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3.1 Introduction

A person riding on a roller coaster experiences too much fear because of which there are changes in his heartbeat, respiration rate and muscular tension. In the same way, sitting at a particular place for a long time, the body experiences prickly or numb sensation. Getting up suddenly from sleep and switching on the light, we feel a shock and even if a hair pricks our feet, we begin to scream and gasp. The cause of all these events is our endocrine system and nervous system which make us feel any sensation.

3.2 Endocrine Glands and Hormones

The hormones secreted by every endocrine gland and their functions are as follows:

Pituitary Gland : It is a pea-sized gland located at the base of the skull. The hormones secreted by it play an important role in controlling bodily functions. One hormone helps to control blood pressure. One another hormone is the cause for powerful muscular contractions at the time of childbirth. In the same way, another hormone controls the process of controlling the balance of water by the kidneys. This gland produces Human Growth Hormone (HGH). Dwarfism is caused at the time of HGH production.



Pituitary gland

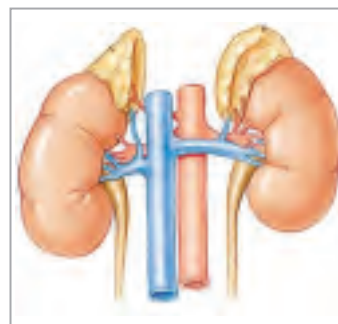
Thyroid Gland : It is located at the base of the neck just below the throat. It is an H-shaped gland which produces two hormones— one hormone is **calcitonine** which controls the level of minerals in the body; and the other hormone is **thyroxine** which controls metabolism.



Thyroid gland

Inability of the thyroid gland to produce thyroxine in sufficient quantity may lead to an increase or decrease in weight in the patient.

Adrenal Glands : Two adrenal glands are located at the upper end of the kidneys and secrete a hormone called **adrenaline**. The heart beats faster because of this hormone and it also helps to increase the rate of other bodily functions.



Adrenal glands

Pancreas : This gland is located below the stomach. It has special kind of cells. Of the two pancreatic hormones, one is insulin. It reduces the sugar in the blood by absorbing it and uses it for energy. The other hormone, **glucagon**, indirectly has an opposite effect of insulin. This increases the level of sugar in blood.



Pancreatic gland

Testes : These glands are present only in males. Testes make the male sexual hormone called **testosterone**. The function of this hormone is to control the male sexual organs and the development of male related characteristics, such as deep voice, moustache, beard, broader body and more hair on it as compared to a female. All these changes happen in boys between the ages of 13 and 14 years.

Ovaries : These glands are only in females. Ovaries produce only two hormones which are called **estrogen** and **progesterone**.

The function of estrogen is to control female sexual hormones and the characteristics found in females such as, shrill voice, soft skin and mammary glands. It helps to broaden the hips in females. These changes happen in girls between the ages of 10 to 13 years. The hormone called **progesterone** controls the changes in womb in menstrual cycle and helps to take care during pregnancy. The most important function of the ovary is to control the changes in the womb.

3.3 Adolescence and Puberty

Adolescence is called the stage between childhood and adulthood. The meaning of adolescence is 'to grow'. It lasts from 13 years to 19 years.

Puberty : The beginning of adolescence is called **puberty**. It is the age in which sex hormones begin to get produced, girls and boys become sexually mature and become capable of reproduction. Puberty arrives early in girls who reach this stage between 10 to 12 years while boys reach it between 13 to 14 years.

Physical Changes During Puberty :

Growth : At puberty, the growth and changes in boys and girls are very rapid. The growth in boys takes place between 11 years to 17 years. Their height may increase by 20 cm and the weight might increase by 25 kg. On the other hand, the growth in girls happen between 10 years to 16 years. Their height may increase by 15 to 17 cm and weight may increase by 18 kg.

Shape of the Body : During puberty, some secondary sex characteristics develop which distinguish the males from the females. The hips of the girls become broad, the pelvic region widens and the breasts become big. In boys, the shoulders become broad and muscles develop.

Hair on the body : In girls and boys, hair begin to grow in the pubic region and the armpits. Facial hair and hair on the chest begin to grow in boys. All these are called **secondary sex characteristics**.

Reproduction : During puberty, the ovaries become big and begin to produce mature eggs. In boys, the penis and the testes become fully grown and sperms begin to produce.

Change in Voice : During puberty, the voice of boys become deep while that of girls become sharp and shrill. In puberty, the neck begins to grow. In boys, the neck protrudes outside while the neck of girls is small. The neck of boys is called **Adam's apple**.

Increase in the activities of sweat and oil glands : Our skin has oil and sweat glands. During puberty, these glands become active. Because, pimples break out on the faces of boys and girls.

Table of endocrine glands, their secreted hormones and their functions

Gland	Location	Hormone secreted	Functions
Pituitary gland	Brain	Human Growth Hormone (HGH) and hormones related to reproduction	Growth of the body and sex organs.
Thyroid gland	Neck	Thyroid calcitonin	Increase the rate of metabolism.
Adrenal gland	Above the kidneys	Insulin	To maintain the level of calcium and phosphorus in the blood, make the liver able to collect sugar, control and break down of sugar in cells and reduce the level of sugar in the blood.
Testes	Hanging outside the abdominal cavity of males	Testosterone	Broadening of shoulders and deepening of voice in males.
Ovaries	Inside the abdominal cavity of females	Estrogen	Broadening of hips and maturing of eggs in the ovaries.

Mental, emotional and intellectual growth : Some changes are as follows :

- (i) Adolescents begin to think independently.
- (ii) Adolescents become inhibited and they assume more responsibility
- (iii) Because of emotional development, they begin to think more.

3.4 Sex Determination of a Baby

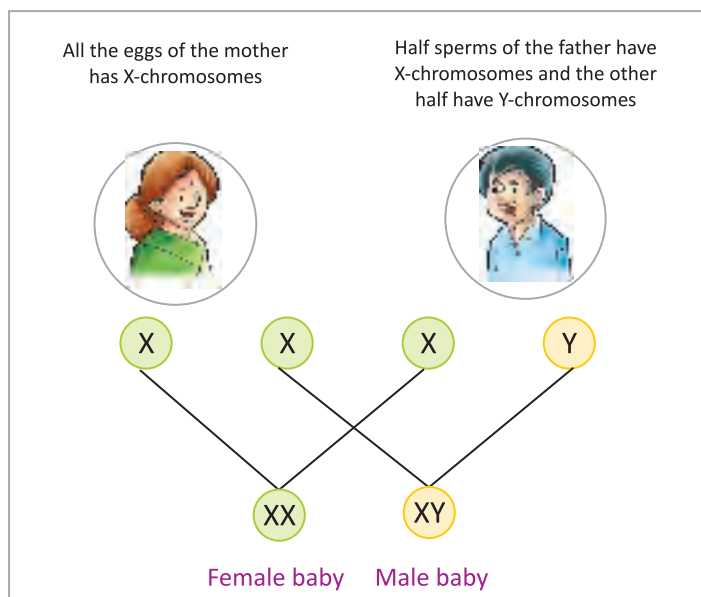
The chromosomes which determine the sex of a baby are called **sex chromosomes**.

Chromosomes are of two kinds : X-chromosomes and Y-chromosomes. A male (man) has one X-chromosome and one Y-chromosome. In other words, half the sperms have X-chromosomes while the other half have Y-chromosomes.

Females too have two chromosomes but they are X-chromosomes. In other words, all the eggs in a female have X-chromosomes.

There can be two conditions for sex determination of a baby :

1. If the sperm having a X-chromosome fertilises an egg with X-chromosome, the child will be a female or a girl because the chromosome combination will be XX.
2. If the sperm having a Y-chromosome fertilises an egg with X-chromosome, the child will be a male or a boy as the chromosome combination will be XY.



Menstrual Cycle : The cycle of changes which takes place in female reproductive system every month is called **menstrual cycle**. The duration of this cycle is 28 days and in it, egg is developed in the ovary.

Release of eggs : During menstrual cycle, the egg develops in the ovary. The mature egg goes into the oviduct. This process is called **release of egg**. In this condition, the walls of the uterus become thick to receive the fertilised egg.

Menstruation : If for any reason, the egg is not fertilised, it leads to breaking of both the egg and the lining of the uterus. The blood and the tissues, due to the breaking of the lining, come out of the vagina. This causes blood flow in women which is called **menstruation**. It lasts for 5 days.

During menstruation, a new egg becomes mature in the ovary and the cycle begins again. Some important things to be kept in the mind are :

- (a) Menstrual cycle ceases between the age of 45 to 50 years.
- (b) The ceasing of menstrual cycle is called menopause.
- (c) Menstrual cycle is controlled by hormones.

3.5 Reproductive Health

Three things are needed for good health: balanced diet, personal cleanliness and physical exercise.

Need of nutrition during adolescence : During adolescence, the development of the whole body, besides the height and growth, takes place such as, the breasts and hips develop in females and the shoulders and muscles develop in males. The diet of adolescents should have all the nutrients in enough quantities. The diet should contain proteins, carbohydrates, fats, vitamins and minerals.

Adolescents should pay special attention to iron as it fulfills the deficiency of many nutrients. Leafy vegetables, jaggery, meat and sour fruits are good source of iron.



Balanced diet

Highlights

- Endocrine system make us sense prickliness or numbness.
- Events such as little shock, a sharp scream, breathlessness, etc. are experienced due to endocrine system and nervous system.
- Pituitary gland is a pea-sized gland located at the base of the skull.
- Pituitary gland makes Human Growth Hormone (HGH) which helps in the growth of the body.
- Thyroid gland is an H-shaped gland just below the neck.
- Thyroid gland makes two hormones, calcitonine and thyroxine.
- Calcitonine controls the level of minerals and thyroxine controls metabolism.
- Production of thyroxine in less quantity may lead to an increase or decrease in weight in a patient.
- Adrenal gland produces adrenaline which controls the vibrations of the heart.
- The hormone insulin, secreted by pancreas, absorbs sugar from the blood and reduces its quantity.
- Testes are present in the males only and produce testosterone.
- Ovaries are found only in females, produce estrogen, control the growth of female sex and broaden the hips.
- Puberty is that stage when sex hormones begin to be produced. Boys and girls become sexually mature and they become able to reproduce.
- A male has two chromosomes, X and Y.
- A female has two chromosomes, X and X.
- When a sperm with X chromosome fertilises an egg with X chromosome, the child will be female.
- When a sperm with Y chromosome fertilises an egg with X chromosome, the child will be male.
- Adolescents should have more of iron.

Exercise



A. Tick (✓) the correct options :

1. The hormone found in thyroid gland is:

(a) Kidney

(b) thyroxine

(c) HGH

(d) None of these

2. Ovaries are found in:

(a) males

(b) females

(c) frogs

(d) All of these

3. Puberty begins in girls in:

(a) 5–6 years

(b) 7–9 years

(c) 9–10 years

(d) 10–12 years

4. Duration of menstrual cycle is:

(a) 10 days

(b) 5 days

(c) 28 days

(d) None of these

5. Pancreas is located :

(a) below the stomach

(b) in hands

(c) in kidneys

(d) None of these

B. Fill in the blanks :

1. Adrenal gland makes _____ hormone.
2. Insulin is made in _____ gland.
3. Puberty in boys begins between the age of _____ years.
4. Two hormones _____ and _____ are found in ovaries.
5. Ceasing of menstrual cycle is called _____.

C. Write whether True or False :

1. Egg is smaller as compared to sperm.
2. Pancreas is located below the stomach.
3. The ovaries produce female sex hormones.
4. Puberty sets early in girls.
5. X and Y chromosomes are sex chromosomes.

D. Very Short Answer Questions :

1. In which part of the body are adrenal glands found?
2. How many chromosomes does a female have?
3. What is the duration of adolescence?
4. When does puberty set in girls?
5. Which hormone is there in testes?

E. Short Answer Questions :

1. Define pancreas.
2. What changes happen in boys during puberty?
3. What changes happen in girls during puberty?
4. Write one function of ovaries.
5. Define menstrual cycle.

F. Long Answer Questions :

1. Write a brief note on pituitary glands and testes.
2. Explain menstrual cycle in detail.
3. How is the sex of the baby determined? Explain.
4. Write four physical changes during puberty.
5. Write a note on menstruation and release of egg.



Project Work

- Write balanced diet to be taken during adolescence on a chart paper and hang it in your class.