Phylum: Plathyhelminthes

General Characteristics:

1- They show bilateral symmetry and dorsiventrally flat worms.

2- They are triploblastic consist of three germinal layers (ectoderm, mesoderm and endoderm).

3- The epidermis is cellular, syncytial or ciliated in Turbellaria. It is covered by cuticle in Trematoda and Cestoda worms.

4- Exo or endoskeleton is completely absent.

5- The parasite shows suckers or hooks or both for attachment to the host body.

6- They are the first animals to illustrate the development of organ system.

7- A true body cavity or coelom is absent, and the space between the body organs is filled with loose parenchyma.

8- Muscular system is well developed. It is mesenchymal in origin. The system consists of circular, longitudinal and oblique muscles beneath the epidermis.

9- The alimentary canal is either absent or highly branched. Anus is absent.

10- Circulatory and respiratory systems are absent.

11- Excretory system consists of flame cells or protonephridia connected to the excretory ducts.

12- Asexual multiplication and alternation of generations are seen in some examples.

13- Nervous system and sense organs are poorly developed.

14- Usually hermaphrodite animals.

15- Fertilization is internal and development may be direct or indirect

16- May be free living (Turbellaria), ectoparasitic or endoparasitic. A few may be commensals.

classification of Phylum Platyhelminthes

Flat worms are divided into four classes:

Class Turbellaria

Usually free-living forms. - soft flattened bodies - epidermis ciliated containing gland cells and rhabdites- mouth usually on ventral surface. mostly hermaphrodite. some reproduce asexually. Ex*: Dugesia, Microstomum, Phagocata.*

Class Monogenea

Monogenetic flukes, with single host. syncytial tegument without cilia. body leaf-like to cylindrical in shape. Posterior attachment organs with hooks, suckers, clamps, usually in combination. monoecious; development direct, with free-swimming ciliated larvae. Ex *Polystomum, Dactylogyrus, Gyrodactylus*.

C- Class Trematoda

Digenetic flukes, with two hosts syncytial tegument without cilia. leaf- like or cylindrical in shape. usually with oral and ventral suckers, no hooks. Alimentary canal with two main branches. mostly monoecious. Development indirect. Ex: *Fasciola* (*Distomum), Schistosoma*.

D-class Cestoda

Tap worm body form tape- like -.syncytial tegument without cilia-.scolex with suker or hooks or both for attachment –body usually divided into a sereis of proglotted- no digestive organ - usually monoecious –parasitic in digestive tractes of vertebrate- developmentindirect – two or more hostes EX:*Taenia* . *Hymenolipas*

Dugesia (Planaria, Euplanaria)

The common freshwater genus *Dugesia* formerly called *planaria* or *Euplanaria*. This generic name, *Planaria* has later been changed by priority *Dugesia* because it was first described by Duges in 1830.

Classification

Domain : Eukarya

Kingdom: Animalia

Phylum: Platyhelminthes .

Class: Turbellaria

order : Tricladida

Genus :*Dugesia*

Habit and Habitat:

The planarians are common in freshwater ponds, pools, lakes, slow- moving streams, and rivers of cold running water. They live in a quiet, secluded life, gliding, turning, twisting on the underside of stones, leaves & debris on the bottom in search of food. yes It is free-living, gregarious carnivorous.

Morphology or External Features:

Elongated, thin, dorsoventrally compressed; ventrally flat and dorsallyslightly curved. Small aquatic worm about (15) mm in length and 3 mm in width, may be yellow, olive, brown, reddish-brown, or blackish-brown

Polarity and Body Surfaces:

It has clear anterior and posterior ends and dorsal and ventral surfaces.

-Anterior end: is broad, blunt, triangular, and arrow-shaped with two dorsally located eyes or eyespots (photoreceptors and with two lateral ear-like projections, the auricles (chemoreceptors).

-Posterior end: is somewhat pointed. The ventral surface bears cilia for locomotion. A mouth mid-ventrally, just behind the middle of the body,for extension of pharynx; a small common genital pore juts behind the mouth.

Dugesia

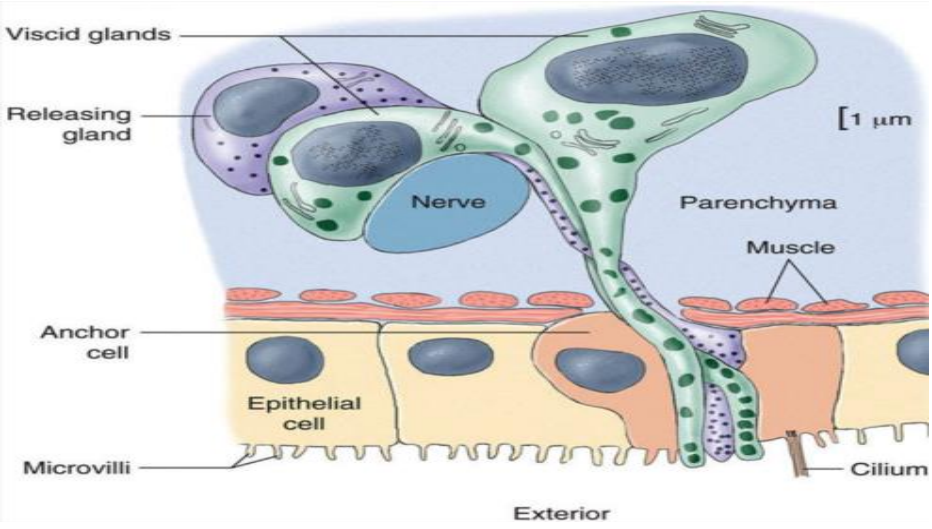
Body wall :

Body wall consists of three main layers:

A-Epidermis:

Single epithelial cell layer, ciliated ventrally. Majority of cells are cuboidal and contain rod-shaped rhabdites when rhabdites are discharged and come in contact with water, they swell and form a protective mucous sheath around the body, and may also help in capturing food particles or small preys.

In most turbellarians, dual-gland adhesive organs are present. These organs consist of three cell types: **vicid** cells **releasing** cells anchor cells Secretions of vicid cells apparently fasten microvilli of the **anchor** cells to the substrate, whereas the secretions of the releasing cells provide aquick chemical detaching mechanism. Epidermal cells lie on a basement membr

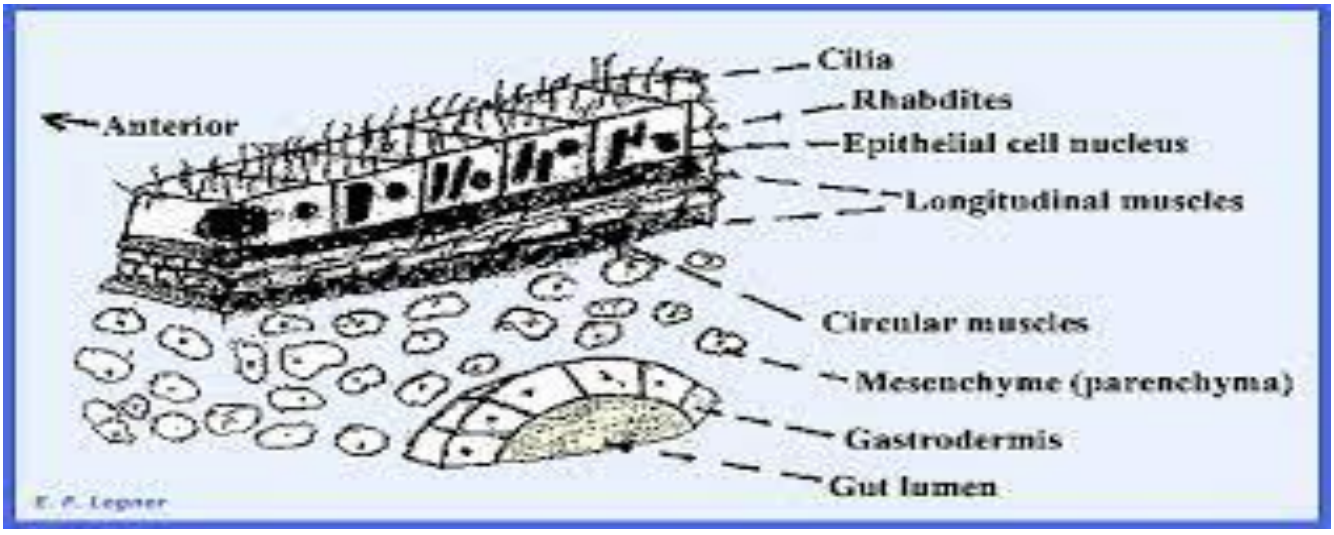


B-Muscular Layer

Muscles layer is well developed forming a muscular system **circular muscles** lie just inner to the basement membrane. Inner to it is a layer **oblique muscles**. A very thick layer of **longitudinal muscles** forms the innermost layer of the muscular system. **Dorsoventra**l muscle bands connect the dorsal & ventral surfaces of the organism.

C-Parenchyma or Mesenchyma

Consists of a thick network ormeshwork of parenchymal polygonal cells, which may be of two types, the normal and formative cell types. These cells fill the space between the body wall and visceral organs or digestive syste herefore, these worms are acoelomates (without coelom).



Locomotion:

Locomotion It is bilaterally symmetrical organism.Turbellarians are the first group of bilaterally symmetrical animals. Bilateral symmetry is usually characteristic of animal with active lifestyle. *Dugesia* is bottom dweller that glides over the substrate.

They move using **cilia** and **muscular undulations**. As it moves, it lays down a sheet of mucus that aids in adhesion and help cilia gain traction.The densely ciliated ventral surface and flattened body enhance the effectiveness of the locomotion.

Digestive system:

Dugesia is carnivorous and feeds on small crustaceans rotifers, nematodes, small food particles of large dead bodies, detects its foodby means of it's auricles (chemoreceptors).

Digestive system is incomplete, it is of closed type with no anus. Digestive system consists of a. Mouth b. Pharynx c. Intestine.

A-Mouth :An opening on the mid-ventral line, just behind the middle ofthe body. It is used as an opening for the extension or protrusion of the pharynx during feeding.

B-Pharynx: A tubular, muscular, and protrusible organ. During feeding, it is extended or protruded through the mouth opening. It is used for sucking small food particles It is enclosed in a pharyngeal sheath, and located in the buccal cavity. It is attached to the branches of intestine.

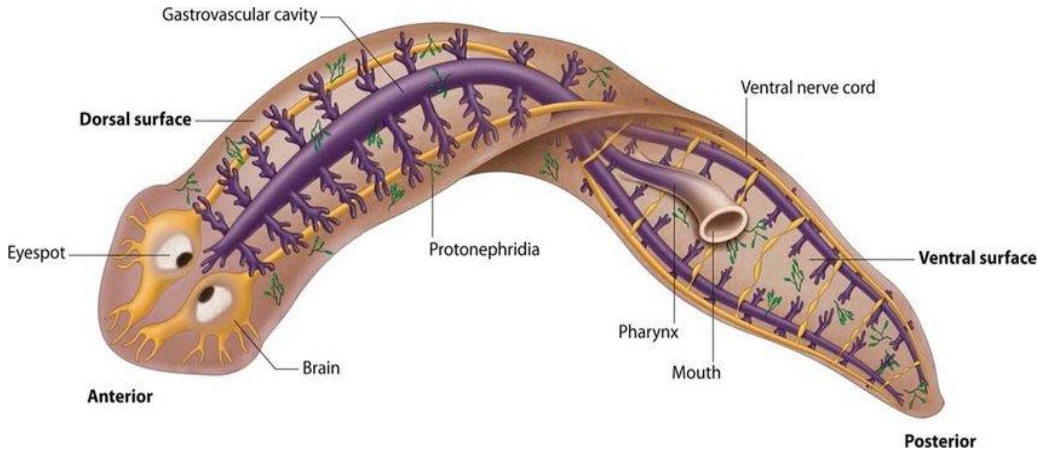
C-Intestine: it is composed of three main branches or trunks, therefore *Dugesia* is put in **order Tricladida**. One branch is anterior (antero-medial) and two posterolateral. Each of these main branches rebranches and ramifies ends with blind diverticula. No anus is there, and pharyngeal opening serves as mouth.

Digestion:

There are two types of digestion, an extracellular and an intracellular digestion.

A-The extracellular digestion: takes place in the intestinal lumenor in the gatrovascular cavity by the help of enzymes secreted by the intestinal glandular cells.

B- The intracellular digestion: takes place in the cells lining the intestine when the phagocytic cells of the intestine engulf the bit of food and form food vacuoles. Lysosomes are added to the food vacuoles and intracellular digestion occurs. The indigestible food in the intestine is thrown out via pharyngeal opening, or the mouth.



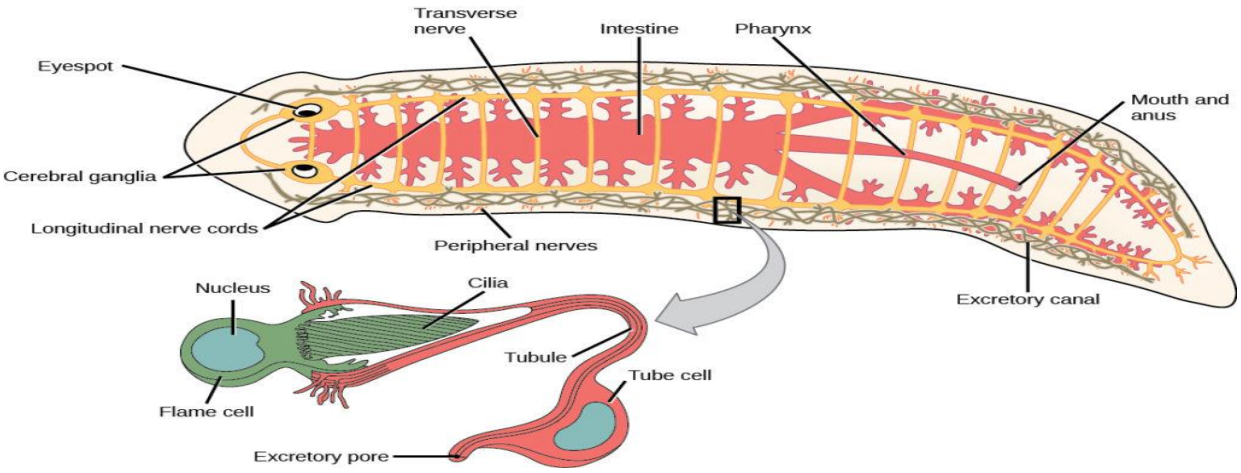
Excretory System:

The excretory cells or **flame cell**: are large in number on both lateral sides of the body Flame cell is cup-shaped with a tuft of long cilia or flagella which into the lumen of the cell and show a flickering movement.

Beating cilia or flagella of the flame cells resemble flickering flame, hence these cells are called flame cells, Beating cilia or flagella drive fluid down the fine collecting ducts which connected to the flame cells. These fine excretory canals unite to form larger excretory ducts.

The large excretory ducts are connected on either side of the body to a main lateral longitudinal excretory canal. The two main lateral longitudinal excretory canals are connected to each other anteriorly via an anterior transverse excretory canal. Several excretory ores are located dorsally on the anterolateral region.

The main function of this system is the removal of excess water or osmoregulation. The secondary function is removal nitrogenous waste products



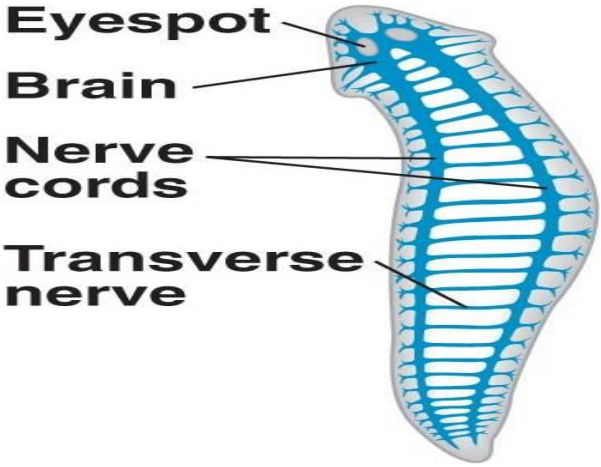
nervous system:

Consists of :

A-Brain :Consists of a pair of nerve ganglia resembling inverted v. It is located in the anterior end of *Dugesia.*

B-Nerve Cords: A pair of ventral longitudinal nerve cords, each arisingfrom one brain lobe. They extend the whole length of the worm.

C- Fine transverse nerves: connect the two main longitudinal nerve cords forming a ladder-like structure therefore, the nervous system of *Dugesia* is called ladder-type nervous system.



Sense organs :

The most important sense organs are:

A-Eyespots: The eyes are two in *Dugesia*, on the dorsal side of the head region. The ocelli are photoreceptors, sensitive to light they donot form images. They are cup- shaped each is made of a single layer of pigmented retinal cells. They are supplied with 2-30 bipolar nerve cells, which connect the eyespot and brain.

B-Auricles: Two ear-like triangular projections, one on either side of anterior end. Each auricle is innervated by brain. These organs detectfood and chemicals, they are chemoreceptors.

Reproduction: *Dugesia* reproduces by two methods:

A-Asexual reproduction: *Dugesia* reproduces asexually by

Transversefission. A constriction takes place transversely, just behind the pharynx. This constriction continues and divides the worm into two unequal parts: a large

anterior one a small posterior one Each of these two partsregenerates its lost parts and grows to a normal worm.

B-Sexual Reproduction :*Dugesia* reproduce sexually during early summer. Reproductive organs develop temporarily. Sexually mature worms have both male and female reproductive organs hermaphrodite though hermaphrodite, cross fertilization takes place. Gonads degenerate after breeding season.

Male Reproductive Organs:

1-Testes: Numerous, small, and follicular. Produce sperms . Efferentia fine ducts connected to the testes. convey sperms from testes.

2-Vas deferens: two large longitudinal canals, one on either side of thebody.

3-Seminal vesicle :two dilations, sac-like, one on each side. store sperms for copulation.

4- Penis or Cirrus: Copulatory organ transfer sperms to the copartner during copulation.

5-Common Genital Atrium: a space where both male and female genital pores open.

6-Common Genital Pore: an opening just behind the mouth on the ventral surface of the body. used for copulation and for delivering cocoons.

Testes (many) →Vasdeferns (two) → Seminal vesicles (two) →Penis→ Common genital atrium→ Common genital pore.

Female Reproductive Organs:

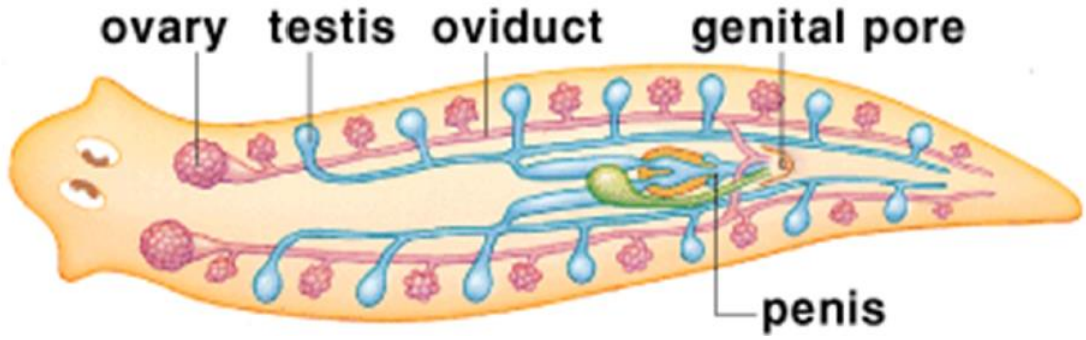
1-Ovary: Two, rounded or club- shaped, just behind the head region. produce eggs

2-Ovovitelline ducts: Two large lateral longitudinal ducts, one on either side of the body transfer both ova and yolk (vitelline) cells, therefore called ovovitelline ducts.

3-common genital atrium: which in turn opens outside via common genet al pore

4- Copulatory bursa or sac: large, club-shaped bursa or sac that opens into the cmmon genital atrium. stores cocoons of the same worm and sperms of the worm participating in copulation.

Ovaries (two) →Oviduct (two) →Copulatory bursa→ Common genital atrium →Common genital pore



Regeneration:

in Dugesia Regeneration: Is the ability of the organism to regenerate or the missing or lost parts of the body, or to regenerate the whole body from a small part of the body. If the anterior en (head region) is cut, the worm can form a new one.

if the posterior end is removed or amputated, it also is able to form it or regenerate it. If the anterior end is split into two parts, it will form two head regions, and if these are split again, each into two parts, four anterior ends will be formed. If the posterior end is split into two parts, two tail regions will be produced.

if the whole worm is split longitudinally into two parts two worms will be produced. if it is cut transversely into four or five pieces, each will form a worm Two phenomena are clearly noticed in regeneration in Dugesia: a. Axial Greadient or Anterior posterior Gradient of Regeneration b. Polarity

Axial Gradient of Regeneration: When Dugesia is cut transversely intofive or six parts, the most anterior part (head region or No. 1) shows very strong power of regeneration. It forms a complete worm before the other parts This is followed by the parts No.2, No.3, No.4, and soon, i e., the power of regeneration decreases anteroposteriorly.

This pnenomenon is called axial or anterior-posterior gradient of regeneration. If the last part or the tail part is too small in size, it mayfail to regenerate the whole worm, and may degenerate and die

Polarity. When Dugesia is cut transversely into several pieces, the anterior end of each piece does form a head region of the regeneratedworm, whereas the posterior end does form the tail region of the regenerated worm. This phenomenon is called polarity.

Polarity takes place if these parts are left to regenerate normally (naturaly). It can be changed" experimentally, if a head region is implanted in the posterior ends of these pieces, then the anterior endsare obliged to form tail regions.

Grafting. An abnormal, strange, and curious Dugesia can be obtained bygrafting. Several head or tail regions can be planted or grafted in a normal worm to obtain a large and an abnormal Dugesia.

Starvation. Dugesia can withstand starvation about nine months or oneyear It can survive for a long time when deprived of food. In such cases,it consumes its tissues and organs in an orderly manner, starting form the less important to more important one

It consumes its organs as follows: 1.mature eggs or ova 2.vitelline glands and cells. 3.reproductive organs. 4.parenchymal tissue cells: theordinary cells and not formative cells which help in regeneration 5.digestive system. 6.muscular system

7. Thus, it becomes very small, about 1/3 of its natural size. 8. If provided with food, it will start regenerating its consumed (lost) organsin a reverse or opposite order to that of their consumption, starting from more important to less important until it grows to normal size.