

Chapter :- How do organisms Reproduce

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Introduction :-

- Reproduction is a energy spending process by which living organisms are able to produce young ones of their own kind.

- Reproduction is an energy spending process which is not at all essential to maintain the life of an individual organisms but is essential for the existence and continuity of species.

- Reproduction at its most basic level will involve making copies of the blueprints of body design through the genetic material DNA-DNA (Deoxyribonucleic Acid) molecules in the cell nucleus is the information source for making proteins and change in the informational leads production of different proteins which eventually lead to altered body design.

Variation and Evolution :-

- A basic (exit) event in reproduction is the creation of a DNA copy which is accompanied by the creation of an additional cellular apparatus and then the DNA copies separate, each with its own cellular apparatus.

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→ The consistency of DNA copying during reproduction is important for the maintenance of body design features that allow the organism to use that particular niche. Reproduction is, therefore linked to the stability of population of species.

→ Complete accuracy in DNA copying leads to the formation of two exactly identical cells but any error in duplication can lead to dissimilar cells or variations of traits up to

→ This inbuilt tendency for variation during reproduction is the basis for evolution.

→ Variation is useful for the survival of species over time.

Asexual Reproduction :-

→ Asexual reproduction involves the production of offspring from a single parent without the fusion of gametes.

→ Asexual reproduction mostly occurs in unicellular organisms (like bacteria, protozoas, etc), fungi, some plants (like algae, bryophytes, etc.) and certain multicellular animals (like sponges and Hydra).

1. Fission :-

→ Modes of asexual reproduction are fission, budding, fragmentation, regeneration, sprout formation and vegetative fragmentation.

i. Binary fission :-

Many bacteria and protists such as amoeba, yeast and Euglena simply split into two equal halves during cell division. These types of division of parents cell into two small nearly equal sized identical daughter cells is called binary fission.

ii. Multiple fission :-

Some single-celled organisms such as the malarial parasite, plasmodium, divide into many daughter cells simultaneously. This type of fission is called multiple fission.

II. Budding:-

Veget cells can develop small buds that separate and grow further. Similarly, in Hydra, a bud develops at an outgrowth due to repeated cell division at one specific site which develops into tiny individuals and detach from the parent body maturation and become new independent individuals. This type of production of new individual from one outgrowth of the parent individual is called budding.

III. Fragmentation:-

Some multi-cellular organisms with relatively simple body organisation such as *Spirulina*, simply breaks up into smaller pieces upon maturation. These pieces are fragments grow into new individuals. This type of asexual reproduction is called fragmentation.

IV. Regeneration:-

Many fully differentiated organisms have the ability to give rise to new individual organisms from their body parts, e.g. - simple animals like Hydra and planaria can be cut into any numbers of pieces and each piece grows into a complete organism. This is known as regeneration. Regeneration is carried out by specialised cells. Regeneration is not the same as reproduction, since most

organisms could not normally depend on being cut up to be able to reproduce.

V. Spore formation:-

Reproduction by the formation of spores is common in some bacteria and most of the fungi. e.g. In *Rhizopus*, the Roy blab like structures called sporangia, are covered in reproduction which contain spores, that can eventually develop into new *Rhizopus*. The spores are covered by thick walls that protect them until they come into contact with moist surface and can begin to grow.

VI. Vegetative Propagation:-

It is a type of asexual reproduction in which parts of plants like the root, stem and leaves develop into new plants under appropriate conditions. e.g. - buds produced in the notches along the leaf margin of *Bryophyllum* fall on the soil and develop into new plants. This property of vegetative propagation is used in methods such as layering or grafting to grow many plants like roses, sugarcanes or grapes for agricultural purposes. It enables propagation of new plants in short duration, whereas plants and plants that are genetically identical to their plants.

Tissue Culture :-

It is a modern technique of vegetative propagation of plants in which cells, tissues and organs are cultured in an artificial medium where they divide rapidly to form a small group of cells or callus which is again transferred to another medium containing hormones for growth and differentiation. The plantlets grown are then placed in the soil so that they can grow into mature plants.

Sexual Reproduction :-

- > Sexual Reproduction is the production of offspring by the fusion of male and female gametes.
- > The sexual DNA made of reproduction incorporates a process of combining DNA from two different germ cells.
- > In very simple organisms, the two germ cells aren't very different from one another or may even be similar. But in higher organisms as the body designs become more complex, the germ cells differ. One germ-cell is large and contains the food-stores called the female gamete while the other is smaller and likely to be male called the male gamete.

-> These germ cells have half amount of DNA and half the no. of chromosomes as compared to the non-reproductive body cells. When these two germ cells combine during sexual reproduction to form new individual, it results in re-establishment of the number of chromosomes and the DNA content in the new generation.

Sexual Reproduction in flowering plant :-

- > Stamens and carpels are the reproductive parts of a flower which contain the germ cell.
- > Stamens is the male reproductive part and it produce pollen.
- > Carpel is the female reproductive part which is made of 3 parts; ovary, style and stigma. The ovary contains ovules and each ovule has one egg cell.
- > The flower may be unisexual (e.g. papaya, watermelon) when it contains either stamens or pistil (e.g. Hibiscus, mustard). It doesn't contain both stamens and carpels.
- > Pollens are transferred from the stamens to the stigma by agents like wind, water or animals. This process is called pollination.

→ If this transfer of pollen occurs in the same flower or the flower of a same plant, it is referred to as self-pollination and if the pollen is transferred from one flower to another flower of a different plant of same species, it's known as cross-pollination.

→ On reaching the stigma of a flower, pollen grain germinates to form a tube called pollen tube that travels through the style to reach the ovary. The male germ cell produced by pollen grain reaches the ovary, through this tube where it fuses with the female germ cells to produce the zygote. This process is called fertilisation.

→ After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed. The ovary grows rapidly and ripens to form a fruit.

→ The seed contains the embryo which develops into a seedling under appropriate conditions. This process is known as germination.

Reproduction in Human Beings:

Puberty :-

→ During adolescence, the rate of general body growth begins to slow down, reproductive tissues begin to mature. This period during adolescence is called puberty.

→ During this period, a whole new set of changes e.g. cracking of voice, facial hair (beard) in males and development of breast and onset of menstruation in females, occur that can't be explained simply as body enlargement. All of these changes take place slowly, over a period of months and years. All of these changes are aspects of the sexual maturation of the body.

Male Reproductive part consists of:-

→ A pair of testes that produce the sperms of the male gametes. The sperms are tiny bodies that consist of mainly genetic material and a long tail that helps them to move towards the female germ cell. Testes also produce a hormone called testosterone that regulates the formation of sperms and brings about changes in appearance seen in boys at the time of puberty.

→ Scrotum is a pouch of skin which is divided internally into right and left scrotal sacs by a muscular partition. The two testes lie in respective scrotal sacs. The scrotum act as a thermoregulator and provides an optimal temperature for the formation of sperms.

→ Vasa deferens (plural: vasa deferentia) that carries

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the sperms from testes to the urethra (a common passage for urine and sperm). Sperms are ejaculated through penis (a long and thick muscular organ) for the purpose of reproduction.

→ Glands like the prostate and the seminal vesicles add their secretions to provide nutrition and make the transport of sperms easier. Prostate gland secretes milky fluid which helps in the mobility of sperms. Seminal vesicle stores sperm & produce viscous fluid which stimulates uterine contraction to help sperms move forward into the fallopian tube of female.

Female Reproductive System & consist of :-

- A pair of ovaries which produce female gametes or eggs or ova. Ovary are the primary sex organs (or female glands).
- One egg is produced every month by one of the ovaries. Release of mature ovum from the ovary is called ovulation. Ovaries secrete female sex hormones called oestrogen & progesterone.
- A pair of oviduct or fallopian tube that carries egg from the ovary to the womb or the uterus and provides an appropriate environment for its fertilisation.
- Uterus is an elastic bag like structure on the lining of which the fertilised egg or zygote gets implanted and develops into an embryo. It is also called womb.

→ Vagina is the opening which serves as the common passage for the entry of sperm during intercourse and child birth. So, the vagina is called 'birth canal' as it opens into the vagina through the cervix.

Fertilisation :-

- Fertilisation takes place inside the Fallopian tube. Sperm received by vagina travel to the egg present in Fallopian tube by the lashing movement of their tail. A single sperm enters into the egg. Fusion of nucleus of sperm & nucleus of ovum marks the completion of fertilisation.
- Fertilisation results in the formation of single-celled zygote. The zygote then undergoes repeated mitotic divisions (Cleavage) to increase the numbers of cells in zygote to form embryo. After 4-5 days the embryo descends into uterus to be implanted into the inner wall of uterus. By 8-9 days of fertilisation specialised tissues of foetus uterine wall of the mother form a structure called Placenta.

→ The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. Placenta is a physiological connection between an embryo and uterine wall of the mother through which nutrients and other useful substances enter into foetus from mother's blood and waste products like urea and CO₂ are expelled into mother's blood from foetus.

→ Umbilical cord arising from embryo's abdomen serves as a link between embryo and the placenta.

→ The development of the child inside the mother's body takes approximately 9 months. The complete development of foetus, from the initial stage of conception till the birth of the young one, is called gestation. It is also termed as pregnancy.

→ Gestation is followed by parturition. It is the act of expelling the full term young one or child from the mother's uterus at end of gestation. The child is born as a result of rhythmic contractions of the muscles in the uterus.

→ This period of embryonic development from the time of fertilisation till birth is called gestation period.

Menstruation:-

→ The uterus prepares itself every month to receive and nurture the growing embryo. The lining thickens and is richly supplied with blood to nourish the growing embryo. If the egg isn't fertilized, this lining isn't needed any longer. So, the lining slowly breaks and comes out through the vagina as blood and mucus. This cycle takes place roughly every month and is known as menstruation. It usually lasts for about 2-8 days.

→ The first menstruation in a girl after attaining puberty is called menarche-period - 11-13 years.

→ The sexual cycle in a woman continues upto the age of 45-55 years. After that the ovary becomes dormant and don't release any further egg. This stage is called menopause. On the arrival of menopause, menstruation in female also ceases to occur.

Reproductive Health:

→ According to WHO, reproductive health means a total well-being in all aspects of reproduction, i.e., physical,

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emotional, social and behavioral.

→ Some of the aspects included and required to be studied under reproductive health are :-
reproductive health care & its provision, family planning, contact and through infected clothes. The disease is easily curable with antibiotics.

(ii) Over population (its all - effects and methods to check it)

(iii) knowledge of reproductive organs and STDs and

(iv) Awareness about reproductive and sex education.

(v) Birth control devices.

(vi) Care of mother and child.

(vii) Prevention of sex abuse and sex related crimes.

> Many diseases can be sexually transmitted. These included bacterial infections like gonorrhoea and Syphillis, viral infections like AIDS and HIV-AIDS. These diseases are called sexually transmitted diseases (STDs).

→ Gonorrhoea is caused by a bacterium *Neisseria gonorrhoeae*. The victim feels burning sensation and pain during

urination. The disease causes inflammation of the mucous membrane of the urinogenital tract, rectum, throat and eye. There may be pus from the urethra and excessive secretion of vagina. It spreads by sexual contact and through infected clothes. The disease is easily curable with antibiotics.

> Syphilis is caused by bacterium, *Treponema pallidum*. The disease is a chronic illness which affects the mucous membrane in genital, rectal and oral regions and causes lesions. Infection occurs by sexual intercourse and occasionally by kissing or close body contact. Syphilis is easily cured with antibiotics.

> The disease AIDS (Acquired Immunodeficiency syndrome) is caused by a virus called HIV. It is a fast spreading incurable disease which weakens the body's immune system.

> The main symptoms of the disease are damage to brain, unexplained fever, unexplained loss of appetite, unexplained loss of weight over a short time, chronic diarrhoea, cough, night sweats, shortness of breath and severe weakness.

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→ spread of disease : AIDS is transmitted only by:

⑤) Unprotected (without condom) sex with an infected partner.

⑥) Use of contaminated needles and syringes to inject drugs or vaccines.

⑦) Use of contaminated razors for shaving.

⑧) Transfusion of infected blood or blood products.

Birth Control:-

→ The population of our country is increasing exponentially. India's population has already crossed 100 crores. If the present trend of population increase continues, very soon there will be a scarcity of food, clothes, housing, proper medical care and education. Therefore, it is the need of the hour and also the interest of the nation that every couple should plan its family in such a way so that increase in population may remain under check.

> Pregnancy makes a major demand on the female body and if her body isn't ready for it, her health would be adversely affected.

→ Many preventative methods have been devised to avoid pregnancy. Such method of avoidance of pregnancy is called contraception / birth control.

→ Methods of contraception are:-

- Creation of a mechanical barrier so that sperm doesn't reach the egg. Condoms on the penis or similar coverings worn in the vagina such as diaphragm (cervical cap), condom etc. can serve this purpose.

> Changing the hormonal balance of the body so that eggs aren't released and fertilised. E.g. oral pills or oral contraceptives (OCs) that mostly contains hormonal preparations oestrogen and progestrone which checks ovulation.

> Using intrauterine contraceptive devices (IUCDs) such as Copper-T (Co-T), loop, spiral rings, shield, etc. which are made of copper, plastic or stainless steel. These can be placed for long periods (upto 5 yrs). The drawbacks associated with these devices are bleeding and discomfort.

LUCDs may come out even without the owners knowledge.

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Surgical Methods: It's done to create blocks on the fallopian tube (Tubectomy) in females or in the vas deferens (vasectomy) in males so that the egg is unable to reach peritoneal cavity (in case of vasectomy) or the sperm transfer is prevented.

\Rightarrow Surgery can also be used for termination of pregnancy which may be caused by people who don't want a girl child. In a healthy society, the female-male ratio must be maintained, hence parental sex-determination has been prohibited by law.