

Endocrine System and Adolescence

- **Endocrine glands**

- Hormones are secreted by endocrine glands such as the pituitary gland, thyroid gland, adrenal gland, pancreas etc.
- Major endocrine glands in humans are
 - Pituitary
 - Hypothalamus
 - Pineal
 - Thyroid
 - Parathyroid
 - Thymus
 - Pancreas
 - Adrenal
 - Testis in men /ovary in women
- A feedback mechanism (positive and negative) regulates the action of the hormones

- **Hormones**

- Hormones are chemical secretions that bring about various changes in the body
- They are produced by **endocrine glands**.
- These glands release hormones into blood to reach specific **target site**.
- Production of hormones is under the control of hormones produced from **pituitary gland**.

- **Characteristics of hormones:**

- Hormones act as chemical messengers.
- They are secreted by living cells/tissues or organs called glands.
- They are secreted in very small quantities by glands.
- They act upon specific cells, tissues, or organs called the target sites.
- They are generally slow in action, but have long lasting effects.

- They either accelerate or inhibit a reaction.

- **Various Glands**

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- **Pituitary gland**

- It is a pea sized gland situated at the base of the brain. It secretes a **growth hormone (GH)**.
- It is required for proper body growth.
- The hyposecretion of growth hormone causes a condition called **dwarfism**.
- The hypersecretion causes **gigantism** in children and **acromegaly** in adults.

- **Thyroid gland**

- It is located close to trachea in the neck. It produces a hormone called **thyroxine**.
- It is required for regulating metabolism in the body.
- The hyposecretion of thyroxine causes **hypothyroidism**. This condition causes abnormalities like **simple goitre**, **myxoedema** and **cretinism**. Lack of iodine leads to deficiency of thyroxine, which results in a disease called goitre.
- The excess secretion of thyroxine causes **hyperthyroidism**. It results in high metabolism, protrusion of the eye balls, high BP, nervous tension, etc.

- **Parathyroid Gland**

- There are four parathyroid glands present on back side of thyroid glands that secrete parathyroid hormone or parathormone (PTH).
- This hormone regulates the level of calcium ions in the bloodstream.
- Excess of parathyroid hormone removes calcium from bones and makes them soft.

- **Pancreas**

- It produces two hormones- Insulin and Glucagon.
- These hormones maintain blood sugar level.
- Deficiency of insulin results in diabetes.

- **Adrenal Gland**

- There are two adrenal glands located one on upper part of each kidney.
- It has two parts- **cortex** and **medulla**.

- Cortex secretes the hormones like **cortisol** that regulates the rate of metabolism.
- The medulla secretes a hormone like **adrenaline** that prepares the body to face various stressful situations.
- **Gonads**
 - It includes testes in males and ovaries in females.
 - Male sex hormone is **testosterone**. It is produced by the testes on the onset of puberty.
 - Female sex hormones produced by ovaries are **estrogen** and **progesterone**.
 - Deficiency of estrogen causes **infertility**.
- **Adolescence**
 - The time period when the body undergoes changes to reach reproductive maturity is known as **adolescence**.
 - It begins around the age of 11 and lasts till about 18 or 19 years of age.
 - Adolescence in girls can begin one or two years earlier than boys.
- **Puberty**
 - The various changes that occur in the body during adolescence marks the onset of puberty.
 - Puberty ends when teenagers attain sexual maturity.
- **Changes that take place during puberty**
 - **Increase in height**
 - It is caused by the growth in long bones of the arms and legs.
 - Girls grow faster than boys initially but both reach their maximum height by the age of 18 years.
 - **Change in body shape**
 - Boys develop broader shoulders, wider chests, and prominent muscles.
 - In girls the region below the waist becomes wider.
 - **Change in the voice pattern**
 - Voice box or larynx starts growing during puberty.
 - It protrudes in males in the neck region and is called **Adam's apple**.
 - Boys develop deep low-pitched voice.
 - Girls develop high-pitched voice.
 - **Change in activity of sweat and sebaceous glands**
 - The activity of sweat glands increases during puberty, resulting in production of more sweat.

- The oily secretions from sebaceous glands increase. The accumulation of oil and bacterial action leads to acne problems in teenagers.
 - **Changes in sex organs**
 - Testes and penis develop completely in boys.
 - Testes start producing sperms.
 - Ovaries develop completely and start producing eggs in girls.
 - **Change in intellectual level**
 - The learning capacity of brain increases.
 - Intellectual development takes place during adolescence.
- **Development of secondary sexual characteristics**
 - Secondary sexual characteristics **in boys**
 - Appearance of moustaches and beard
 - Appearance of hair on chest
 - Growth of hair in genital area and other parts
 - Secondary sexual characteristics **in girls**
 - Increase in breast size
 - Growth of hair in the pubic region
- **Reproductive phase in humans**
 - In males, the production of sperm continues throughout the life.
 - In females, the reproductive phase starts from 10-12 years and continues till 45-50 years.
 - The female reproductive tract undergoes series of cyclic changes, called menstrual cycle, which is of 28 to 30 days.
 - One ovum is produced during one cycle.
 - The wall of uterus becomes thick to receive fertilized egg.
 - If pregnancy does not occur, the unfertilized egg and uterus lining are shed off, which results in bleeding, called **menstruation**.
 - First menstrual flow in a female is called **menarche**.
 - Stoppage of menstruation in females is called **menopause**.
- **Personal health and hygiene in adolescents**
 - Adolescents should have a balanced diet with right proportions of various nutrients.
 - Adolescents should maintain cleanliness to prevent bacterial infections.
 - They should indulge in some physical exercises to keep their bodies fit.
 - They should avoid the consumption of drugs and alcohol.