



كلية مدينة العلم الجامعة

قسم علوم الحياة

ديدان طفيلية

المرحلة الرابعة

الفصل الدراسي الأول 2020

nematode



cestode



trematode



المرحلة الرابعة

اسم الطالب

المادة: ديدان نظري | 2

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The term *helminth* (**Greek *helmins-worm***) first known as intestinal worms, but now is included many other worms, including tissue parasites as well as many free-living species. The term **helminth** is usually deal with a **long cylindrical worm-like shape**, but not all of them possess this structure. Some are **flat and ribbon-like**, while some others **are leaf-shaped**.

Classification of Helminths

Regarding to their shape and other characteristic. Helminths, which occur as parasite in humans can be classified into two phyla (شعبتان) (Table 1):

1. *Phylum Platyhelminthes* (الديدان المفطحة)(flatworms): they are divided into two classes:

- i. *Class: Cestoda* (tapeworms) (الديدان الشريطية)
- ii. *Class: Trematoda* (flukes or digeneans).

2. *Phylum Nematelminthes*: It consist of Nematoda class ديدان أسطوانية and two subclasses:

- i. *Subclass: Adenophorea* (Aphasmidia)
- ii. *Subclass: Secernenrea* (Phasmidia).

Table 1: General features of Helminths

	Helminths	
	<i>Nematelminthes</i> (<i>Nematode</i>)	<i>Platyhelminthes</i> (<i>cestode. trematode</i>)
Body Cavity	Present	Absent
Body shape	Elongated (طولي) , cylindrical (اسطواني) , unsegmented (غير مقسم)	Dorsoventrally ظهري بطني flatted leaf like or tape like segmented (مقسم) or unsegmented
Sex	Separate (dioecious) (Fig.1)	Mostly Hermaphrodite except schistosomes (dioecious)
Alimentary canal (قناة غذائية)	Complete (كامل)	Not complete



Fig 1. (a) Monoecious helminthes (Oriental lung fluke) (b) Monoecious and diecious organism sign (c) diecious helminthes (Ascaris).

The **differences** between cestodes, trematodes and nematodes have been summarized in **Table 2**.

Table 2: Differences between cestodes, trematodes and nematodes

	Cestodes	Nematodes	Trematodes
Head end (النهاية الامامية)	Suckers apparatus present; (ادوات سحب المواد من خطافات) some have attached hooks (شص)	Hooks and sucker absent. Well-developed buccal capsule with teeth (اسنان) or cutting (قواطع) plates seen in some species	Suckers are present but no hooks
Body Shape	Tape-like segment	Elongated, cylindrical, unsegmented	Leaf-like unsegmented
Body cavity	Absent, but inside is filled with spongy undifferentiated mesenchymatous cells, in the midst of which lie the viscera	Present and known as <i>pseudocoel</i> . Viscera remains suspended in the pseudocoel	Same as cestodes
Alimentary canal	Absent (لا يوجد)	Complete with anus (كامل مع ادوات الخروج)	Present but no anus (موجود لكن غير كامل)
Sex	Not separate: Hermaphrodite (monoecious)	Seeparate	Not separate: Hermaphrodite except <i>Schistosoma</i>
Life cycle	Requires two host except <i>Hymenolepis</i> (one host) and <i>Diphyllobothrium</i> (three host)	Requires one host except filarial worms (two host) and <i>Dracunculus</i> (two host)	Requires three host except schistosomes (two host)

Phylum: Classification of Platyhelminthes

General character

1. **Platyhelminthes** are bilaterally symmetrical, dorsoventrally flattened and triploblastic worms.
2. **Body shape** generally worm-like but varies (تختلف) from moderately elongated shape to long flat ribbons (شرائط مسطحة طويلة) and leaf-like. ورقية الشكل.
3. The flatworms are **small to moderate in size** varying from microscopic to extremely elongated forms measuring up to the **10-15 meters**.
4. **The color of** flatworms differ from one to other ,the Majority are **white, colorless**, some derive **color from the ingested food** while the **free-living** forms are **brown, grey, black or brilliantly colored**.
5. **Anterior end** (النهاية الامامية) of the **body** is differentiated into the so called **head**.
6. Presence of great variety of adhesive secretions إفرازات لاصقة , organs of attachment and adhesion أجهزة التعلق والالتصاق (hooks and suckers).
7. The body of parasitic **trematodes and cestodes** covered (يغطي) with **cuticle**.
8. **Exo-skeleton** (الهيكل العظمي الخارجي) and **endo-skeleton** (الهيكل العظمي الداخلي) are completely absent لا يوجد , hence, the body is generally soft. Hard parts consist of **cuticle, spines, thorns, hooks, teeth, etc**.
9. Acoelomate, true coelom is absent ، الجوف الحقيقي غائب . Body space between the various organs is filled with a mesenchyme usually called parenchyma.
10. **Digestive system** الجهاز الهضمي is totally absent in tapeworms but in other flatworms is consist of mouth, pharynx and blind intestine (anus absent).

11. **Respiratory** الجهاز التنفسي and **circulatory** الجهاز الدموي systems are absent.
12. **Excretory system** جهاز الافراز consists of single or paired **protonephridia** with flame cells or bulbs.
13. **Nervous system** الجهاز العصبي is primitive بدائي . **The main nervous system consists** of a (1) pair of cerebral ganglia or brain and (2) one to three pairs of longitudinal nerve cords connected to each other by transverse commissures. This type of nervous system is called **ladder type of nervous system**.
14. **Sense organs** (الاحساس) are of common occurrence in Turbellaria but these are greatly reduced in parasitic forms.
15. Sexes are united (hermaphrodite) with very few exceptions.
16. **Reproductive system** (التكاثر) is highly evolved or complex in most of the forms.
17. **Asexual reproduction by fission occurs in many freshwater Turbellaria.**
18. **Cross-fertilization** in trematodes and self-fertilization in cestodes is very common. Fertilization is internal.
19. **Life cycle** دوره الحياه **complicated** involves one or more hosts.

Classification

Class 1. Turbellaria (turbella = a little string)

1. Mostly free-living flatworms but some ecto- and endocommensals or parasitic.
2. Body unsegmented, Body covered with a cellular or syncytial epidermis usually with mucous cells and which is usually partly ciliated.
4. Life cycle simple.

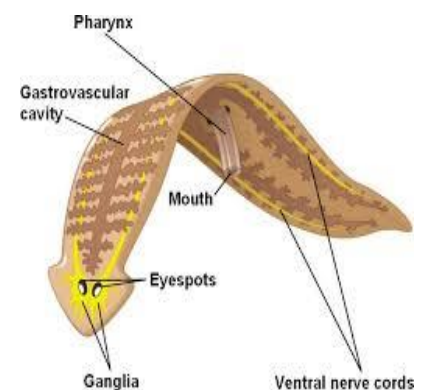



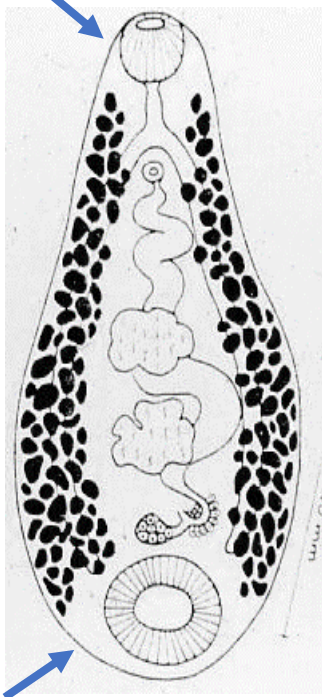
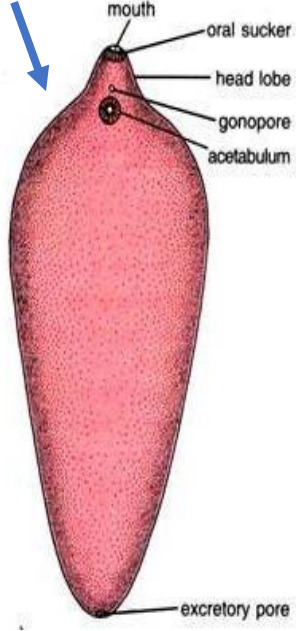
Fig 2. Turbellaria

Class 2 Trematodes المخرمات (trematodes = having pores)

General description

1. Ectoparasitic or endoparasitic forms, commonly called **flukes**.
2. **Body shape** is usually **Leaf-like**, dorsoventrally flattened.
3. **Body wall** is without epidermis and cilia.
4. **Body is undivided** and covered with a cuticle.
5. Well-developed suckers usually present, **ventral sucker** sometimes termed the **acetabulum** table 3.

Table 3 acetabulum (Ventral sucker) in trematodes

1. Monostome	2. Amphistome	3. Distome
-Only interior end, no (ventral sucker) acetabulum example: Notocotylus sp.	acetabulum at end, as a "holdfast" example: Paramphistomum	two suckers (oral and ventral) acetabulum at center, "normal" example: Fasciola
		

6. Digestive tract incomplete consisting of mouth, pharynx and two forked or many branched intestine; anus absent.
7. Cell **protonephridial excretory system** consisting of flame cells.
8. Mostly hermaphrodite (monoecious).
9. **Ovary** single, testes two to many.
10. **Life cycle** simple or complicate

Table 4 Trematodes orders

Class 2: Trematoda		
Order 1. Aspidogastrea	Order 2. Digenia	order: Monogenea
<p>1. Small group of flukes that are primarily internal parasites (endoparasites) of molluscs.</p> <p>2. A large, oval holdfast organ called the opisthaptor covers the entire ventral surface of the animal and characterizes all aspidogastreans (The opisthaptor is an extremely strong attachment organ, and ridges or septa usually subdivide it)</p> <p>3. The oral sucker, characteristic of most other trematode mouths, is absent.</p> <p>4. The life cycle may involve only one host (a mollusc) or two hosts. In the latter case, the final host is usually a vertebrate (fishes or turtles) that becomes infected by ingesting a mollusk that contains immature aspidogastreans. Fig 3 a</p>	<p>1. Endoparasites of vertebrates and invertebrates.</p> <p>2. Mostly with two suckers without hooks;</p> <p>3. Life cycle complicated involving many larval stages.</p> <p>4. One to more intermediate hosts in life cycle. • Example: Fasciola Fig 3 b</p>	<p>Monogenetic flukes traditionally were placed as an order of Trematoda, but they are sufficiently different to deserve a separate class.</p> <p>1. Monogeneans are all parasites, primarily of gills and external surfaces of fish. (Ectoparasite)</p> <p>2. They have a direct lifecycle and do not require an intermediate host. Adults are hermaphrodites, meaning they have both male and female reproductive structures.</p> <p>3. The anterior structures are collectively termed the prohaptor, while the posterior ones are collectively termed the opisthaptor</p> <p>4. The posterior opisthaptor with its hooks, anchors, clamps etc. is typically the major attachment organ which are used to attach onto fish, and as a result, could lead to infections. Fig3 c</p>

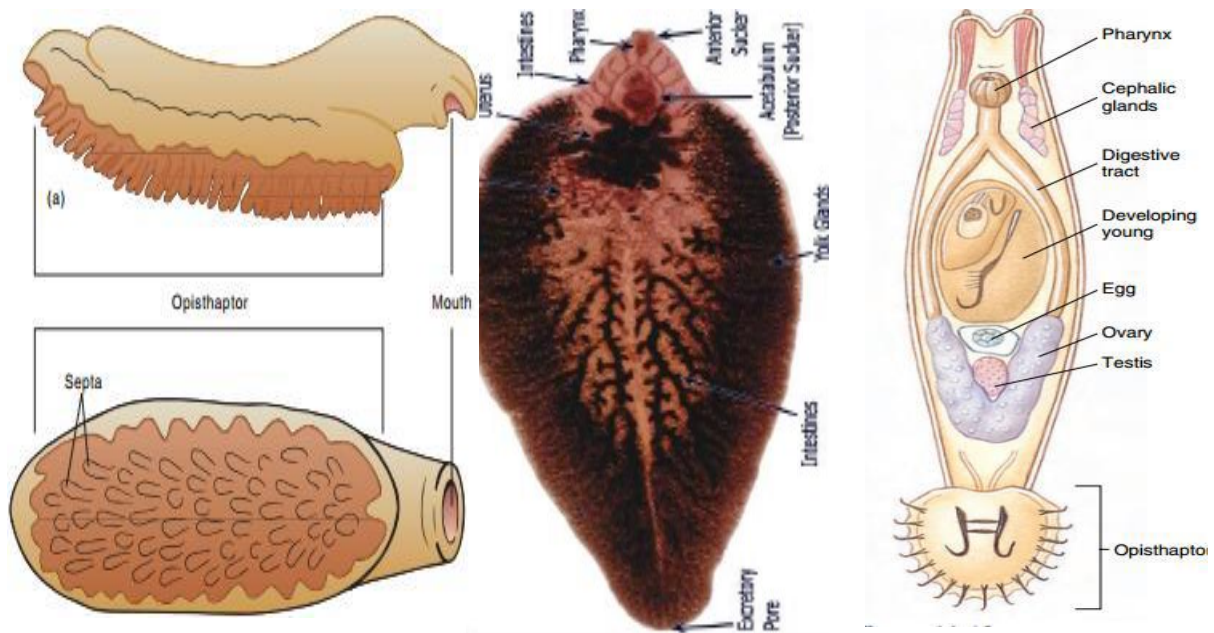


Fig 3 a Aspidogastre (b) Digenia (c) Monogenea

Class4. Cestoda (kestos = girdle + eidos = form)

1. **(Endoparasites** in the intestine of vertebrates.
2. Commonly called **tapeworms**.
3. Body without epidermis and **cilia** but covered with cuticle.
4. **Body usually divided** into few to many segments (proglottids), rarely undivided.
5. Anterior end (**scolex**) is provided with adhesive structures (hooks, suckers) except in **Cestodaria**.
6. **Mouth and digestive tract totally absent**.
7. Excretory system consists of **protonephridia** with typical terminal flame bulbs.
8. Nervous system usually comprises a pair of ganglia and two lateral longitudinal nerve cords.
9. Each segment contains one or two sets of complete hermaphroditic reproductive system.
10. Life cycle complicated usually involving two or more hosts.
11. Embryos possess hooks.

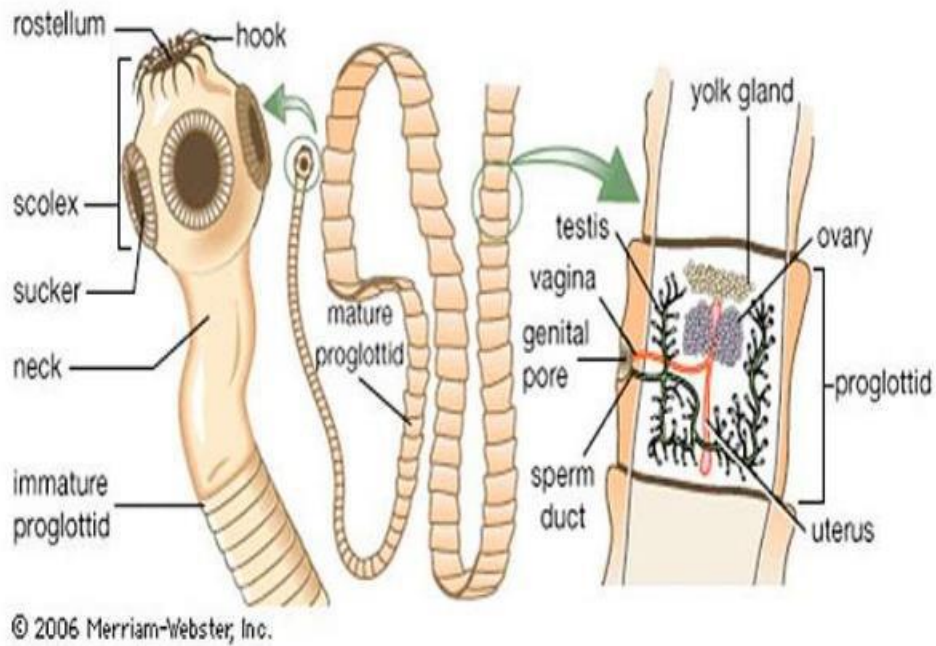


Fig 4 Tapeworm

Subclass 1. Cestodaria

VS

Subclass 2. Eucestoda

1. **Endoparasitic** in coelom or intestine of vertebrate
2. **Body** undivided (**monozoic**).
3. **Scolex** absent.
4. Larva **lycophore** with ten hooks. • Example: **Gyrocotyle**.

1. **Endoparasitic** forms in the intestine.
2. **Body** usually very elongated ribbon-like.
3. Body **divided** into anterior scolex, neck and strobila consisting of few to many proglottids (**polyzoic**).
4. Each proglottid with one or more than one set of monoecious reproductive organs.
5. **Larva** with **six hooks**.

Subclass 2. Eucestoda is divided into two orders

Table 5

Order 1. Pseudophyllidae	Order 2. Taenioidea or Cyclophyllidae
<p>1. Scolex with two to six (suckers). 2. Ovary bilobed, testes numerous, follicular and scattered in the mesenchyma of proglottids. 3. Gonopores midventral. The uterus with uterine pore. 4. Vitellaria follicular, numerous</p> <p>• Example: Diphyllobothrium latum</p>	<p>1. Parasites in the intestine of reptiles, birds, and mammals. 2. Large-sized tape worms. 3. Scolex bears four large cupped suckers (acetabula) often with an apical rostellum armed with hooks. 4. Ovary two to many lobed; uterine opening absent. 5. Gonopores on one or both margins. 6. Vitellaria (yolk glands) single and compact. • Example: Taenia</p>