

6

REACHING THE AGE OF ADOLESCENCE



THEORY

INTRODUCTION

Humans pass through various stages in their life. These are infancy, childhood, adolescence and adulthood. Infancy is the first stage. A newborn baby remains an infant till one year. An infant can see, feel the touch, hear sounds and react by crying, smiling or moving hands and legs. Childhood is the stage between infancy and adolescence. During this time, a child learns about his surroundings and culture. As he grows up, he develops various ideas and thoughts. Adolescence is the stage between childhood and adulthood. It is the transitional stage during which various biological and psychological changes occur. Human beings become adults by the age of 18. An adult becomes physically, psychologically and socially mature. He reaches the maximum height, becomes sexually active and mentally and emotionally strong.

PUBERTY AND ADOLESCENCE:

You must have seen a sudden increase in height in some of the boys or girls of your class. OR You must have seen hairy line above the lips in boys? Have you ever wondered, what are these changes all about?

These are seen because the boys or girls are growing up. Growth is a natural process. It begins from the day one you are born, but upon crossing the age of 10 or 11, there is a sudden spurt in growth that becomes noticeable. The period of life, when the body undergoes certain noticeable changes, leading to reproductive maturity is called *adolescence*. It begins after the age of 11 and lasts up to 18 to 19 years of age. Adolescents are also called as "teenagers" because the period covers the teens (13 to 18 or 19 years of age). The human body undergoes several changes during adolescence. These changes mark the onset of puberty. Puberty is the start of the time when a boy is biologically ready to become a father and a girl is biologically ready to become a mother. It basically refers to the bodily changes of sexual maturation rather than psychological and cultural aspects of adolescence, whereas adolescence is psychological and social transition from childhood to adulthood. It generally overlaps the period of puberty.

Puberty ends when an adolescent reaches reproductive maturity.

CHANGES AT PUBERTY

Puberty involves all sorts of big and small changes to your body and your brain. During puberty, our body grows faster than at any other time in your life, except for when you were a baby.

- The various changes that take place in adolescents during puberty are:
1. **Increase in height:** This is the most conspicuous change during puberty. *When you go through puberty, it might seem like your sleeves are always getting shorter and your pants are creeping up your legs. Why is it happening so?* It is because your body is going through a growth spurt that lasts for about 2 to 3 years. Spurt is a short burst of activity or something that happens in a hurry. When that growth spurt is at its peak, some kids grow 4 to more inches in a year. At the end of your growth spurt

you will reach your normal adult height or just about. But, your height is not the only things that grows or changes during puberty. You can see that other parts of body especially your feet are growing faster than everything else. This makes you feel awkward or clumsy but eventually it will fill out and soon the body will regain its normal proportions. Hence, it is important that the body gets the correct nutrition during adolescence to ensure healthy growth of bones, muscles and other parts.

Initially girls grow faster than boys but by about 18 years of her age, both will reach their maximum height. The rate of growth in height varies in different individual. Some children grow suddenly at puberty and then slows down, while some grows gradually. Have you ever thought *why do we stop growing after a period*. The average body is about one feet eight inches long at birth. Over the next twenty years, man triples the length of the body he was born with and reaches an average height of about five feet, eight inches. *But why doesn't an individual just keep on growing and growing?*

In the body there is a endocrine gland, thyroid in the neck, the pituitary attached to the brain, the thymus which is in the chest and sex glands, that control our growth and development. The pituitary gland is the one that stimulate our bones to grow. If this works too hard our arms and legs would grow too long and our hands and feet too big. If the gland doesn't work hard enough, we would end up as midgets.

We continue to grow, but only slightly, after the age of 25 and we reach our maximum height at about the age of 35 or 40. After that we shrink about half an inch every ten years. The reason for this is the drying up of the cartilages in our joints and in the spinal column as we get older.

Average rate of growth in height of boys and girls in percentage.

Age (Years)	% of maximum of full height	
	Boys	Girls
11	81%	88%
12	84%	91%
13	88%	95%
14	92%	98%
15	95%	99%
16	98%	99.5%
17	99%	100%
18	100%	100%

This table gives the percentage of maximum of full height a person has achieved at a particular age. For example, by the age of 12, a boy has 84% of his possible maximum height, while a girl has reached 91% of her maximum height.

This information can be used to calculate the maximum height by the following formula :

$$\text{Maximum height (cm)} = \frac{\text{Present height (cm)}}{\% \text{ maximum height at this age}} \times 100$$

For example, if a boy is 12 years old and has reached 130 cm height, at the end of the growth period, he is likely to attain a maximum height of

$$\frac{130}{84} \times 100 = 154.8 \text{ cm} \quad (\text{data from table})$$

Proper growth of the body, no doubt, is related to the right kind of food eaten during the growing years.

NUTRITIONAL NEEDS OF ADOLESCENTS

- **Balance Diet**

As the body is in a stage of rapid growth during adolescence, nutritional needs are also more. The diet during this period has to be a **balanced diet**.

Balanced diet is a diet containing proper amounts of all the nutrients – proteins, carbohydrates, fats, vitamins and minerals. In such a diet, energy giving (carbohydrates and fats), body-building (proteins) and protective foods (vitamin and minerals) are present in requisite proportions.

- **Adequate Exercises, Rest and Sleep**

1. Live a disciplined life.
2. Keep yourself away from tension, long hours of television viewing and long hours of continuous table work.
3. Take rest and regular sleep.
4. Undertake exercise regularly. Brisk walking, running, cycling and swimming are some good exercise. Exercises help in improving blood circulation. They also help in keeping out lungs, heart and body muscles healthy. Exercise also helps in resisting infections and building up health.

- **Stay away from Alcohol**

Alcohol causes intoxication, the effect of which is the same as of any other poison.

- **Say 'No' to Drugs**

Drugs are normally used for the treatment of diseases. There are some drugs which affect the individual physically as well as mentally. The prolonged use of drugs may lead to the dependence of the body on them. This is called **drug addiction**.

2. **Changes in Body Shape:** *During puberty, your body fills and changes shape. You must have seen that boys in your class have broader shoulders and wider chest than boys in junior class. Why such variations are present?* This is because the body have entered the age of puberty. During puberty,

In boys -

- (i) The shoulders become broader
- (ii) The chest becomes wider
- (iii) The body becomes more muscular

In girls-

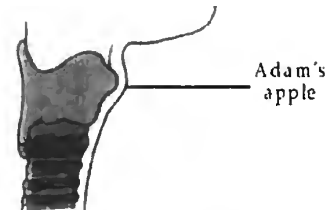
- (i) The pelvic region widens
- (ii) Hips get broaden
- (iii) Breasts develop and increase in size. The mammary glands (milk secretion glands) develop inside the breasts.

3. **Voice changes:** Both boys and girls experience voice change as they grow older. *A boy's voice may change from sounding like a little bird to sounding like somebody's dad! Why it is so?*

The larynx, also known as voice box, actually gets bigger during puberty. It is a tube-shaped piece of cartilage, located in your throat. Larynx helps the individual to talk, sing, hum, yell, laugh and make all sort of noises. When a boy reaches puberty his body starts secreting a hormone called testosterone. This testosterone causes the boy's larynx to grow and his vocal cords to get longer and thicker. Vocal cords are thin muscles that stretch across the larynx like rubber bands.

How sound is produced by an individual? When you speak, air rushes from your lungs and makes your vocal cords to vibrate and produce the sound of your voice. Before you reach puberty, your larynx

is small enough and your vocal cords are kind of small and thin. That is why your voice is higher than an adult's. As you go through puberty, the larynx gets bigger and the vocal cords get lengthened and thickened. This makes your voice deeper. As your body adjusts to this changing structure (larynx) your voice may 'crack' or 'break'. But this process lasts only for few months. Once the larynx has finished growing, your voice won't make those unpredictable noises. The growing voice box in boys can be seen as a protruding part of the throat called *Adam's apple*. When the larynx grows bigger, it tilts to a different angle and part of it sticks out inside the neck. You can see it at the front of the throat. For girls, the larynx also grows bigger but not as much as in boys. It means there is no Adam's apple in a women's neck. Generally, girls have a high pitched voice whereas the voice in boys is deep. Sometimes, the muscles of the growing voice box go out of control and voice becomes hoarse.



Adam's apple

4. **Increased activity of sweat and sebaceous gland:** As you enter puberty, the puberty hormones stimulate the glands in your skin, including the sweat glands under your arms. When sweat and bacteria on your skin get together, it smells pretty bad. Another thing that comes with puberty is acne. The increased secretion of sebum from sebaceous glands makes the skin oilier. Pimples usually start showing up and you may get them through out the teenage years.
5. **Development of hair:** During puberty, in both boys and girls, hair starts growing in the armpits and in the pubic area.
6. **Reaching Mental Intellectual and Emotional Maturity:** During puberty, you might feel confused or have strong emotions that you have never had before. You may feel overly sensitive or become upset easily. Some kids lose their temper more often and get angry with their friends and families. Intellectual development also occurs during adolescence to transform the individual from a child to adult. In fact, it is the time in one's life when the brain has the greatest capacity for learning. The changes are natural part of growing.
Hence during puberty -
 - (i) There is mental growth of an individual. Individual is able to think in a more flexible and a logical way. The ability to see other's point of view, exploring ideas, developing concepts and memory skills improve.
 - (ii) There is an emotional growth. The individual is happy at one moment and the very next moment their mood changes. Interest in the opposite sex and desire for closeness arise.
 - (iii) There is a social growth. It includes developing a personal identity accepting oneself, developing independence and preparing for a career. Sometimes, it is hard to deal with all these new emotions. But it is necessary for you to know that while your body is adjusting to the new hormones, so is your mind.
7. **Sexual feeling:** At puberty, the adolescents may also have sexual feelings that they have never felt before. It causes the boys and girls to become interested in and attracted to the opposite sex.
8. **Development of sex organs:** During this period the male sex organs like testes and penis develops completely. Also, the testes begins to form sperm. In girls, the ovaries enlarge and eggs begin to mature. Also, ovaries start releasing matured eggs.

9. **Secondary sexual characters :** Secondary sexual characters are those features that help to distinguish the male from the female. In girls, during puberty, breast begins to develop and boys begin to grow facial hair that is moustaches and beard. As these features are used to distinguish male and female, hence they are called as **secondary sexual characters**.

Some of the secondary characteristics in girls during puberty are-

- (i) Development of breast and increase in their size.
- (ii) Development of hair under armpits and in the pubic region.
- (iii) Widening of pelvic region and broadening of hips.
- (iv) Start of menstrual cycle.

Some of the secondary sexual characteristics that develop in boys during puberty are -

- (i) Growth of facial hair (beard and moustaches).
- (ii) Voice becomes deeper.
- (iii) Muscles develop and shoulders become broad.
- (iv) Hair develop under the armpits, under chest and in the pubic region.

GLANDS AND HORMONES :

The glands and hormones are the two key components of the endocrine system. Glands are groups of specialized cells which produce and secrete hormones into the bloodstream. Then these hormones travel inside our bodies and act like chemical messenger. Hence, it is the hormones that make you feel hungry or full, determine how you handle stress or how you sleep and much more. The glands control the body's day to day functioning. They affect its shape, its strength, its reproduction, its growth and its nourishment. A hormone from the pituitary gland causes us to grow to about average height. Other gland enables us to digest our food. Without them not even a feast would tempt us to eat.

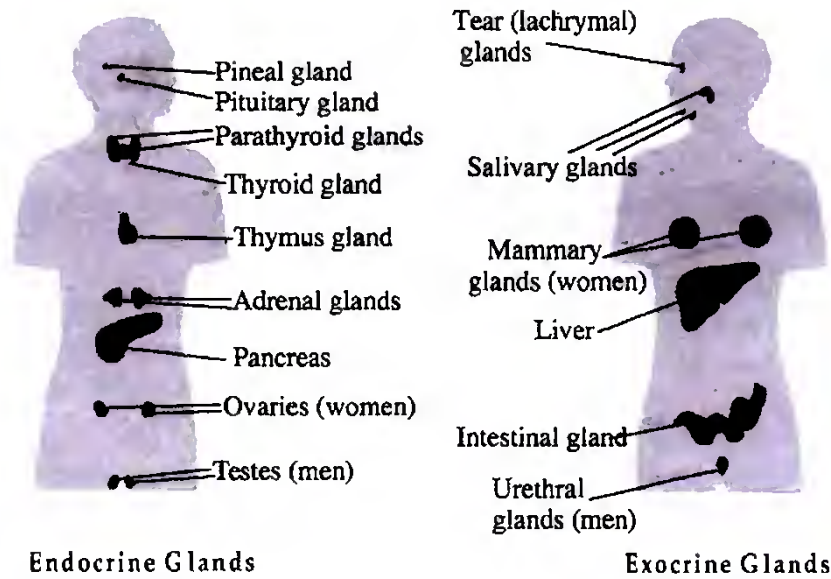
KNOWLEDGE BUILDER

Heterocrine glands are partly exocrine with duct and partly endocrine without duct. Exocrine part releases secretion in duct while endocrine part releases hormones in blood.

For example, pancreas and gonads.

Glands are divided into two types :

- (i) **Exocrine glands:** The glands that release their secretions with the help of ducts at specific site are called *exocrine glands*. For example, the salivary glands secrete saliva in the mouth through salivary duct. Similarly, digestive glands secrete their secretions in the digestive tract with the help of ducts. Sweat gland is also an example of exocrine gland.
 - (ii) **Endocrine glands:** The glands that pour their secretions directly into the blood are called *endocrine glands*. Endocrine glands are called ductless glands as they do not have ducts. The secretions reach their target through blood. The major endocrine glands that make up the human endocrine system are - Pituitary gland, hypothalamus, thyroid glands, parathyroid glands, adrenal glands, pineal body and reproductive glands that include the testes in the male and ovaries in the female.
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ROLE OF HORMONES IN INITIATING REPRODUCTIVE FUNCTION:

The testes and ovaries are endocrine glands. During puberty, the testes begins to secrete the testosterone hormone. This hormone brings about the physical changes that make a boy look like an adult male. These changes are called male secondary sexual characteristics. Similarly, in girls during puberty the ovaries begin secreting the hormones called estrogen and progesterone. These hormones develop female sexual features. The production of male and female hormone is under the control of a hormone from another endocrine gland called pituitary gland. Pituitary gland secretes follicle stimulating hormone (FSH) that in turn form matured ova in the ovary and sperms in the testes.

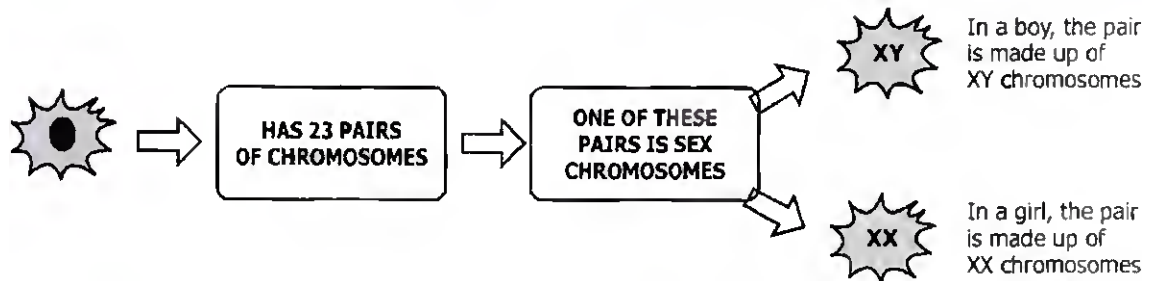
REPRODUCTIVE PHASE OF LIFE IN HUMANS:

In females, the reproductive phase of life begins at puberty and generally lasts till the age of approximately 45 to 50 years. The ova begin to mature with the onset of puberty. During the reproductive period, the two ovaries inside a female body take turns to produce an ovum (or egg) and one egg is released every 28 days. The process of release of an egg by an ovary is called *ovulation*. During this period, the wall of uterus passes through several phases that are controlled by two hormones, called estrogen and progesterone. The inner lining of uterus gets thickened and is supplied with blood from which growing embryo draws nutrition. This is a natural preparation to receive the egg in case it is fertilized and pregnancy occurs. If fertilization does not occur, the lining of uterus breaks down slowly and is released out in the form of blood and mucous from the vagina. This process is called *menstruation*. Menstruation is a process in which blood and mucous flows out every month through the vagina. This is usually a 28 day cycle.

SEX DETERMINATION -BOY OR GIRL:

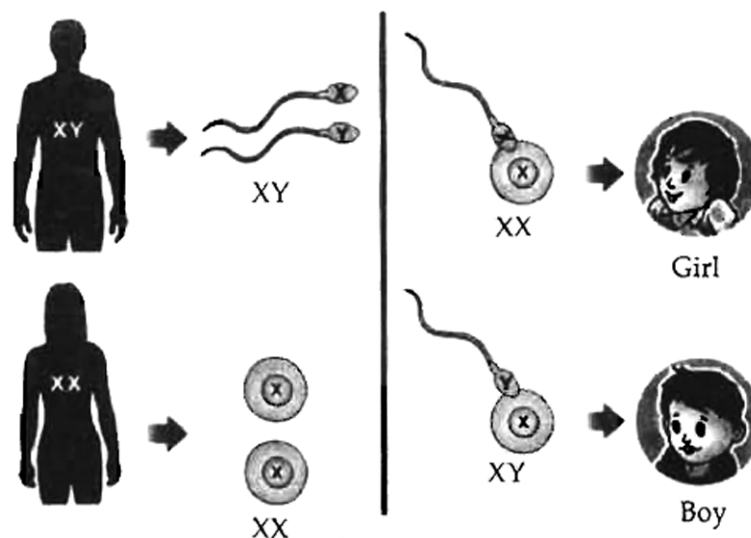
What determines whether the baby developing inside the mother's womb is a boy or a girl? This is determined by a thread like structure called chromosomes, located inside the nucleus of zygote or fertilized

egg. Chromosomes are thread like structure that carry information in the form of genes. Genes determine all inherited characters, including the sex of the baby. Each cell contains 23 pairs of chromosomes of these, one pair is called sex chromosomes. There are two types of sex chromosomes-X and Y. Female cell contains two X chromosome (XX) while male cells carry one X and one Y chromosomes (XY).



When the egg gets fertilized, the sex of the child will depend on the kind of sperm that fertilizes the ovum.

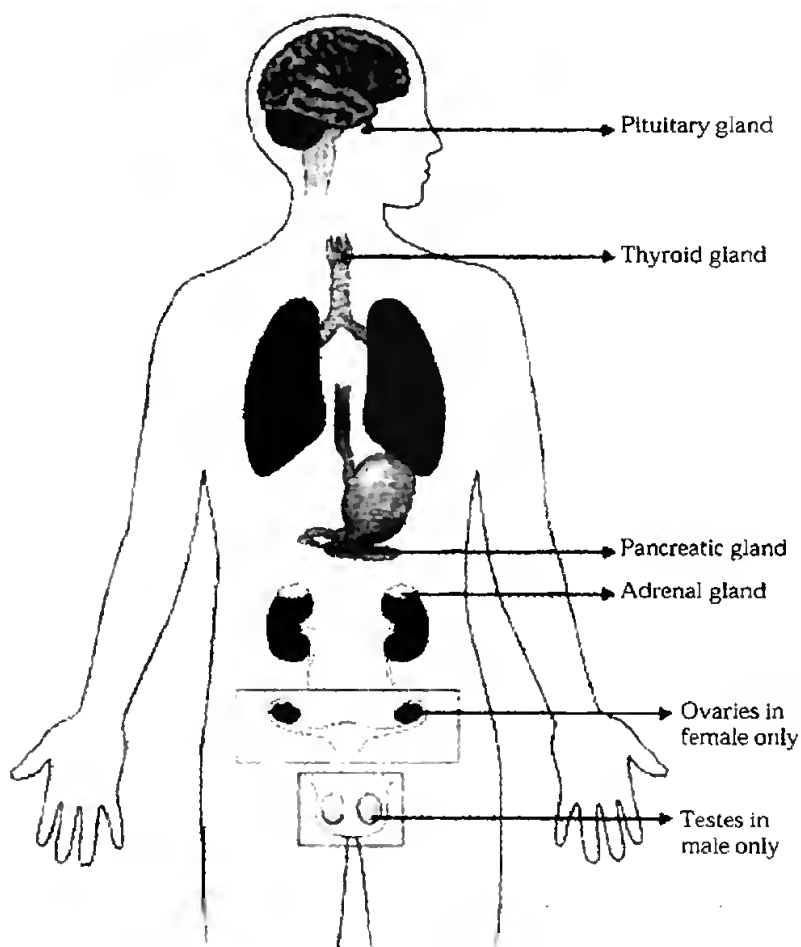
- If the sperm carrying X chromosome fertilizes the egg, it would be a girl, since the chromosome pair will be XX.
- If the sperm carrying Y chromosome fertilizes the egg, the baby will be a boy, since the chromosome pattern will be XY.



It possible to find out the sex of the baby while inside the mother's womb. Doctors determine the sex of the child with the help of special techniques called sonography. Unfortunately, these days, people started misusing this test and are using it for killing a girl foetus if present inside the mother's womb. The process of killing foetus in mother's womb is called *abortion*. This killing of girl foetus is known as *female infanticide*. To put a stop to female infanticide the government has made it illegal and has banned techniques to find out the sex of growing foetus.

HUMAN ENDOCRINE SYSTEM:

Let us now learn about the different hormones present in our bodies. The major glands that make up the human endocrine system are - Pituitary, Thyroid, Adrenals, Pancreas, the Ovaries and the Testes.



Human Endocrine System

- (1) **Hypothalamus:** Hypothalamus is located in the basal part of forebrain and it regulates wide range of body functions. It contains neurosecretory cells that produces hormones. These hormones regulate the synthesis and secretion of pituitary gland.
- (2) **Pituitary Gland :** It is a pea-shaped gland located at the base of the brain and is attached to hypothalamus by a stalk. The pituitary gland is anatomically divided into an anterior pituitary and posterior pituitary. The hormone secreted by pituitary gland influences the secretion of other glands. Therefore, they are known as *Trophic hormones*.

Role of hormones secreted by pituitary :

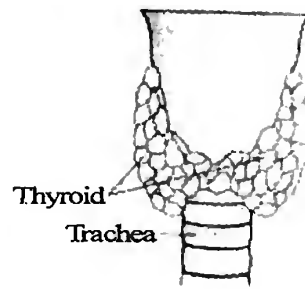
- (i) TSH stimulates the growth and functions of thyroid gland.
- (ii) Growth hormone (GH) stimulates the growth and development of the body.

KNOWLEDGE BUILDER

Pituitary gland is also called as master gland of the endocrine system. It is because:

- (i) It is a hormone that controls the activity of many other endocrine system.
- (ii) Its job is to receive messages about the need for a particular hormone and to secrete the hormones that cause the manufacture and release of the hormone.

- (3) **Thyroid Gland:** It is located in the neck in front of wind pipe. The thyroid gland produces the hormone called thyroxine. Iodine is required for the production of this hormone.



Thyroid Gland

Role of thyroxine :

- (i) Thyroxine regulates the body temperature.
- (ii) It also plays a major role in growth and development of body.

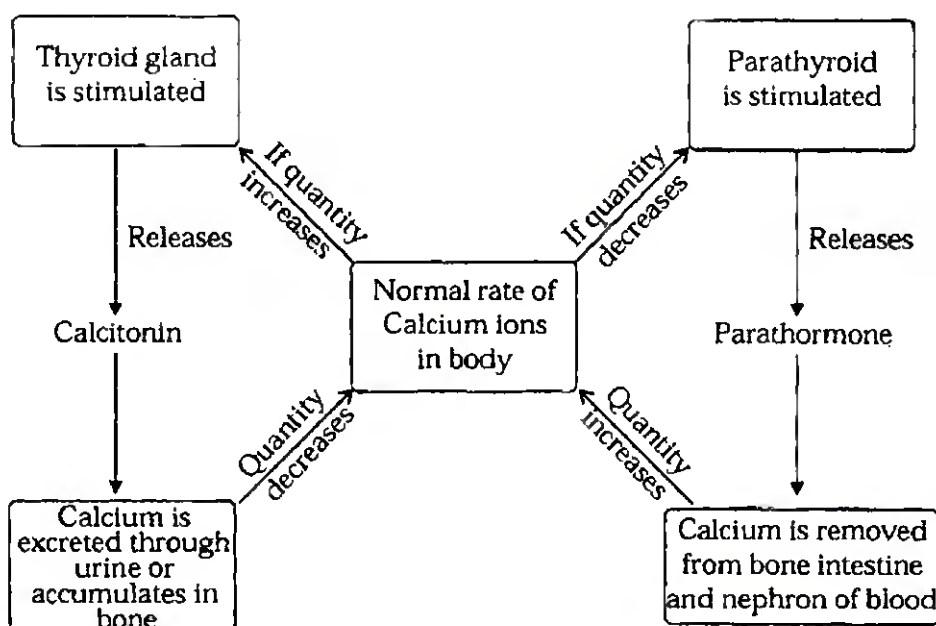
Goitre : The enlargement of thyroid gland due to deficiency of iodine in blood is termed goitre. This condition can be prevented by eating vegetables and fishes as they contain iodine in it. The abnormal secretion of thyroxine affects the body.

Hypothyroidism is a condition caused by under production of thyroxine. It is characterized by low energy production, slowing down of heart beat, loss of appetite and lethargy. *Hyperthyroidism* is a condition caused by over production of thyroxine. It is characterized by increased energy production, increased heart beat, increased appetite, frequent sweating and shivering of hands.

Apart from all these, it also causes a condition characterised by the retardation of mental and physical development. This condition is known as *cretinism*. In adult, the deficiency of thyroxine leads to a disease called *Myxoedema* while the over secretion of thyroxine leads to *exophthalmic goitre*.

The thyroid gland produces another hormone called *calcitonin*.

Calcitonin along with *parathormone*, produced by parathyroid gland regulates the level of calcium ions in blood.

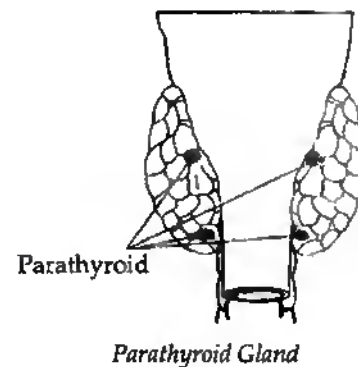


Regulation of Calcium ions in blood

- (4) **Parathyroid Gland:** It is located on the posterior side of thyroid gland. It regulates the level of calcium ions in the blood.

If there is increase production of parathormone in blood? Calcium salts are absorbed from the bones and added to blood. As a result, bones become brittle. Also, the kidney filters and excretes more calcium from the blood. This leads to stone formation in kidneys.

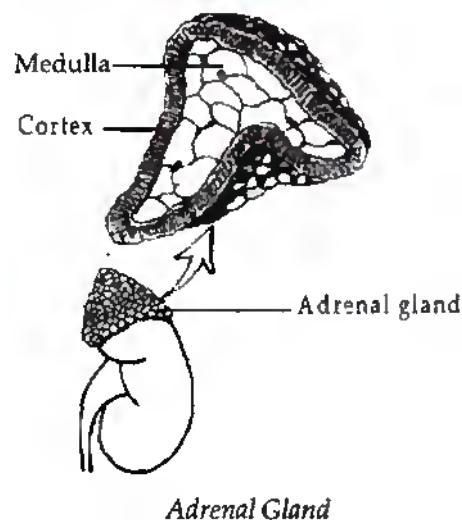
The deficiency of parathormone leads to deficiency called tetany. *Tetany* is manifested as strong spasms of muscles.



- (5) **Adrenal gland:** It is located at the top of each kidney. The hormone secreted by adrenal gland is adrenaline.

Role of adrenaline:

- (i) It helps in defence of the body in emergency situations.
 - (ii) It maintains the correct salt balance in the blood.
- Adrenal gland is structurally and functionally divided into adrenal cortex and adrenal medulla.
- (i) **Cortex:** The hormone secreted by cortex are aldosterone and cortisol.
- (i) *Aldosterone* - Aldosterone helps to maintain the balance of salts and water in the blood.
 - (ii) *Cortisol* - Cortisol stimulates the break down of proteins and fats. It also stimulates synthesis of glucose from amino acids. Continuous use of cortisol causes elevation of glucose level in blood.
- (ii) **Medulla:** Medulla is a source of two hormones called adrenaline and nor adrenaline. Both of these hormones prepare our body to overcome emergency situation.



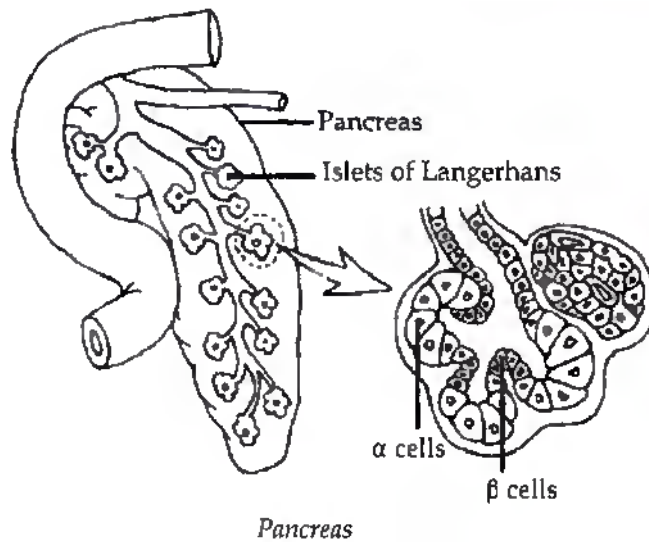
KNOWLEDGE BUILDER

ADRENALIN

Adrenaline is often known as the fight or the flight hormone because it prepares the body to act, especially when the body encounters stress. Hence it is also termed as stress hormone because it helps to calm down when one is very angry, embarrassed or worried. It is released under emergency situations. Some of the physiological changes brought about by adrenaline are

- (i) It increases the heart beat
- (ii) It increases the blood-sugar level
- (iii) It results in overall increase in energy level in the body.

- (6) **Pancreas :** It is located near the liver i.e. below the stomach. The hormones secreted by pancreas are insulin and glucagon. They are secreted by the cluster of cells called islets of Langerhans.



Role of pancreatic hormones: It maintains blood-sugar level of body.

- **Insulin** - Lowers the blood sugar level.
- **Glucagon** - Raises the blood sugar level.

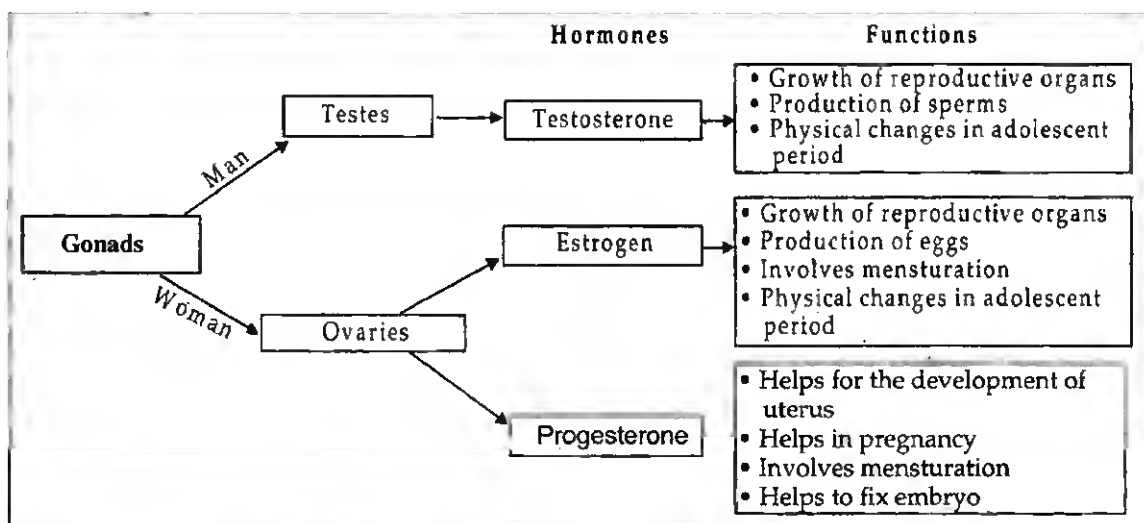
(7) **Ovaries:** They are two in number and located in the pelvic region of female body. The hormones secreted are oestrogen and progesterone.

Role of hormones secreted by ovaries:

- (i) Hormones control the development of secondary sexual characters in females such as development of breasts.
- (ii) They play an important role in regulation of menstrual cycle and pregnancy.

(8) **Testes:** Like ovaries, they are also two in number. The testes are two oval organs in the scrotum. The hormone released is testosterone.

Role of Testosterone: It controls the development of secondary sexual characters in males such as facial hair.



KNOWLEDGE BUILDER

THYMUS GLAND

Our body also possesses a gland, which starts functioning in the embryonic stage itself, becomes active during childhood and undergoes regression and gradually stops functioning after adolescence. It is known as thymus gland.

Thymus produces the hormone thymosin that imparts resistance to diseases in children. However it continues to be the production centre of lymphocytes.

ROLE OF HORMONES IN COMPLETING THE LIFE CYCLE OF INSECTS AND FROGS:

In previous chapter, we have learnt about the life history of a butterfly and a frog. Try to recall the stages of life history of the butterfly? In the life history of a butterfly the caterpillar has to pass through various stages to become adult. This process of change from larva to adult is called *metamorphosis*. In insects, the process of metamorphosis is controlled by insect hormones like Ecdysone. Similarly, in frog metamorphosis it is controlled by thyroxine. The presence of thyroxine causes the tadpoles to become adult frog. But do you know, thyroxine production requires the presence of iodine in water. If the water in which tadpoles are growing does not contain sufficient iodine the tadpoles cannot get metamorphosed into adults.

REPRODUCTIVE HEALTH:

During adolescence, there is rapid mental and physical growth. The physical and mental well being of an individual is regarded as an individual's health.

Therefore for proper individual health, every human being needs –

- (i) To have a balanced diet.
 - (ii) To observe personal hygiene and cleanliness regularly
 - (iii) To undertake adequate regular exercise.
- (i) **To have a balanced diet:** A balanced diet contains the right amount of proteins, carbohydrates, fats, vitamins and minerals. The diet should contain adequate amounts of cereals for carbohydrate, pulses for proteins, controlled amount of butter and ghee for energy and fruits and vegetable for protection against diseases. Our Indian meal of roti/rice, dal (pulses) and vegetable is a balanced diet. Milk is a balanced diet in itself. Fast food which is tasty but does not contain adequate nutrition. Hence, it should not be used as substitute for meals.
- (ii) **Personal Hygiene:** Personal hygiene is necessary for adolescents because the increased activity of sweat glands sometimes make the body smelly. Taking a bath every day and cleaning all parts of the body is essential, otherwise, there are chances of catching bacterial infections. Girls should keep track of their menstrual cycle and should be especially careful about hygiene during menstruation.
- (iii) **Regular physical exercise:** Walking, playing and jogging etc. in the fresh air keep the body fit and healthy. Since adolescence is a stage of insecurity and confusion, it is easy for the adolescent mind to get diverted by wrong company or advice and may fall prey to drug and alcohol abuse. Adolescents are advised not to feel confused or insecure. You are just passing through a period of much activity in the body and mind, which is a normal part of growing up. So if anybody suggests that you will get relief by taking some drug just say 'No' to them. Drugs are actually addictive and once taken, there is a tendency to take them again and again. They harm the body in the long run, thereby ruining the health and happiness.
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AIDS (ACQUIRED IMMUNODEFICIENCY SYNDROME) :

You must have heard about AIDS. What is it? AIDS is a fatal disease caused by a dangerous virus called HIV (Human immunodeficiency virus). It destroys the body's ability to fight against illness and infections. AIDS stands for acquired immunodeficiency syndrome. HIV kills or damages cells of the body's immune system which slowly destroys the body's ability to fight infection and diseases. AIDS is the final stage of HIV infection.

Methods of transmission of virus are

- (i) By sharing the syringes used for injecting drug between normal and infected person.
- (ii) From infected mother to an infant through milk.
- (iii) Through sexual contact with a person infected with HIV.

Preventing measures that can be taken to prevent spread of AIDS are -

- (i) Do not share syringes or needles.
 - (ii) Avoid receiving infected blood during transfusion
 - (iii) Use sterilised surgical instruments
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POINTS TO REMEMBER

- The period of life, when the body undergoes certain noticeable changes, leading to reproductive maturity is called *adolescence*.
- *Puberty* is the start of the time when a boy is biological ready to become father and a girl is ready to become mother.
- *Changes at puberty*
 - During childhood, girls and boys are similar in height. During puberty, both sexes rapidly become taller. But on average, boys grow more and so usually end up taller adults than girls
 - Girls develop a more rounded body outline, especially on the shoulders and hips while boys become more angular with broader shoulders . .
 - The reproductive or menstrual cycle begins in girls while reproductive organs in the male body begin to develop sperm cells.
- *Secondary sexual characters* are those features that help to distinguish the male from the female. In girls, breast begin to develop and boys begin to grow facial hair.
- The changes at puberty are controlled by hormones.
- *Hormones* are chemical messengers of the body that transfer information from one set of cells to another.
- *Glands* are group of specialised cells that produce and secrete hormones.
- *Glands are of two types* –
 - (i) *Exocrine gland* that releases their secretions with the help of ducts at specific site. Ex-Salivary gland
 - (ii) *Endocrine gland* that releases their secretions directly into blood. Ex Adrenal gland.
- The endocrine glands play a vital role in controlling and co-ordinating activities of life.
- The various hormones of pituitary gland control the secretion of hormones from other endocrine gland.
- The pituitary and hypothalamus are connected by nerve fibres and blood vessels.
- The pituitary gland is controlled by the releasing hormones from hypothalamus. The under secretion or over-secretion of various hormones can cause health diseases.
- *Various types of glands and their secretions are as follows* –
 - *Pituitary* - Master gland of body
 - *Thyroid gland* - Thyroxine and calcitonin
 - *Parathyroid* - Parathormone
 - *Adrenal glands*
 - Cortex - Aldosterone and Cortisone
 - Medulla - Adrenalin and nor-adrenalin
 - *Pancreas* - Insulin and Glucagon
 - *Gonads*
 - Testes - Testosterone
 - Ovaries - Estrogen and Progesterone

CONCEPT APPLICATION LEVEL - I [NCERT Questions]

Q.1 Why is adolescence also called teenage?

Ans. Adolescence begins around the age of 11 and lasts up to 18 or 19 years of age. Since this period covers the teens (13 to 18 or 19 years of age) adolescence is also called teenage.

Q.2 What is the most important changes which makes puberty?

Ans. The human body undergoes several changes during adolescence. These changes mark the onset of puberty. The most important change which marks puberty is that boys and girls become capable of reproduction.

Q.3 What are the changes in shape of the body of girls and boys during adolescence?

Ans. In boys the shoulders become broader and chests become wider in the age of adolescence. In girls the region below the waist becomes wider.

In boys the muscles of the body grow more prominently than in the girls. The changes occurring in adolescent boys and girls are different.

Q.4 Explain the development of sex organs in male and female.

Ans. At the puberty, male sex organs like testes and penis develop completely. The testes also begin to produce sperms. In girls the ovaries enlarge and eggs begin to mature. Ovaries also start releasing mature eggs.

Q.5 Explain the changes that occur in the voice of boys and girls during puberty.

Ans. The voice box or larynx begins to grow. Boys develop larger voice boxes. The growing voice box in boys can be seen as a protruding part of the throat, called Adam's apple. In girls the larynx is hardly visible from the outside because of its small size. Girls have high pitched voice, whereas boys have a deep voice.

Q.6 Why some young people get acne and pimples on the face during puberty?

Ans. During puberty the secretions of sweat glands and sebaceous glands increase. Many young people get acne and pimples on the face at this time because activity of these glands in the skin increases.

Q.7 What are the secondary sexual characters in girls?

Ans. In girls breasts begin to develop at the time of puberty. These features help us to distinguish the male from the female. These characters are called secondary sexual characters. Hair grows under the arms and in the region above the thighs or the pubic regions in girls.

Q.8 Explain menarche and menopause.

Ans. Menarche: The first menstrual flow beginning at puberty is termed as menarche.

Menopause : At 45 to 50 years of age the menstrual cycle stops. Stoppage of menstruation is termed as menopause.

Q.9 Why pituitary gland is called master gland?

Ans. Pituitary gland is called master gland. It is the most important endocrine gland. The hormones secreted by the pituitary gland stimulate testes and ovaries to produce their hormones. Pituitary gland also controls the secretions of other endocrine glands. It is attached to the brain.

Q.10 How do hormones help in the completion of life history of insects and frogs?

Ans. The changes from larva to adult is called metamorphosis. Metamorphosis in insects is controlled by insect hormones. In a frog it is controlled by thyroxine, the hormone produced by thyroid. Thyroxine production requires the presence of iodine in water. If the water in which the tadpoles are growing does not contain sufficient iodine, the tadpoles cannot become adults.

Q.11 How do hormones work?

Ans. Hormones are released by endocrine glands into blood stream to reach a particular body part called target site. The target site responds to the hormone. There are many endocrine glands or ductless glands in the body.

Q.12 Why should adolescents avoid sexual contact?

Ans. Sexual contact by adolescents should be avoided because :

- (i) to avoid unwanted pregnancies.
 - (ii) to avoid getting HIV (AIDS) infection or any other sexually transmitted disease.
 - (iii) the responsibilities of parenthood should only be taken when you are settled in life.
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