UNIT 15

HUMAN GROWTH AND DEVELOPMENT

1. **Growth:** The speed with which normal growth occurs in length before birth and in length after birth is known as growth.
2. **Development:** It is defined as the acquisition of knowledge, skill, attitude and behavior from conception to child birth and up to adulthood.

Stages of Growth and Development

No	Stage	Definition
1.	Neonate	The newborn infant up to the age of 6 weeks is known as neonate.
2.	Infant	The child from the time of birth to one year of age is known as infant.
3.	Toddler	A young child especially one who is learning or has recently learned to walk (age between 1 to 3 years) is known as toddler.
4.	Childhood	The human of the age between the infancy and the puberty is known as childhood.
5.	Puberty	Puberty is the time in which a child's sexual and physical characteristics mature. It occurs due to hormone changes. During puberty, endocrine glands produce hormones that cause body changes and the development of secondary sex characteristics.
6.	Adolescence	Adolescence is the time between the beginning of sexual maturation (puberty) and adulthood. The adolescent experiences not only physical growth and change, but also emotional, psychological, social, and mental change and growth.
7.	Adulthood	The period in the human lifespan in which full physical and intellectual maturity have been attained. Adulthood is commonly thought of as beginning at age 20 or 21 years. Middle age, commencing at about 40 years, is followed by old age at about 60 years.

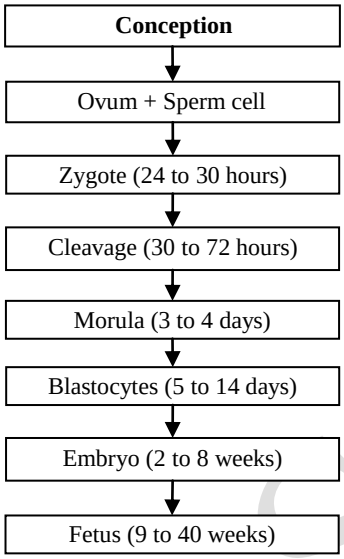
Differences between Growth and Development

No	Growth	Development
1.	The term is used in purely physical sense. It generally refers to increase in size and length.	Development implies overall change in shape form or structure resulting in improved working and functioning.
2.	Changes in the quantitative aspects come into the domain of growth.	Changes in the quality or character rather than the quanntative aspects come in this domain.
3.	It is a part of developmental process.	It is comprehensive and wider term and refers to overall changes in the individual.
4.	Growth does not continue throughout life. It is stops when maturity has been attained.	Development is a wider and comprehensive term and refers to overall changes in the individual. It is continues throughout life and is progressive.
5.	Growth involves body changes.	Development changes goal of maturity.
6.	Growth may or may not bring development.	Development is also possible without growth.

EMBRYO AND FETUS DEVELOPMENT

- **Embryo:** The developing fertilized ovum from 2nd weeks to 8th weeks of pregnancy is known as embryo.
- **Fetus:** The developing child in the uterus from seven to eight weeks after fertilization until birth is known as fetus.

Stages of Embryo and Fetal Development



FETAL CIRCULATION

See the unit: 4 (Circulatory system)

NEONATAL CHANGES

Neonatal changes refer to the physiological adjustments that newborns undergo as they transition from intrauterine life to the external environment. These changes occur in multiple systems:

1. **Respiratory System:** At birth, the baby's lungs inflate for the first time. The removal of fluid from the lungs and the onset of gas exchange are crucial.
2. **Circulatory System:** The ductus arteriosus (between the pulmonary artery and the aorta), foramen ovale (between the right and left atrium), and ductus venosus (from the umbilical vein to the inferior vena cava) close, allowing blood to circulate properly through the lungs and body.
3. **Thermoregulation:** Newborns must maintain body temperature through mechanisms like brown fat metabolism since they have limited ability to shiver or produce heat.
4. **Gastrointestinal System:** The gastrointestinal tract starts functioning, and babies typically pass their first stool (meconium) within 24 to 48 hours.
5. **Renal System:** Kidney function matures after birth. Babies begin to excrete waste via urine, but they initially produce small amounts as their fluid balance and electrolyte levels stabilize.
6. **Immunological Changes**: Newborns have an immature immune system and rely on maternal antibodies (IgG) transferred through the placenta. Additional immunity can be provided by colostrum and breast milk.
7. **Neurological Adjustments**: Reflexes such as sucking, rooting, and grasping are critical for survival in the early neonatal period.
   Sleep patterns are not yet fully developed, with frequent cycles of sleep and wakefulness.

AGING

Aging is a normal process characterized by a progressive decreased in the body's ability to restore homeostasis. The changes associated with aging are apparent in all body systems. Examples include wrinkled skin, gray hair, loss of bone mass, decreased muscle mass and strength, diminished reflexes, decreased production of some hormones, increased incidence of heart disease, increased susceptibility to infections and cancer, decreased lung capacity, less efficient functioning of the digestive system, decreased kidney function, menopause, and enlarged prostate.

Causes of Aging

Several key mechanisms have been identified as contributing to aging:

1. **Cellular Senescence**: Cells lose the ability to divide and function properly over time. These senescent cells accumulate, releasing inflammatory signals that can damage surrounding tissues.
2. **DNA Damage and Mutations**: Over time, exposure to environmental stressors like UV radiation, chemicals, and oxidative stress can damage DNA. Cells may lose the ability to repair this damage efficiently, leading to mutations and impaired function.
3. **Oxidative Stress**: Free radicals, produced as byproducts of normal metabolism, can cause damage to proteins, lipids, and DNA. The body's antioxidant defenses weaken with age, leading to increased oxidative damage.
4. **Mitochondrial Dysfunction**: Mitochondria, the energy-producing organelles in cells, accumulate damage over time. Dysfunctional mitochondria produce less energy and more free radicals, which further accelerates aging.
5. **Inflammation**: Chronic, low-grade inflammation increases with age and contributes to the development of age-related diseases such as cardiovascular disease, Alzheimer's, and diabetes.
6. **Epigenetic Changes**: Chemical modifications to DNA that regulate gene expression, such as DNA methylation, change with age. These alterations can turn off beneficial genes or activate harmful ones, contributing to aging.
7. **Stem Cell Exhaustion**: The body's ability to regenerate tissues diminishes as stem cells, responsible for creating new cells, become less efficient or depleted.
8. **Hormonal Changes**: Hormone production, including growth hormone, estrogen, and testosterone, declines with age, affecting metabolism, muscle mass, and other physiological processes.

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