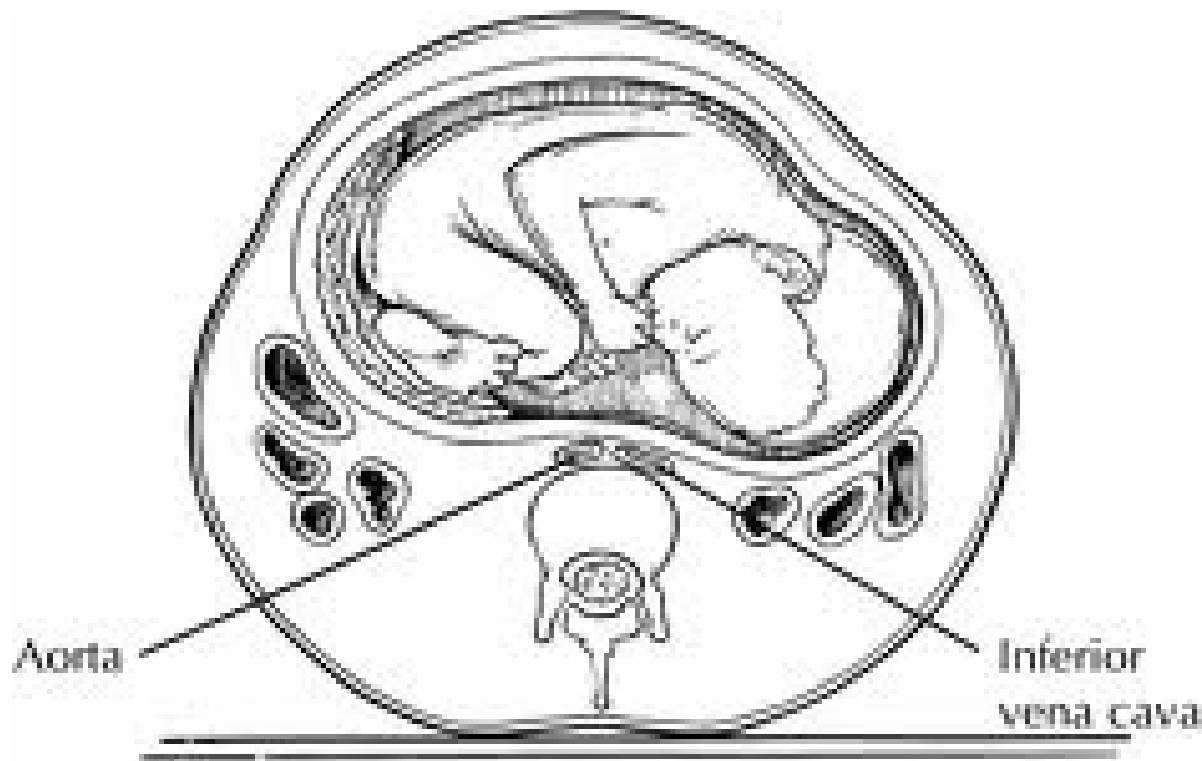


Key point 3

Do not lie pregnant women flat on their back in late stages of pregnancy

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Aorto-caval compression



Source: Pearlman MD, Tintinalli JE, Dyne PL: *Obstetric and Gynecologic Emergencies: Diagnostic and Management*: <http://www.accessremergencymedicine.com>

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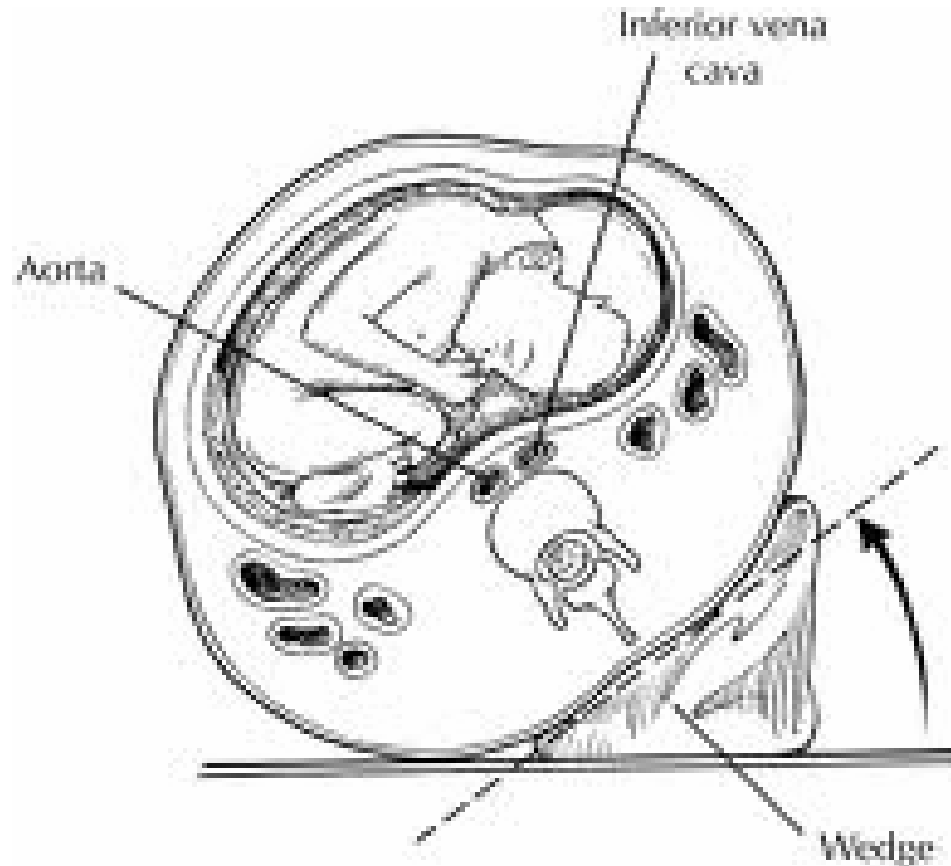
Aorto-caval compression



Source: Tintinalli JE, Stapczynski JS, Ma OJ, Cline DM, Cydulka RK, Meckler GD:
Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7th Edition:
<http://www.accessmedicine.com>
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Aorto-caval compression



Source: Pearlman MD, Tintinalli JE, Dyne PL: *Obstetric and Gynecologic Emergencies: Diagnosis and Management*; <http://www.accessemergencymedicine.com>

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Physiological changes – Respiratory + GI

▶ Respiratory

- ▶ Uterus pushes up against diaphragm
 - ▶ May feel short of breath
- ▶ ↑ Tidal volume
- ▶ ↑ Oxygen consumption

▶ GI

- ▶ Uterus pushes stomach upwards → nausea, vomiting, indigestion
- ▶ Passage of food through the gut slows → constipation → haemorrhoids



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Physiological changes – Others

- ▶ **Loosening of ligaments**
 - ▶ Back pain
 - ▶ ↑ Risk of sprains
- ▶ **Uterus pushes down on bladder**
 - ▶ ↑ Urination frequency
- ▶ **↑ Venous thrombo-embolism (DVT) risk**
- ▶ **Breast changes**
 - ▶ ↑ Size
 - ▶ Change in colour around nipple area
- ▶ **Skin changes**



Key point 4

Pregnancy is a risk factor for DVTs

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Physiological changes – Skin

**Linea
nigra**



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Physiological changes – Skin



Key point 5

Screening for UTIs is important

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UTIs

- ▶ Leads to ↑ morbidity and mortality in neonate and mother
 - ▶ ↑ risk of preterm labour
 - ▶ More likely to damage kidneys (pyelonephritis)
- ▶ Often no symptoms (asymptomatic bacteruria)
- ▶ Dipstick urine when possible
 - ▶ Leukocytes
 - ▶ Nitrites
 - ▶ Protein (but remember pre-eclampsia)



Questions?



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Summary – Key points

1. Pre-eclampsia

2. Anaemia

3. Aorto-caval compression

4. Deep vein thrombosis

5. Urinary tract infections



Thank you

