

Prenatal Development

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Prenatal Development

- Introduction
 - Compared to the newborns of other species, human newborns are quite helpless, dependent and underdeveloped at birth.
 - As a result, much of our development occurs in a rather stimulating environment, which is both a challenge and a source of opportunity
 - Even so, a great deal of development occurs prenatally....

Three Stages of Prenatal Development

1. Germinal Period: fertilization and implantation (conception - 2 weeks)
 - sperm and egg unite to form single-celled *zygote*
 - zygote travels through fallopian tube toward uterus as cell division by *mitosis* begins
 - by day 4, approximately 60-70 cells, arranged like a hollow ball, referred to as a *blastula*
 - when blastula reaches uterus, it burrows into the lining and begins process of *implantation*, which begins by about day 6 and takes a few days to complete.
 - Implantation initiates the next (embryonic) period.
- Note: ~58% of zygotes fail to implant successfully!

Stages of Prenatal Development (cont'd)

2. **Embryonic Period:** period of structural development (3-8wks)
- support system develops:
 - **placenta** - remarkable organ that allows for exchanges between mother's and embryo's blood systems
 - maintains hormone levels that prevent menstruation, prepare breasts for milk production and eventually help to initiate labor and delivery
 - **umbilical cord** - connects embryo to placenta
 - **amniotic sac** - protective membrane, holds in amniotic fluid in which embryo is suspended

Also during the embryonic period:

- 21-28 days: eyes start to develop, heart begins to beat, system of blood vessels develops
 - 5 weeks: arm and leg buds form
 - 7 weeks: facial structures connect
 - 8 weeks: major organ development completed
- Final major development: **sex differentiation** (not completed until the next stage) - ~6 weeks, appearance of **indifferent gonad** = a cluster of cells that can develop into either male or female sex organs. Presence of Y chromosome triggers production of testosterone and dev. of male sex organs; default is dev. of female organs. Completed by 12 weeks
- brain development is different for males and females
- Note that a serious error of development during this embryonic stage typically will result in a spontaneous abortion

Stages of Prenatal Development (cont'd)

3. **Fetal Period:** focus on growth and maturation (9wks-birth)
- by **end of 3rd month:** fetus is 3 inches long and weighs .75oz; fetus moves spontaneously; heartbeat can be heard with amplified stethoscope
 - **4th-5th month:** weight increases 10-fold
 - 4th month: fetus sucks and swallows; mother probably has felt **quickening** (social implications)
 - 5th month: vernix covers skin; activity more pronounced
 - **6th month:** sensory receptors become well-established
 - **20-26 weeks: transitional period** - turning point in probability of survival outside the womb
 - 22 wks/22 oz/at most 20% chance of survival
 - 26 wks/32 oz/80% chance of survival
 - 30 wks/ survival almost certain

Fetal Period (continued)

- **8-9 months:** fetus gains 3-4 pounds
respiratory system matures
central nervous system matures
fetus begins to respond to sound
– 9th month: turns head-down, prepares for birth

Some changes in preparation for birth:

1. Development of sleep/waking cycles
2. ~27 weeks: eyelids open, eyes function (perceive light)
3. Fetus can hear (e.g., soothed by lullaby)

Also, fetal brain begins to produce hormones that increase production of estrogen in the placenta, which in turn leads to a shift from mild to strong contractions, which result in dilation of cervix, rupture of amniotic sac and delivery.

Advantages of Full-Term Fetus

1. Ability to begin and maintain regular breathing
2. Stronger sucking response (reflexive)
3. Well-coordinated swallowing movements
4. Stronger peristalsis, therefore better digestion and excretion of waste
5. More fully balanced control of body temperature
