NURSING

Science lectures

Prof Peter O'Donoghue

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LEARNING OBJECTIVES

Lecture 6: Overview of Development (Embryology)

- determine timeline for foetal development
- list major reproductive disorders
- examine process of parturition (birth)

child bearing

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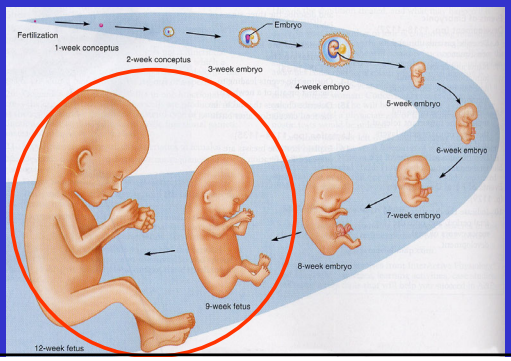
FOETAL DEVELOPMENT

foetus from week 8 until birth



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Foetal development

By week 8 (second month): 30 mm

- head as large as body
- all major brain regions present (first brain waves)
- liver large, forms blood cells
- limbs present, digits become free
- bone formation continues
- weak muscle contractions
- cardiovascular system function (heart pumping since week 4)

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Foetal development

Weeks 9-12 (third month): 90 mm

- body elongates
- spinal cord development
- skin development (including facial features)
- liver enlarges, produces bile
- bone marrow development
- genitalia evident

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Foetal development

Weeks 13-16 (fourth month): 140 mm

- body outgrowing head
- cerebellum prominent
- sensory organs develop (blinking of eyes apparent)
- gastrointestinal tract apparent
- stronger foetal movement (kicking)
- sucking motion of lips
- bones distinct, joints develop

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Foetal development

Weeks 17-20 (fifth month): 190 mm

- foetal position assumed, limbs near-final proportions
- mother experiences quickening (↑ muscle activity)
- sebaceous glands secrete waxy vernix onto skin
- skin covered with fine lanugo (silk-like hair)

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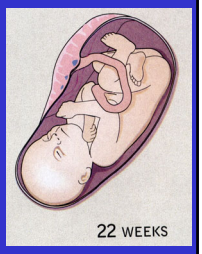
Foetal development

Weeks 21-24 (sixth month): 230 mm

- myelination of spinal cord
- eyes open
- distal limbs complete (fingernails, toenails)
- tooth enamel
- practises breathing (inhaling amniotic fluid)



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Foetal development

Weeks 25-28 (seventh month): 280 mm

- skin wrinkled and red
- body lean and proportioned
- significant weight increase

(may survive if born premature at 27-28 weeks but needs: temperature regulation and lung surfactant)

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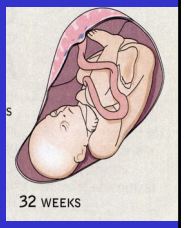
Foetal development

Weeks 29-32 (eighth month): 320 mm

- skin whitish pink
- fat deposited in hypodermis
- foetus sleeps 90% of day
- experiences REM sleep (dreaming)
- lungs mature
- head may engage mother's pelvis
- foetus may seem less active



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Foetal development

Weeks 33-birth (ninth month):

size 360-400 mm
weight 2.7-4.1 kg

Parturition (birth 37-43 weeks)
av. 280 days (40 weeks) from last menses
or 266 days (38 weeks) after fertilisation

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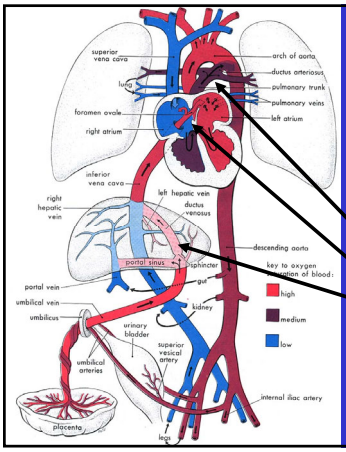

Foetal circulation

3 shunts permit the blood to bypass the liver and lungs:

- ductus arteriosus
- foramen ovale
- ductus venosus

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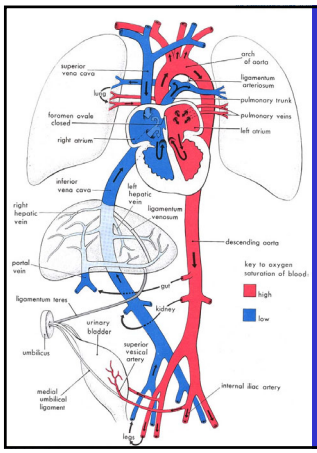

Following birth

- shunts cease to function (if not, hole-in-heart)
- pulmonary and systemic circulations become separated

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Major developmental periods

embryonic period (weeks 2-8)
- germ layers give rise to tissues and organs
- extremely sensitive to pertubation
- mother often does not know she is pregnant

foetal period (week 9 onwards)
- characterised by maturation of tissues/organs
- few malformations arise during this period
- but cell death in CNS caused by cytotoxic agents can cause postnatal behavioural disturbances

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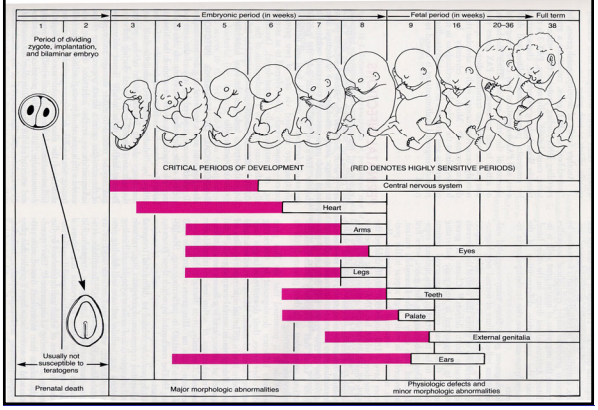
Periods of vunerability



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Reproductive problems

<u>Pre-implantation</u>
- gamete production - male infertility
  - female infertility
- no fertilization - tube blockage
- no implantation - hostile uterus

<u>Post-implantation</u>
- foetal death - abortion/miscarriage
  - resorption/mummification
  - stillbirth
- live birth - congenital abnormalities
  - silent infection

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Congenital malformations

2 to 3% of liveborn infants have congenital malformations

- Environmental factors (10%)
- Genetic factors (10%)
- Environmental and genetic factors (80%)

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Environment

Environmental factors

- infectious agents (rubella, herpes, syphillis)
- radiation
- chemicals (thalidomide, diazepam, alcohol)
- hormones (diethylstilbestrol, cortisone)
- nutritional deficiencies
- hypoxia

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Arbortifacients (non-infectious)

- genetic causes (abnormalities)
- immunological causes (incompatibility)
- physical stressors (heat, transport)
- chemicals (toxic herbicides, nitrate poisoning)
- maternal disease (fever, pneumonia)
- dystocia (difficult birth)

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Congenital infections

TORCH

***T*oxoplasma/*T*reponema**

Other (varicella-zoster/*Listeria*/*Mycobacterium*)

Rubella (German measles)

***C*ytomegalovirus/*C*hlamydia**

Herpes-simplex/Hepatitis-B/HIV

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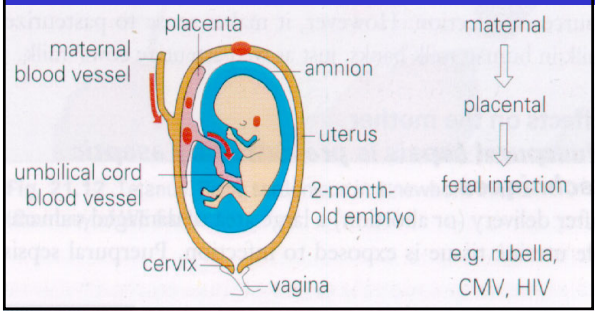
Pre-natal (*in utero*) infection



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Congenital rubella

Developmental abnormalities

brain	**small brain size, mental retardation**
eye	**cataract, microphthalmia, blindness**
ear	**hearing defect, deafness**
heart	**patent ductus arteriosis, patent interventricular septum**
liver	**hepatomegaly, thrombocytopenia**
spleen	**splenomegaly, anaemia**
general	**low birth weight, failure to thrive increased infant mortality**

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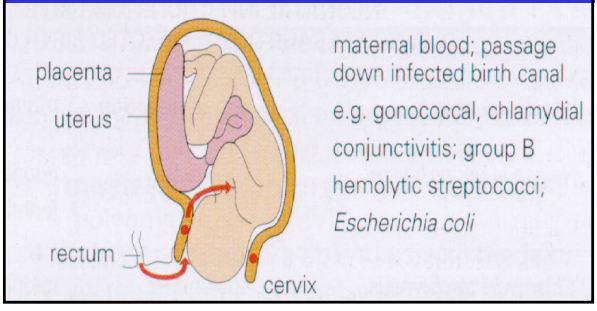
Peri-natal (birth) infection



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Birth infections

Gonococcal infection

Herpes infection

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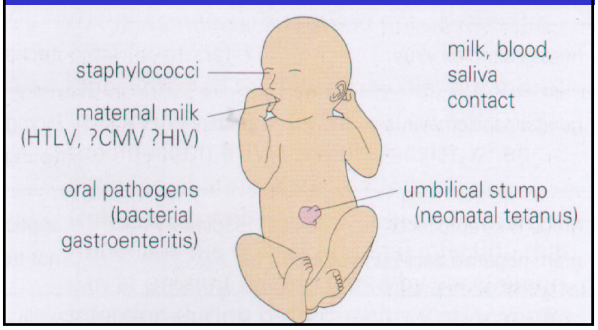
Post-natal infection



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Genetic disorders

Sex chromosome abnormalities
- **XXY (Klinefelter's syndrome)**
  (1 in 500 males, sterile, testicular atrophy)
- **XO (Turner's syndrome)**
  (1 in 1500 females, absence of ovaries)
- **XXX (triple X syndrome)**
  (super female, some fertile)

Autosome abnormalities
- **Trisomy 13 (Patau syndrome)**
- **Trisomy 18 (Edward syndrome)**
- **Trisomy 21 (Down syndrome)**

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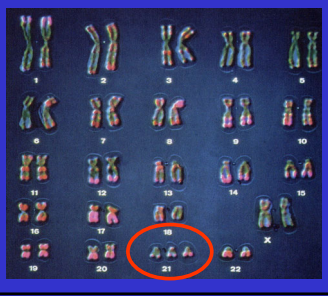
Down syndrome

Trisomy 21 arising from meiotic problems:
- **non-disjunction (95%)**
- **translocation (4%)**
- **mosaicism (1%)**



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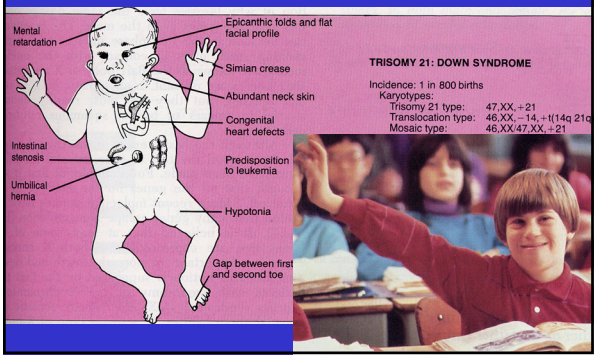
Trisomy 21 (Down syndrome)

genotype determine phenotype



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SUMMARY

fertilization – diploid zygote (day 0)

pre-embryonic development (wk 0-2)
- **cleavage**
- **implantation**
- **placentation**

embryonic development (wk 2-8)
- **gastrulation**
- **organogenesis – neurulation**

foetal development (wk 9-38)

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