REPRODUCTION

CONTENTS

The ability of the living organisms to produce new living beings similar to themselevs is called reproduction.

◈ **Types of Reproduction :**

ASEXUAL REPRODUCTION

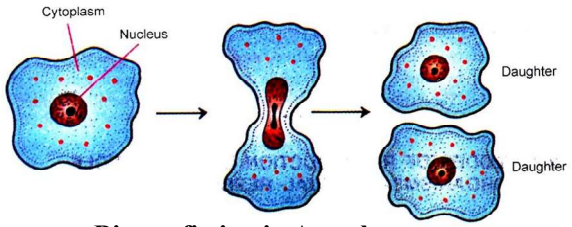
- Single organism commonly multiply through asexual reproduction. Asexual reproduction is the process of formation of new individuals from specialised or unspecialised parts of a single parent without the formation and fusion of gametes. Because of the formation of new individuals from a parent, asexual reproduction is called uniparental.

◈ ***Fission*** **(L. fissus-cleft)**

- It is a mode of asexual of asexual reproduction in which a parent undergoes division to form two or more individuals. Fission is of two types, binary fission and multiple fission.

◈ **Binary Fission :**

- It means 'splitting into two'. In binary fission, the nucleus or nuclear matter elongates and then divides into two. It is followed by cleavage of cytoplasm in between the two daughter nuclei to form two daughter individuals.

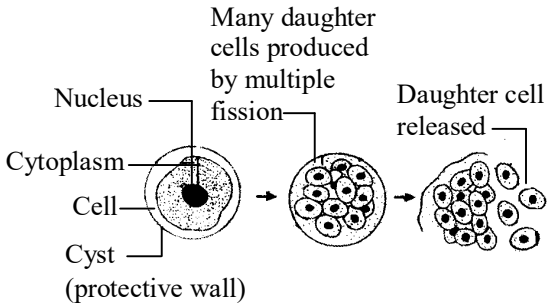


Binary fission in Amoeba

Methods of Asexual Reproduction :

◈ **Multiple Fission :**

- In multiple fission, many individuals are formed from a single individual.



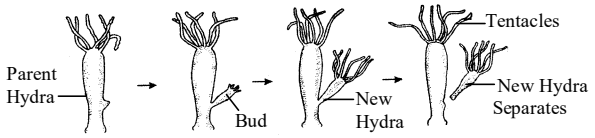
Multiple Fission in Plasmodium

- The nucleus of cell divides repeatedly, producing many nuclei.
- Each nucleus is surrounded by a small amount of cytoplasm & many daughter cells are produced within the cyst.
- The cyst breaks up under favourable conditions & small off springs are liberated.

- In plant, multiple fission is seen in many algae & in animals, a common example of multiple fission is that of the malarial parasite (*Plasmodium*).

◈ Budding :

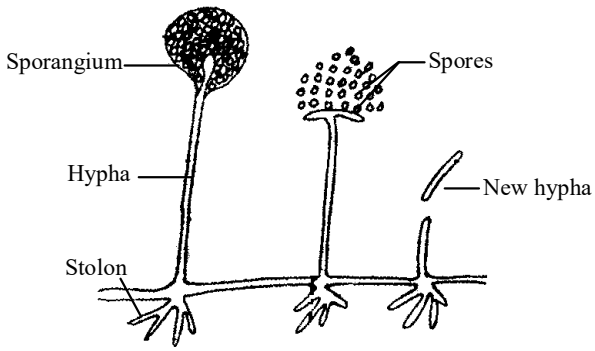
- In budding a small part of the body of the parent organism grows out as a "bud" which then detaches and become new organism.
- The nucleus of the parent divides and one of the daughter nuclei passes into the bud.
- The bud detaches itself from the parent body & becomes a new individual after growing to full size.
- In plants, budding takes place in yeast and in animals budding is seen in hydra & sponges.



Budding in Hydra

◈ Spore Formation :

- In spore formation, the parent plant produces hundreds of tiny spores which can then produce new plants. During the growth of a fungus plants like. Rhizopus, tiny round bulb like structure called sporangium develops at the top of the hyphae.

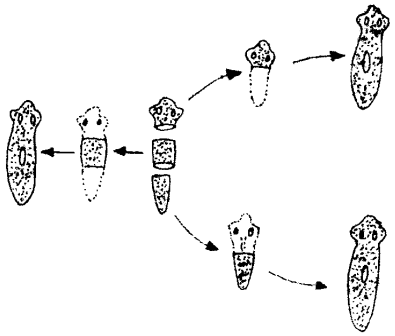


Spore Formation in a Fungus (Rhizopus)

- Non-flowering plants like fungi (mucor, Rhzopus, penicillium) bacteria, ferns or mosses, formation of spores is method of reproduction.

◈ Regeneration :

- It is the ability of an organism to replace its lost body parts.

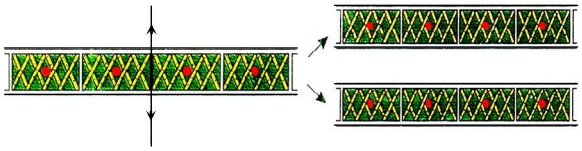


Regeneration in Planaria

- A special case of regeneration is fragmentation, in which a parent multicelluar organism on maturing breaks up naturally to produce two or more daughter organisms.
- Among plants, filamentous algae like spirogyra reproduce by this method.
- Hydra, Planaria & Sponges exhibit regeneration.

◈ Fragmentation (1. fragmere – to break) :

- It is the process of bracking up of the body of an organism into two or more parts called fragments, each of which grows into a new individual. Fragmentation is quite common in algae, fungi, bryophytes and some marine ribbon worms. It is caused by mechanical disturbance, chemicals, death and decay of older parts, emptying of intervening cells, etc. Fragmentation is common method of multiplication in green filamentous alga, *Spirogyra* (figure). Here all the cells are capable of photosynthesis, growth and division. Therefore, each fragment grows into a new filament.



Fragmentation in Spirogyra

◈ Vegetative Propagation :

- In vegetative propagation, new plants are obtained from the parts of old plants like stems, roots & leaves, without the help of any reproduction. It can be achieved naturally or artificially.
- There are **two ways** of vegetative propagation.

(a) Natural Vegetative Propagation :

- Various sturcture that take part in this type of reproduction are roots, stem, leaves.

Natural Vegetative Propagation by Roots :

- In some plants like Dahlia, sweet potato, etc., the adventitious roots become thick, swollen and tuberous due to storage of food.

Natural Vegetative Propagation by Stems :

- Some plants reproduce by means of stems. They may be aerial like runners, suckers or underground like ginger (rhizome), potato (tuber), and sugarcane.

Natural Vegetative Propagation by Leaves :

- The fleshy leaves of Bryophyllum bear adventitious buds in the notches along the leaf margin.

(b) Artificial Vegetative Propagation :

- Some plant growers have developed artificial methods of vegetative propagation like cutting, layering and grafting which are used in agriculture and horticulture.

➢ SEXUAL REPRODUCTION

Sexual reproduction is a mode of multiplication in which the young ones are produced through the process of formation & fusion of gametes.

◈ Significance of sexual reproduction :

***Variation* :**

- Due to reshuffling of chromosomes and crossing over, sexual reproduction brings about variations in almost all characters so that no two individuals are similar.

***Vigour and Vitality* :**

- It maintains the vigour and vitality of the individuals.

***Uniformity of Population* :**

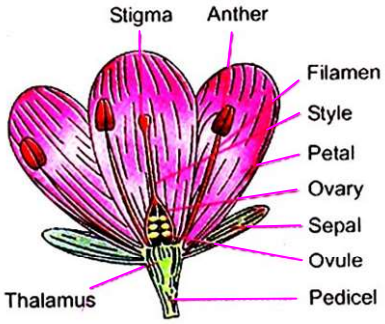
- Due to the flow of genes amongst individuals during sexual reproduction, the uniformity of population is maintained where there is a broad resemblance of all the individuals with one another.

***Evolution* :**

- Genetic changes brought about by sexual reproduction paly an important part in evolution of new forms.

Sexual reproduction in flowering plants :

A flower has following parts.



Parts of a flower in longitudinal section

***Sepals* :**

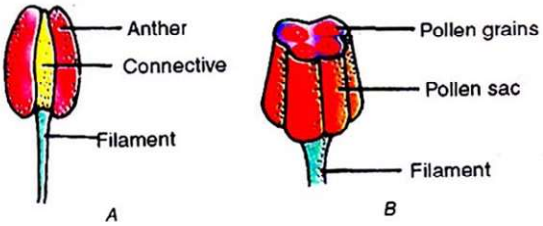
- Sepals are green outermost leaf-like floral organs which protect the flower in the bud stage. In the mature stage they provide support to other floral organs.

***Petals* :**

- Petals are coloured accessory floral organs which lie above the sepals. Petals attract insects to flowers for pollination.

***Stamens* :**

- Stamens are the male reproductive organs of the flowers. Each Stamen has a slender stalk called filament.



Structure of stamen. A, External. B, T.S. of anther

Each anther lobe has two long pollen sacs so that there are four pollen sacs in an anther. They produce yellowish coloured powder of haploid pollen grains.

***Carpels* :**

- Carpels form the central female reproductive organs of the flowers.

◈ **Pollination :**

Pollen grains from the anther are transferred by air, water, insects, and other animals, to the stigma of a pistil.

- "The process of transfer of pollen grains from the anther of a flower to the stigma of same or other flower, is called as pollination". On the basis of transfer of pollen grains to the stigma of same or other flower, pollination is of **two types**.

(A) Self pollination (B) Cross pollination

Self Pollination :

- The process of transfer of pollen grains from the anther of a flower to the stigma of same flower, is called as "Self-Pollination" or autogamy. e.q. Pea, Chinarose, Rice, Wheat.
- Self-pollination in bisexual flowers ensures continuity of the race.
- It helps to preserve the parental characters, as the gametes from the same flower are involved.

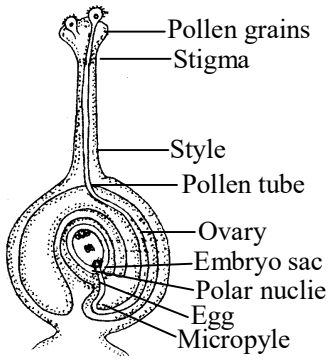
***Cross Pollination* :**

- The process of transfer of pollen grain from the anther of a flower to the stigma of other flower, is called as "Cross-pollination" or allogamy. e.q., musturd, rose.
- Seeds produced by cross pollination have much better germinating capacity.
- Variations are introduced by cross pollination.

◈ **Fertilization in Plants :**

Pollination is followed by fertilisation in plants.

- After reaching the stigma, the pollen grain develops the pollen tube.
- This pollen tube grows through the style and reaches the ovary where ovules are located.
- The pollen tube enters the ovule through a small opening called **micropyle**, where it releases two male gametes into the embryo sac.
- One male gamete fuses with the egg contained in the embryo sac of the ovule; and this fusion of male and female gametes is called **syngamy** and its product is the **zygote**.
- The other male gamete fuses with the two polar nuclei and this process is called **triple fusion**, where three nuclei are involved in the fusion process, one male gamete and two polar nuclei.
- The process of double fertilisation occurs inside each embryo sac, in which two fusions, syngamy and triple fusion take place.
- After fertilisation, ovary develops into the fruit and ovules develop into the seeds.

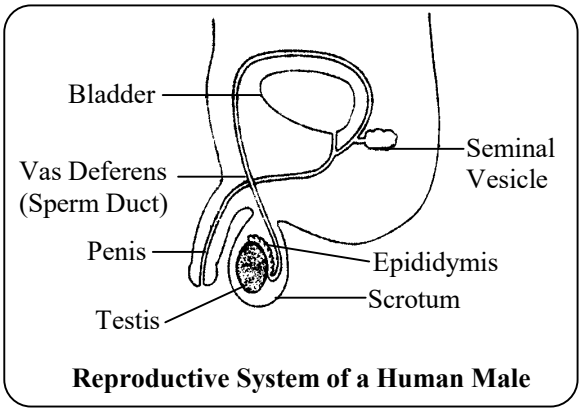


Fertilisation in a Flowering Plant

◈ **Reproduction in human :**

Male Reproductive System :

The human male reproductive system consists of the following organs :

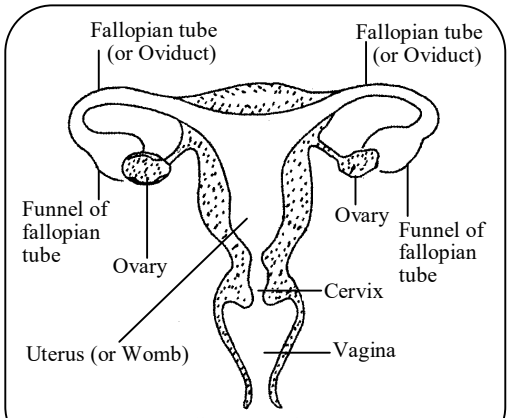


Reproductive System of a Human Male

- A pair of testis lies in a small sac-like muscular structure outside the abdominal cavity called **Scrotum.** The function of testis is to produce sperm and male sex hormone called testosterone. The scrotum provides the optimal temperature for formation of sperms.
- **Epididymis** is a coiled tube-like structure firmly attached to the testis and serves as the storehouse of sperms. Inside the epididymis, sperms become mature and develops motility.
- **Vas deferens** The sperms are carried by a long tube called vas deferens or sperm duct into organs called seminal vesicles, where the sperms get nourished and stored.
- **Seminal** vesicle is a glandular structure which joins vas deferens to form ejacuatory duct.
- **Ejaculatory** duct enters prostate gland and joins urethra to form common urino-genital duct.
- **Penis** is a copulatory organ at the tip of which urinogenital duct opens.

Female Reproductive System :

The human female reproductive system consists of the following organs :



Reproductive System of a Human Female

- **Ovaries** are a pair of small and oval-shaped organs, located in the abdominal cavity near the kideny. Ovaries are the female primary reproductive organs which perform dual functions of production of female gamete or ovum and the secretion of female sex hormones, estrogen and progesterone.
- **Fallopian Tube or Oviduct -** are a pair of long convoluted tubes that carry ovun or eggs from the ovary to the uterus. The fallopian tube has a funnel-shaped opening near the ovary. These tubes from both the sides open into a muscular structure, the **Uterus**.
- **Uterus or womb -** is a hollow, pear-shaped organ within which the embryo develops. Its upper portion is broader, while its lower portion is narrower, called **cervix**.
- **Vagina** - The cervix opens into the vagina which is a tubular structure and also called "birth canal". or canal for menstrual flow. Vagina receives sperms from the male and also serves as the passage through which the fully developed foetus is born.

MENSTRUAL CYCLE

If the egg is not fertilized, it lives for one day and is then expelled. This sets in motion which is called menstrual or ovarian cycle. The first menstruation is called menarche. It stops between age 45–50 years. Stoppage of menstruction permantely is called menopause. Menstrual cycle consists of four phases.

Menstrual Phase :

- It is characterized by menstruation (= menses, GK. mensum-month) or discharge of blood.

mucus and endometrial lining. Menstrual phase lasts for 3–5 days.

***Proliferative Phase* :**

- There is repair and growth of endometrium. Under the influence of hormone FSH, a few follicles grow but only one follicle called Graafian follicle matures in the two ovaries. It secretes hormone estrogen Proliferative phase lasts from 5^{th} to 14^{th} day.

***Ovulation Phase* :**

- At about the middle of the menstrual cycle on 13^{th} or 14^{th} day, the growing follicle bursts and mature ovum is released from the ovary under the influence of estrogen and LH.

***Secretory Phase* :**

- It lasts from middle of menstrual phase to end of the same, *i.e.*, 14–28 days. During this period the uterine wall thickness further. Glands present in endometrial area become functional and begin to secrete of materials for nourishment of the egg if it happens to get fertilised.

➢ REPRODUCTIVE HEALTH

Reproductive health is the state of physical, mental and social fitness to lead a responsible safe and satisfying reproductive life. (i) It provides awareness to both male and female regarding fertility regulating methods. (ii) Reduction in the number of children to the limit of enjoying family life as well as rearing the children with better resources as and when they are available. (iii) Prevent catching up sexually transmitted disease. (iv) Manage disorders related to reproductive system by getting them treated at the earliest.

➢ CONTRACEPTION

Prevention of pregnancy is called contraception. The techniques used in preventing the occurrence of pregnancy are called contraceptive devices.

◈ Mechanical Barrier Methods of Contraception :

***Condom* :**

- It is tubular latex sheath which is worn over the male copulatory organ or penis during sex.

***Cerival cap* :**

- It is rubber nipple that is fitted over the cervix.

***Diaphragm* :**

- It is tubular rubber sheath with flexible metal or spring ring at the margin which is fitted inside vagina.

***Intrauterine Contraceptive Devices* (IUCD or IUD) :**

- They are devices made of plastic, metal or a combination of the two which is inserted into uterus to prevent contraception generally through excessive secretion of cervical mucus. The most common type is copper for preventing implantation. It is functional for 3-5 years.

◈ Hormonal Methods of Contraception :

***Oral Pills* :**

- They contain progesterone with or without estrogen.

***Implants* :**

- They are subdermal devices which provide long term contraception, *e.g.*, norplant.

***Morning-After Pills* :**

- They prevent contraception even after coitus, *e.g.*, i pill,

◈ Chemical Methods of Contraception :

- They are creams, jellies and foaming tablets (vaginal pills) which are placed in vagina for killing the sperms at the time of coitus.

◈ Reversible Sterilisation or Surgical Method :

It is of two types vasectomy in males and tubectomy in females.

Vasectomy :

- The two vasa deferentia of the male are blocked by cutting a small piece and tying the rest. This prevents passage of sperms from testes to semen.

***Tubectomy* :**

- A portion of both the fallopian tubes is excised or ligated to block the passage of ovum.