

Introduction to Conception and Growth (Embryology)

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- **Embryology**

- study of how body structures form and develop before birth
- begins with fertilization of an ovum and culminates with the birth of the baby
- Also involves study of integration of various complex molecular, cellular and structural processes that are accountable for the growth and development of a 9-month-old neonate
- period of development from fertilization to birth is termed **prenatal development**
- Period of development of an individual after birth up to age of 25 years is termed **post natal development**

- **Divisions of Prenatal Period**
- Clinically - **prenatal period** is divided into 2 parts:
- (a) embryonic period and (b) fetal period
- **embryonic period** - fertilization to the end of 8th week and the developing organism is called an **embryo**
- embryonic period is further divided into 2 parts:
- (a) pre-embryonic period and (b) embryonic period proper
- **fetal period** - beginning of the ninth week (third month) until the birth

- Embryologically prenatal period is divided into 3 parts:
- (a) pre-embryonic period, (b) embryonic period (c) fetal period
- **Preimplantation/Pre-embryonic period:** conception (fertilization) to the end of 2nd week of intrauterine life (IUL)
- morphogenic events- fertilization, transportation of zygote through the uterine tube, mitotic divisions/cleavage, implantation, and formation of primordial embryonic tissues

- **Embryonic period:** beginning of 3rd week to the end of 8th week of Intrauterine life
- morphogenic events - differentiation of 3 germ layers into specific body organs and the formation of placenta, umbilical cord, and extraembryonic membranes
- **Fetal period:** beginning of the 9th week to birth
- tremendous growth and specialization of the body structures

- **Postnatal Period of Development**

- birth of an individual to adulthood

- Divided into

- **1. Neonatal period:** birth to 28 days after birth

- first 4 weeks are critical in the life of the newborn/neonate various systems especially respiratory and cardiovascular have to make adjustments with the external/extruterine environment

- **2. Infancy:** 1 month to 1 year

- newborn is called *infant*

- **3. Childhood:** 2nd year to 12th year of age

- an individual is called a child

- period of rapid growth and development. Also called paediatric age

- **4. *Puberty*:** 12 years to 16 years
- rapid physical growth and development of secondary sex characters and depends on the interaction of sex hormones and growth hormones
- **5. *Adolescence*:** 17 years to 20 years
- rapid physical growth and sexual maturation
- reproductive ability is established
- **6. *Adulthood*:** 21 years to 40 years.
- **7. *Middle age*:** 40 years to 60 years.
- **8. *Old age*:** 60 years to death

- **SUBDIVISIONS OF EMBRYOLOGY**

- *1. General embryology:*

- study of development during pre-embryonic and embryonic periods (first 8 weeks after fertilization)
- single-celled zygote is converted by cell multiplication, migration and reorganization into a miniature form of an individual with various organs and organ systems of the body

- **2. *Systemic embryology*:** detailed study of formation of primordia and their structural and early functional organization into various organs and systems of the body.
- subdivided into development of cardiovascular system, digestive system, urinary system, genital system, etc.
- **3. *Teratology*:** deals with abnormal embryonic and fetal development, i.e. congenital abnormalities or birth defects
- **4. *Stem cell therapy*:**
 - Cells forming tissues in the embryo are called *stem cells*.
 - These are undifferentiated cells that can differentiate into specialized cell types
 - is an uncommitted cell and depending on the signal it receives, it can develop into many specialized cells.
 - These cells are capable of treating certain diseases in postnatal life

- **Importance of Embryology**

- 1. Informs us how a single cell(the fertilized ovum, i.e. zygote) develops into a newborn, containing numerous tissues and organs(understanding normal development)
- 2. knowledge helps us to understand many complicated facts of adult anatomy like the location and relations of organs to one another(understanding normal adult anatomy)
- 3. helps us understand why some children are born with organs that are abnormal
- 3. Appreciation of the factors responsible for abnormal development assists us in preventing, or treating, such abnormalities
- i.e exposure to radiation during pregnancy, use of certain medications during pregnancy or a genetic abnormality that exists in family

- *4. Understanding postnatal and adulthood diseases:*
- mechanisms (molecular and cellular) taking place during the development of embryo play a key role in the development of a wide range of diseases in adult life
- *5. Health care strategies for better reproductive outcome:*
- facilitates interpretation of the results of various techniques like fetal ultrasound, amniocentesis, and chorionic villous biopsy
- Based on the results, appropriate treatment can be planned
- *4..Therapeutic procedures for infertility/fertility-related problems*

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