



الحقية التعليمية



قسم تقنيات المختبرات الطبية

Worm

اسم المقرر:

Second

المرحلة / المستوى:

Second

الفصل الدراسي:

2026\2025

السنة الدراسية:



Worm					معلومات	
عامة					اسم المقرر:	
Medical Laboratory Technologies					القسم:	
Dour Technical Institute					الكلية: المعهد	
Second					المرحلة / المستوى	
Second					الفصل الدراسي:	
2		عملي	1	نظري	عدد الساعات الاسبوعية:	
3					عدد الوحدات الدراسية:	
MLT213					الرمز:	
*		كلهما	عملي	نظري	نوع المادة	
No					هل يتوفر نظير للمقرر في الاقسام الاخرى	
-					اسم المقرر النظير	
-					القسم	
-					رمز المقرر النظير	

معلومات تدريسي المادة

Tuqa Mohamad abd 2023 ماجستير 2022 6		اسم مدرس (مدرسي) المقرر: اللقب العلمي: سنة الحصول على اللقب الشهادة : سنة الحصول على الشهادة عدد سنوات الخبرة (تدريس)
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يكتب في هذا الجزء وصفاً عاماً و ملخصاً للمقرر الدراسي :-

Understanding the idea of metazoa as well as the component of parasite and method diagnosis

1. اسم المقرر	Worm
2. رمز المقرر	MLT213
3. الفصل / المستوى	Second\Second
4. تاريخ اعداد الوصف	2024/3/7
5. اشكال الحضور المتاحة	Weekly presence
6. عدد الساعات الدراسية (الكلية) / عدد الوحدات (الكلية)	3 / 45
7. اهداف المقرر	The goal of the course is to make sense of the fundamental concepts and terminology of metozoa, classified metazoa, type of host l, and type of parasitepathoginc —diagnosis method .
8. استراتيجيات التعليم والتعلم	- Explanation of the course - Daily exams - Student groups - Field visits
9. بنية المقرر	

weeks	times	Subject	Learning method	Attendance Forms	Method of examination
First	3	Definition of Parasitology	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Second	3	Classified Worm and type of Metazoa	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Third	3	Method diagnosis of Worm	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fourth	3	Type of cestoda, life cycle	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fifth	3	Method of cestoda diagnosis	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Sixth	3	.Type of Trematoda , life cycle.	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Seventh	3	Method diagnosis of Trematoda	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Eighth	3	, Hidden human spores, life cycle	Explain the lecture, PowerPoint presentations,	Classroom and Laboratory	Exams

			and practical applied		
Ninth	3	Method diagnosis of Hidden human spores	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Tenth	3	Dwarf scaly worm	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Eleventh	3	Method diagnosis of Dwarf scaly worm	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Twelve	3	Liver flukes diagnosis	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Thirteenth	3	Lung flukes diagnosis	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fourteenth	3	Nematoda ,life cycle ,method diagnosis	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
Fifteenth	3	Quarter legged worm ,life cycle ,method diagnosis	Explain the lecture, PowerPoint presentations, and practical applied	Classroom and Laboratory	Exams
1.تقييم المقرر					
Daily, monthly, and final exams, as well as weekly reports.					

scientific books

Main references for Worm

Scientific papers for Worm

Online scientific resources

اهداف العامة

- 1- knowledge of the mechanisms of action of Worm
- 2- studying type Worm
- 3- The study Worm of antigens, antibodies, and antigen receptors.
- 4- Understand how Worm to microorganisms develops.
- 5- Understanding of metozoa classified.
- 6- Study of pathogenic , morphology , diagnosis method .

اهداف الخاصة

- Study Worm and the components of the metozoa and how to protect the body from infections and pathogens.

اهداف السلوكية او نواتج التعلم

- The learner has to be aware of the significance Worm fundamentals and understand the components of the metozoa .
- The learner must understand the difference between Worm and host.
- The student should be able to provide some information about the basics Worm and how to work in the parasitology laboratory.

((Educational aims): After finishing the lesson (lecture), the learner will be able:-

- Knows the basics of metozoa
- Recognize the many forms of worm and know how to differentiate them .

• اذكر أي متطلبات سابقة قد يحتاجها الطالب قبل التسجيل في المقرر، مثل مواد دراسية سابقة أو مهارات معينة.

- **Recognize parasitology and study of metozoa functions and interactions with pathogens, diseases, and other biological processes. it is critical for understanding and controlling infectious diseases, as well as medicinal treatments. As well as the field of parasitology has also increased in significance because of its increasing applications in several areas such as biotechnology, pharmaceuticals, healthcare, and research.**

الأهداف السلوكية او مخرجات التعليم الأساسية		
ت	تفصيل الهدف السلوكي او مخرج التعليم	آلية التقييم
1	Student Understanding of parasitology	• Lectures. • Home works and participation. • Discussions and tests.
2	The student gets the ability to identify worm types.	• Research and skill development thro scientific reports
3	Ability to provide worm information	• Home works • Tests
4	The student's understanding of the significance of metazoa for the human body	• Home works • Tests

أساليب التدريس (حدد مجموعة متنوعة من أساليب التدريس لتناسب احتياجات الطلاب ومحتوى المقرر)

الأسلوب او الطريقة	مبررات الاختيار	
1. Lectures and practical lectures	Classical lectures	
2. Interactive and mutual learning	Interactive Lecture	
3. Learning via reasons and evidence	The skill of interpreting information	
4. Discussion at the finish of the lecture	Provide abstract and understanding of the topic	

عدد الوحدات	الساعات الأسبوعية			المستوى	رمز المقرر	اسم المقرر
	م	ع	ن			
6	6	4	2	الثاني	MLT213	worms

Aims of subject

-: General aims

.having an idea about the human pathogenic parasites and its diseases and the lab. Diagnosis of its

-: Special aims

.To know how can be analyzed different techniques of diagnosis the pathogenic parasites

Theoretical syllabus	
Weeks	Topics
1	.spp <u>Cryptosporidium</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
2	Review and examination (First one)
3	In generally introduction of characteristic features of metazoa (nematoda and trematoda, cestoda) Helminthes
4	Cestoda Class <u>saginata Taenia</u> <u>solium Taenia</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
5	<u>nana Hymenolepis</u> <u>diminuta Hymenolepis</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis

6	<u>granulosis Echinococcus</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
7	Trematoda Class In general life cycle of .spp <u>Schistosoma</u> <u>haematobium Schistosoma</u> <u>mansoni Schistosoma</u> <u>japonicum Schistosoma</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
8	<u>hepatica Fasciola</u> (Short notes of (liver flukes <u>buski Fasciola</u> (Lung flukes) <u>heterophes Heterophyes</u> (intestinal flukes) Lab. diagnosis
9	Class Nematode <u>lumbricoides Ascaris</u> <u>trichura Trichuris</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
10	<u>vermicularis Enterobius</u> <u>dudenale Ancylostoma</u> <u>americanus Necator</u> Morphology ,life cycle ,pathogenicity, Lab. diagnosis
11	in human migrans Larva migrans cutenous larva-1 <u>caninum Ancylostoma</u> .sp <u>Schistosoma</u> (Myiasis)(worm scrow) migrans subcutenous larva-2

	migrans visceral larva-3 .spp <u>Toxocara</u> pathogenicity, Lab. Diagnosis
12	Filaria <u>bancrofti</u> <u>Wuchereria</u> loa Loa Morphology ,life cycle ,pathogenicity, Lab. diagnosis
13	in medicinalis Hirudo Short notes of class Annelida . human morphology and lab. diagnosis And from metazoan Arthropoda Class Short notes of morphology and lab. diagnosis , some pathogenicity of Reduviid, fly tse – Tse, Sand fly, Anopheline) insect-1 (Cimex , lice ,Fleas , Culex, bug Arachnids-2 Mites , tick
14	Review
15	(Examination (second one And Final examination

Practical syllabus	
.Weeks No	Topics
1	.Slides of Cryptosporidium spp With lab. diagnosis
2	Review and examination
3	Slides of <u>solium Taenia</u> , <u>saginata Taenia</u> With lab. diagnosis
4	Slides of <u>diminuta Hymenolepis</u> , <u>nana Hymenolepis</u> With lab. diagnosis
5	Slides of stages of <u>granulosus Echinococcus</u> With lab. diagnosis
6	<u>haematobium Schistosoma</u> <u>mansoni Schistosoma</u> <u>japonicum Schistosoma</u> . Slides of stages and kind ,sample of its snail
7	<u>hepatica Fasciola</u> Slides of Heterophes, <u>buski Fasciolypsis</u> . stages Heterophes
8	<u>lumbericoides Ascaris</u> Slides stages and lab. diagnosis
9	<u>vermicularis Enterobius</u> (stages)Slides

10	(slides (stages <u>duodenale</u> <u>Ancylostoma</u> (stages)slides <u>americanus</u> <u>Necator</u>
11	slides and picture migrans Larva
12	slides and pictures of Filaria <u>bancrofti</u> <u>Wuchereria</u> loa–Loa
13	sedimentation , , hotation Concentration methods (formal ether). concen special
14	arthropoda Slides or pictures of some ,Tick ,Mites , Cimex, worm Scrow , Lice , Fleas) (.etc....
15	.Review and examination and G.S.E exam

خارطة القياس المعتمدة

عدد الفقرات	الأهداف السلوكية					الأهمية النسبية	عناوين الفصول	المحتوى التعليمي
	التقييم	التحليل	التطبيق	الفهم	المعرفة			
5	%20	%10	%25	%10	%35	%100	تعريف علم الطفيليات انواع الطفيليات	الفصل الاول / المستوى الثاني
5	%20	%10	%25	%10	%35	%100	الطفيليات والامراضية	الفصل الاول/ المستوى الثاني

Target Population

طالبة المرحلة الثانية-قسم المختبرات الطبية

ب-المحتوى

- Parasitology
- Parasitology disorders or disease
- Parasite division

- الاختبار القبلي (pre-test)

- Q1 /What is Parasitology

Q2/What are the types of parasite?

- 1) Parasitology: is the science which deals with living organisms which live temporary or permanently on or within other organisms for the purpose of procuring food and shelter.
- 2) Medical parasitology: is the branch of parasitology dealing with parasites living in or on the body of human which infect him to produce diseases.
- 3) Parasites: Organisms that infect other living beings. They live in or on the body of another living being called host and obtain from it nourishment and shelter.

Types of Parasites:

- 1- Ectoparasite (external parasite): Which inhabit the body surface only without penetrating into the tissues like lice, ticks, mites, mosquitoes, and fleas.
- 2- Endoparasite (internal parasite): Which live within the body of the host like all protozoan and helminthes parasites.
- 3- Pathogenic parasite: Which causes infection to the host by its toxic or mechanical activity.
- 4- Temporary parasite: It is a free-living parasite which occasionally visits the host for obtaining food.
- 5- Permanent parasite: Which remains on or in the body of the host from early life until maturity.
- 6- Facultative parasite: Organism which may exist in a free-living state or may become parasitic.
- 7- Obligate parasite: It is an organism which is completely dependent on the host.

Q\classified metazoa?Q\ Definethe following

Strobila Scolx

metazoa

Characteristic features of metazoa : Helminthes (means worms)

A- Phylum: Platyhelminthes:

1.Cestoda or tapeworms. 2.Trematoda or flukes
(flatworms).

B- Phylum: Nemathelminthes (Nematoda).

Table explains the differential features of types of worms

character	Cestoda	Trematoda	Nematod
Form	Tape- like worm, unsegmented	Leaf- like worm unsegmented	Cylindrical worm, segmented
Sex	Hermaphrodite, bisexual, unseparated sexes	Hermaphrodite, bisexual, unseparated sexes monoecious or cutting platesexcept	Separated sexes,
Head some times hooks	Has scolex with some times suckers	Cephalic end has buccal capsule or cutting plates.	No suckers, no hooks, only suckers with teeth has hooks.
ntestinal tract	Absent, no (digestive system)	Present but incomplete without anus	Present and complete alimentary canal with anus an

Body cavity	Absent, acoelomata	Absent, acoelomata	Present, pseudocoel
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Class : Cestoda

Characteristic features and morphology:

1-Segmented worm like tape, called (tapeworms), dorsoventrally flattened . 2- Sex:

bisexual, hermaphrodite,-Its long from some millimeter to many meters.

3- Adult consist of: scolex with suckers (some has hooks) Neck and Trunk or Strobila .

Trunk or Strobila consist of many segments or proglottides which are a- Immature segments b- Mature segments c- Gravid segments (fill of eggs).

4- Intestinal tract (alimentary canal) = absent. The **nutrition** of cestoda is obtained through the **integument** (skin) as they lack a digestive system.

Terms used in relation to cestodes:

Rostellum: the protuberant anterior part of the scolex of certain tapeworms.

Scolex : the anterior organ of a tapeworm used for attachment to host tissues.

Protoscolex : the scolex of larval stage .morphologically it resembles the adult scolex.

Neck : the connecting tissues between the scolex and strobila of a tapeworm.

Proglottid : single segment of tapeworm.

Strobila : the body of tapeworm.

Strobilisation : the process of producing new segments which happens near the neck.

Hexacanth : a larval stage of tapeworm having 6 hooks.

Cysticercus: larva of tapeworm having fluid filled bladder , called (**bladder worm**).

Cysticercoids : a larva of tapeworm which has a solid body and no bladder.

Oncosphere : a hexacanth embryo, the embryo inside the eggs of cestoda.

Hydatid : larva of Echinococcus, containing a large number of prortoscoleces.

Hydatid sand: free protoscoleces lying inside hydatid.

Brood capsule :small cyst attached to the germinal layer of the hydatid, containing many protoscoleces.

Taenia saginata

Common name : Beef tape worm or bovine tape worm.

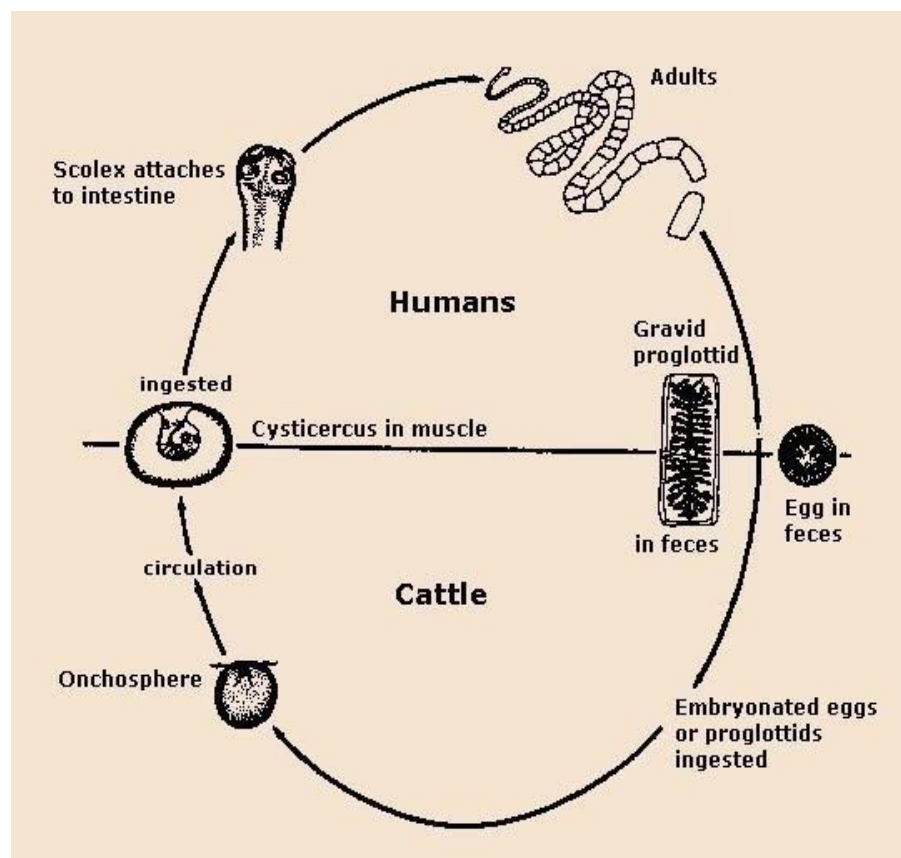
Habitat : adult worms live in small intestine of man.

Disease : Taeniasis or beef tape worm infection.

Intermediate host : cattle

Final host : Man

Infective stage: *Cysticercus*
bovis This larva is not found
in human only in cattle



Pathogenicity

The majority of cases are symptomless. In some patients there may be vague intestinal discomfort

- Constipation
- Diarrhea
- Headache
- loss of appetite

Taenia saginata proglottid (segment) causes

- obstruction of the bowel
- stomach ache
- weight loss.

Migrating proglottids can cause

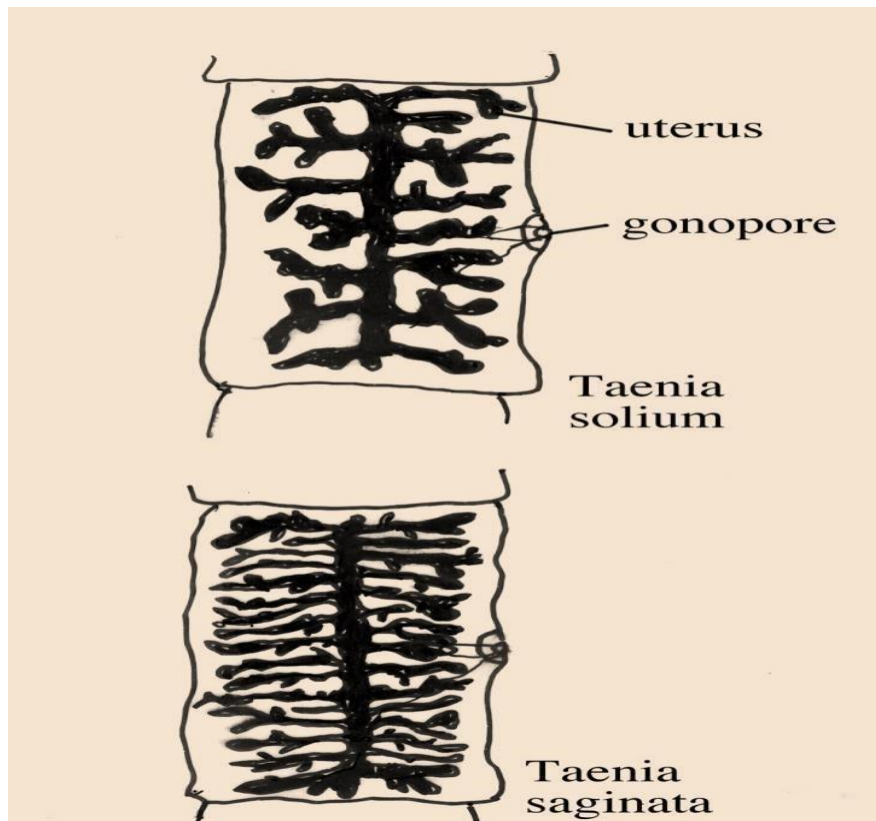
- inflammation of the appendix
- inflammation of the bile duct

The ova (egg)

They consist of an outer vitelline layer which is a membranous covering. The inner layer is a thick brown embryophore which is made up of longitudinal blocks giving the eggs a radially striated appearance. Inside the egg is the hexacanth embryo or oncosphere which carries 6 hooks

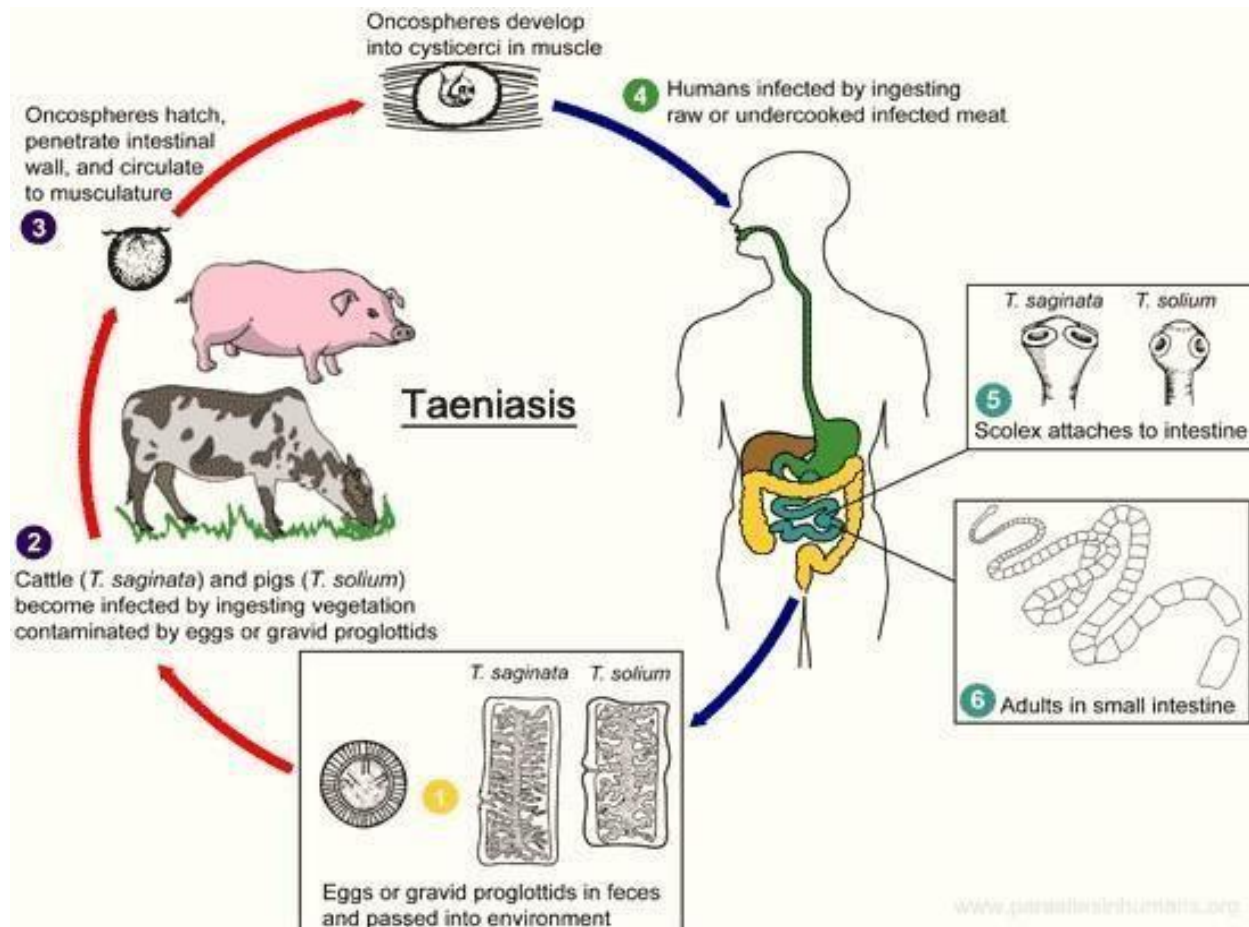
Diagnosis

This is based on detection of eggs or segments in the faeces . The eggs of *Taenia saginata* and *Taenia solium* are indistinguishable. Species identification cannot be made from the eggs, this can be done by examining the gravid proglottide which pressed between two slides, when uterine branching 15-30 lateral branches it is *T. saginata* and under 13 lateral branches in *T. solium*.



Taenia solium

- *Common name :** Pork tape worm.
- *Habitat:** Adult worms live in the small intestine of man.
- *Disease:** Taeniasis or Pork tape worm infection.
- *Intermediate host:** Pigs
- *Final host:** Man
- *Infective stage:** Cysticercus cellulosae) This larva is found in humans) and ova.



Life cycle of *T. solium*

Pathogenicity

A- The adult worm, as in *T. saginata*.

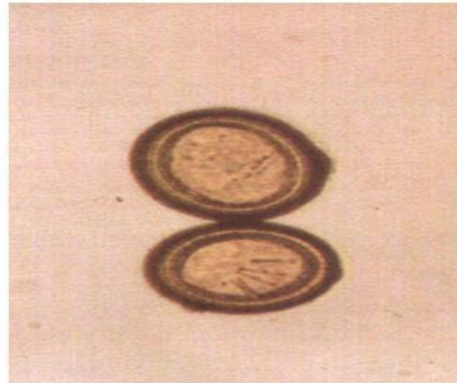
B- In case of *Cysticercus cellulosae* infection:

The infection is called Cysticercosis. Humans acquire the parasite by autoinfection or by accidental swallowing of cysticerci with food or water. The hexacanth embryos usually settle down in the muscles of heart, liver, lungs- the central nervous system (brain, spinal cord) and the eye. The most common symptoms are: palpable subcutaneous nodules, epilepsy fits, in 3 to 6 years' time cysts begin to die and are calcified. The calcified cysts are visible on x-ray examination.

Diagnosis

A - The adult worm, as diagnosis in *T. saginata*.

B - Diagnosis of cysticercosis: This based on biopsy of nodules and X - ray examination. Various serological tests also become positive.



eggs of *Taenia solium* and *T. saginata*

The eggs are rounded or subspherical, diameter 31 - 43 μm , with a thick brown embryophore. Inside each egg is an embryonated oncosphere with 6 hooks. A complete egg always has the primary membrane (shell) that surrounds eggs.

Table explain the comparative morphology of *Taenia saginata* and *Taenia solium*

Seq.	Characters	<i>Taenia saginata</i>	<i>Taenia solium</i>
1.	Common name.	Beef tape worm (unarmed tape worm)	Pork tape worm (armed tape worm)
2.	Intermediate host	cattles	pigs or Man
3.	Definitive host	Human	Human
4.	Infective stage	<i>Cysticercus bovis</i> (bladder worm)	<i>Cysticercus cellulosae</i> & ova
5.	Scolex	4suckers & no hooks	4 suckers & rostellum with hooks
6.	The length	4-12 meter or more	2-7 meter(shorter)
7.	Proglottid	1000-2000 segment	Less than1000 proglottids
8.	Mature segment a. ovary b. testes	(2) large lobes 300-400	(1) small & (2) large lobes 150-200
9.	Garvid segment	uterus has 15-30 lateral branches	Uterus has 7-13 branches

10.	Disease	Taeniasis or beef tape worm infection	Taeniasis or pork tape worm infection (cysticercosis).
11.	Ova	Rounded with striated layer embryo called (oncosphere) or hexacanthempro	The same

الاختبار البعدي

- Q\diferance between Taenia saginitaand Taenia soluim?
- Q\what is infective stage of Taeniasoluim ,Taenia saginita ?
- Q\what are intermdite host ?
- Q\diagnosis Taenia saginita ,soluim?
- Q\what is symptoms of Taenia saginata ,Taenia solium ?

الاسبوع الرابع الاختبار
القبلي

- Q\classified Hymenolipis nana ?
- Q\what is common name of Hymenolipeis nana ,diminuta ?

Hymenolepis nana

Common name: The dwarf tape worm.

Habitat : Adults live in the upper part of the small intestine of man, rats

Disease: dwarf tape worm infection.

Intermediate host: non (need not) or direct life cycle.

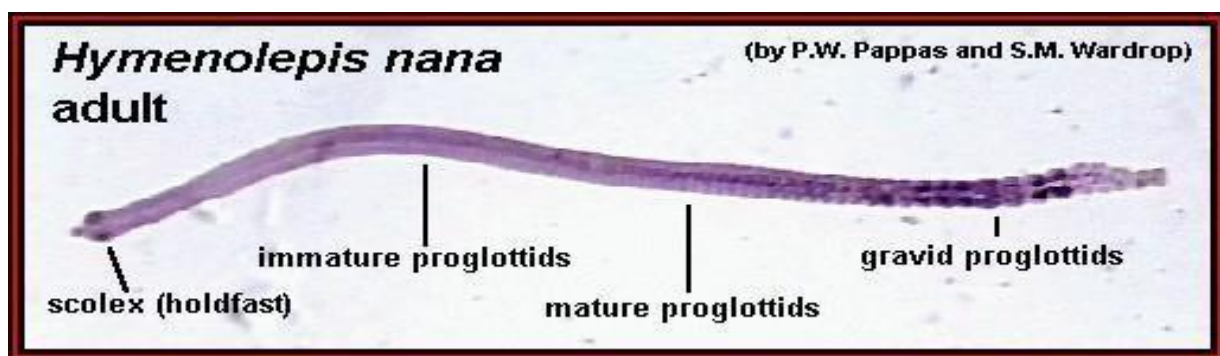
Final host: Man , rats and mice

Infective stage: Embryonated egg.

This is the smallest tapeworm found in man. It varies in length from 25 to 40 mm, with approximately 200 proglottids. The eggs are ovoid al, 30 to 47 μm diameter. They have 2 membranous shells. The inner shell has 2 poles, from each in the egg is the oncosphere which carries 6 hooks. Infection is established by the swallowing of the egg. The hexacanth embryo penetrate the villi of the small intestine where it transforms into a **cysticercoid larva**. The larva re-enters the intestinal lumen and develops into a complete tapeworm *H. nana*

Pathogenicity : Usually no symptoms are produced in light infections. In heavy infection the parasite may give rise to intestinal disturbances such as diarrhea, vomiting and anorexia

Diagnosis This is based on finding the eggs of *Hymenolepis nana* in the feces.



Hymenolepis diminuta

Common name: Rat tape worm.

Habitat: Adult worms live in the ileum of mice and rats, occasionally in Human

Disease: Rat tape worm infection.

Intermediate host: Fleas, beetles, cockroaches

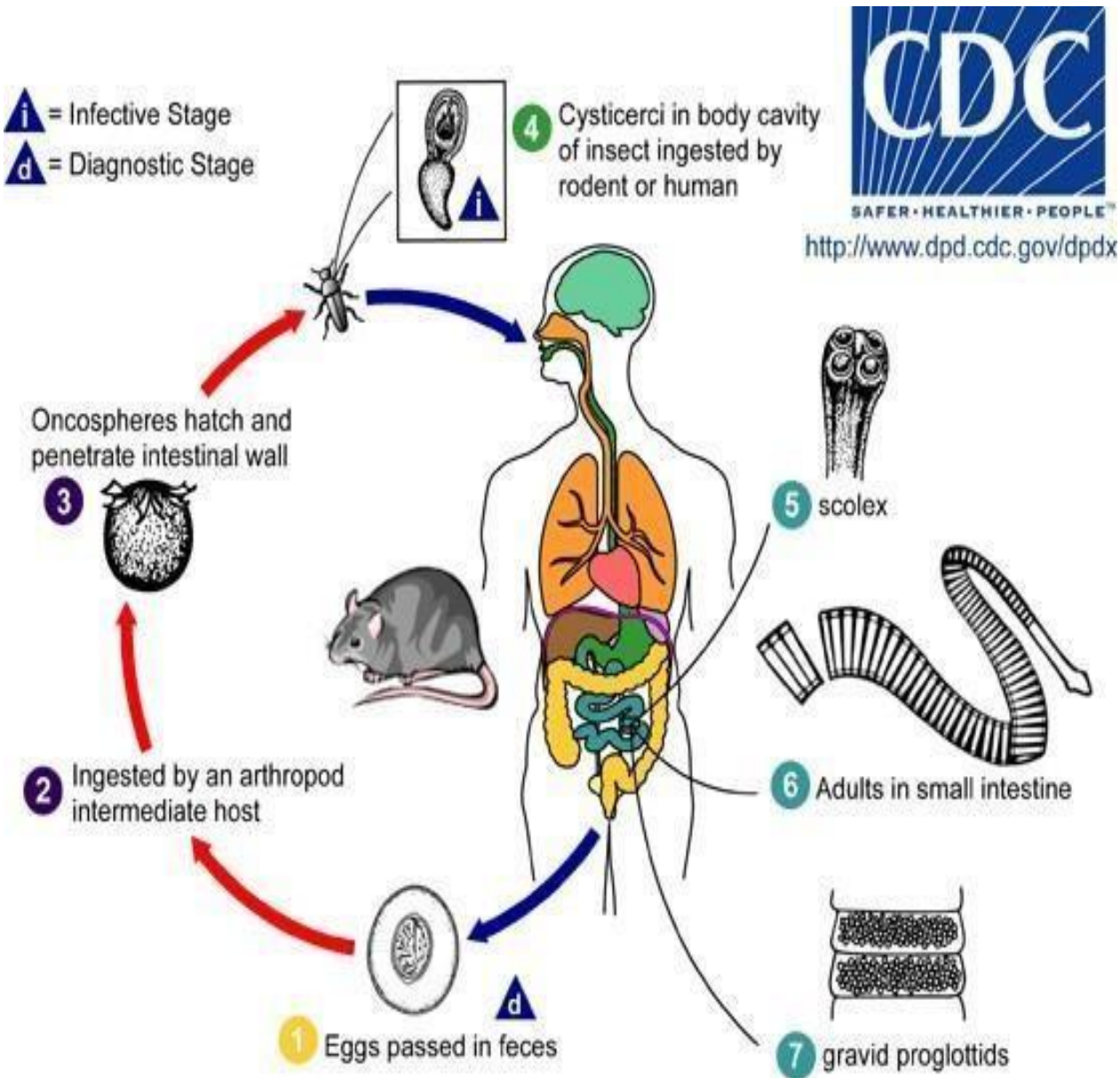
Final host: Man, rats and mice.

Infective stage: Cysticercoid larva.

Measure 20 to 60 cm in length and may have up to 1,000 proglottids

The eggs are spherical and hyaline. They measure 72 to 86 μm and like ***H. nana*** have 2 membranous shells. The inner shell has polar thickening but no filaments. The eggs which are passed in the faeces are ingested by arthropods, usually a rat flea or a flour beetle. In the arthropod the egg develops into a cysticercoids. If the infected arthropod is ingested by a rodent or human the worm develops into maturity in intestine. The infection is often asymptomatic.

Diagnosis: This is based on finding the eggs of ***Hymenolepis diminuta*** in the faeces.



Life cycle of *Hymenolepis diminuta*

الاختبار البعدي

Q\what are intermediate host *Hymenolepis nana*, *Hymenolepis diminuta* ?,

Q\what is infective stage of *Hymenolepis nana* ?

Comparative morphology of *H. nana* and *H. diminuta*.

characters	<i>nana</i>	<i>H . diminuts</i>
Scolex	4 suckers rostelium th hooks	4 suckers with no hooks
Egg	Polar thickening with filaments	Polar thickening without filaments
Mature segment ovary	Bilobed	Bilobed
Tests	3 globular close	3 globular widely separated
Gravid segment uterus	Sac like irregular	Sac like irregular

?

الاختبار القلبي الاسبوع
الخامس

Q\what is common name Echinococcus granulosus ?
Q\what is final host of Echinococcus granulosus

Echinococcus granulosus.

Common name: Dog tape worm or the hydatid worm.

Habitat : Adult worms inhabit the small intestine of dogs, jackals

Disease: Hydatid cyst or hydatid disease in Human and herbivorous animals (sheep, cattle --) Echinococcosis

Intermediate host: Man, sheeps, cattles and swines..... Etc

Final host: Dog , jackals and wolves.

Infective stage to Human : Eggs.

Morphology

The adults are located in the small intestine of dogs and another carnivores and they are 3 to 6 mm long with 3 to 4 proglottids

Pathogenicity

This depends on the site and size of the hydatid cyst . the early stage of infection is generally asymptomatic As the cyst

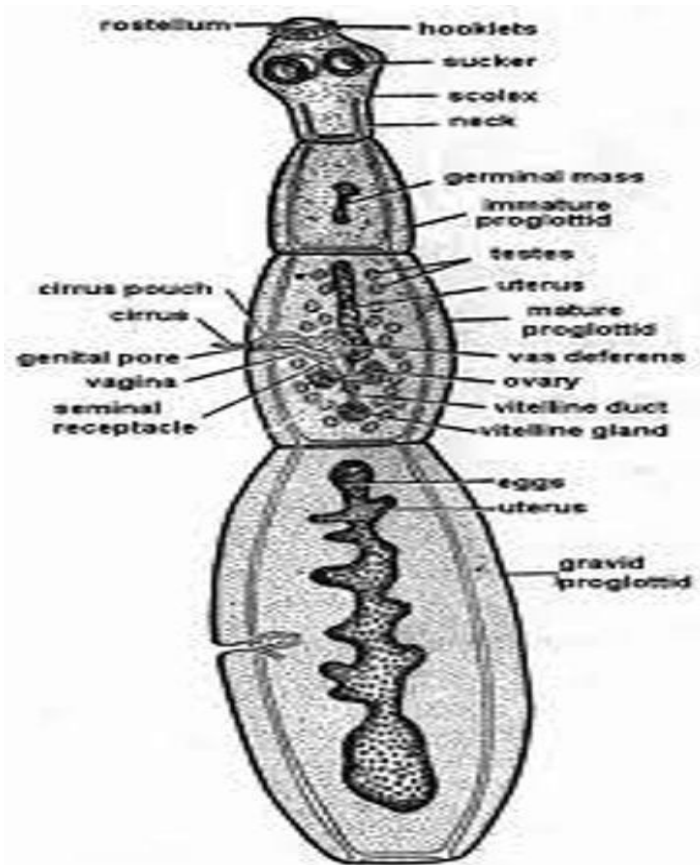
. grows in size, symptoms of a space occupying lesion develops. Allergic reactions and sometimes anaphylactic shock may occur if the cyst ruptures

Dignosis

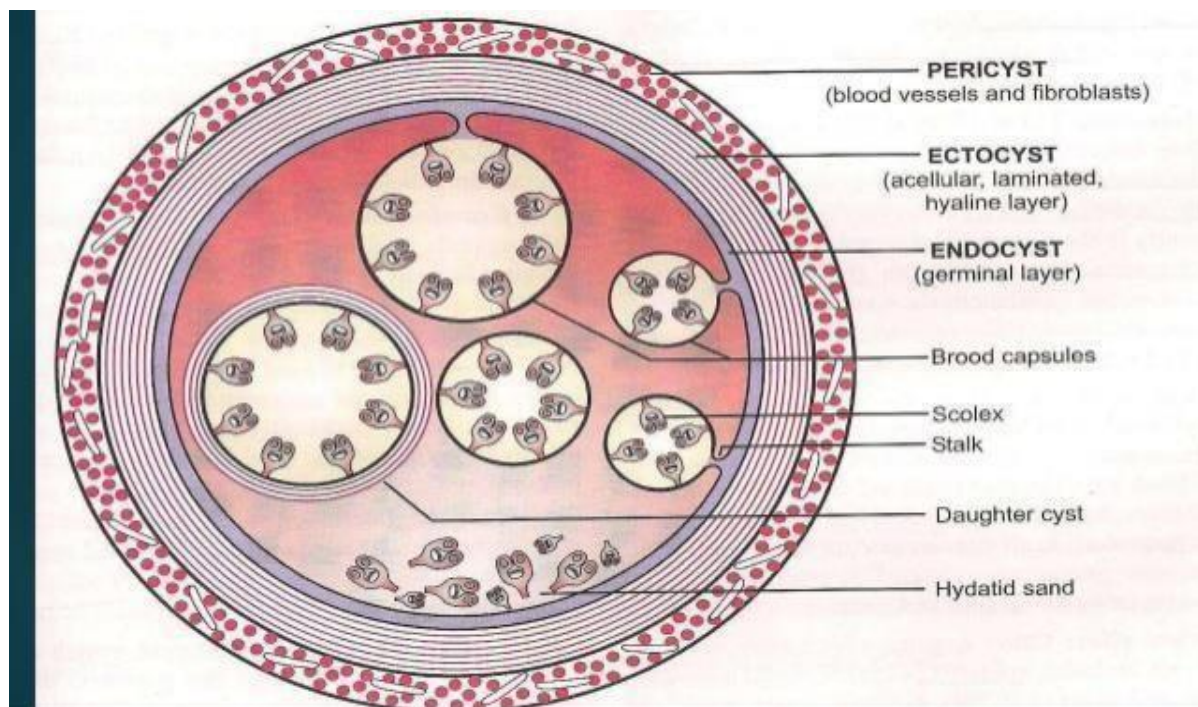
1-Radiological examination will show the cyst, if it is calcified.

2-Immunological tests are useful in conforming the diagnosis and as indicators of post operative persistence or of recurrence of infection. The tests include an intradermal reaction (casoni's test), haemagglutination test, complement fixating test and fluorescent antibody test.





***Echinococcus granulosus* whole worm**



Q\diagnosis of Echinococcus garanulosis
Q\what is intermidite host of Echinococcus granulosis?

Q\classified nematode ?

Q\what are stage of Nematoda ?

Nematoda worms

Nematode parasites classified according to location of adult worm in the body:

A- In large intestine

Enterobius vermicularis and Trichuris trichura

B- In small intestine like:

(Ascaris lumbricoides and Ancylostoma duodenale).

Enterobius vermicularis

***Common name :** Pin worm or seat worm

***Habitat :** Large intestine – Colon ,rectum, cecum, some times appendix.

***Disease:** Enterobiasis , Oxyuriasis or Pin worm infection.

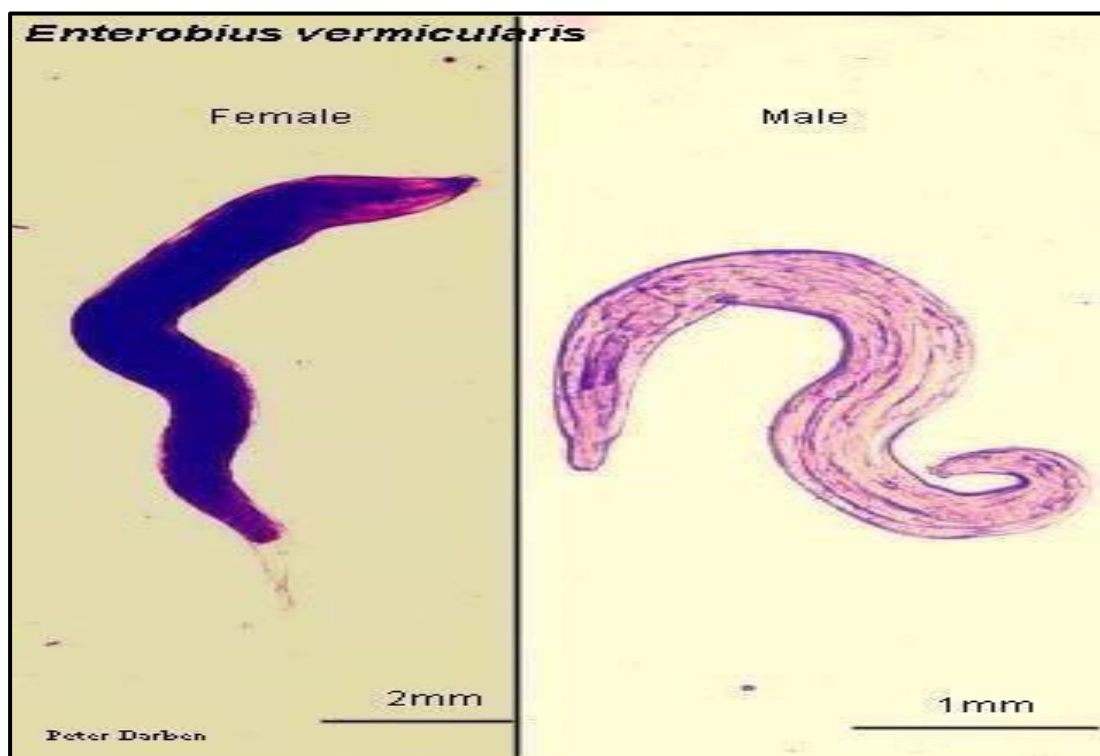
Intermediate host: non (has no intermediate host)

Final stage: Man

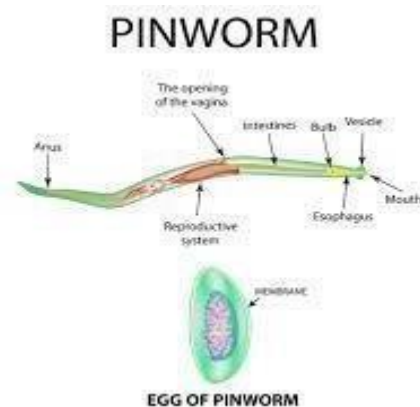
***Infective stage:** Fully developed eggs (egg with larva)

Morphology & life cycle

the adults are short, white, uniform worms with pointed ends looking like bits of white thread **Final host**. The mouth of adults has 3 lips, the body has cuticular alae. The male is 2 - 5mm long, its posterior end is tightly curved and carries a single copulatory spicule, the male is seldom seen as it does not migrate, it usually dies after mating and is passed in the feces. The female is 8 - 13mm long, its posterior third is drawn into a thin pointed pin-like tail, the gravid female migrates down the colon to the rectum at night when the host is in bed and comes out through the anus and crawls about on the perianal skin to lay the eggs. Autoinfection is very common, the larva hatches in the intestine and becomes adult. A single worm lays 5000 to 17000 eggs, when the eggs are all laid, the worm dies. The female may often be seen in feces.



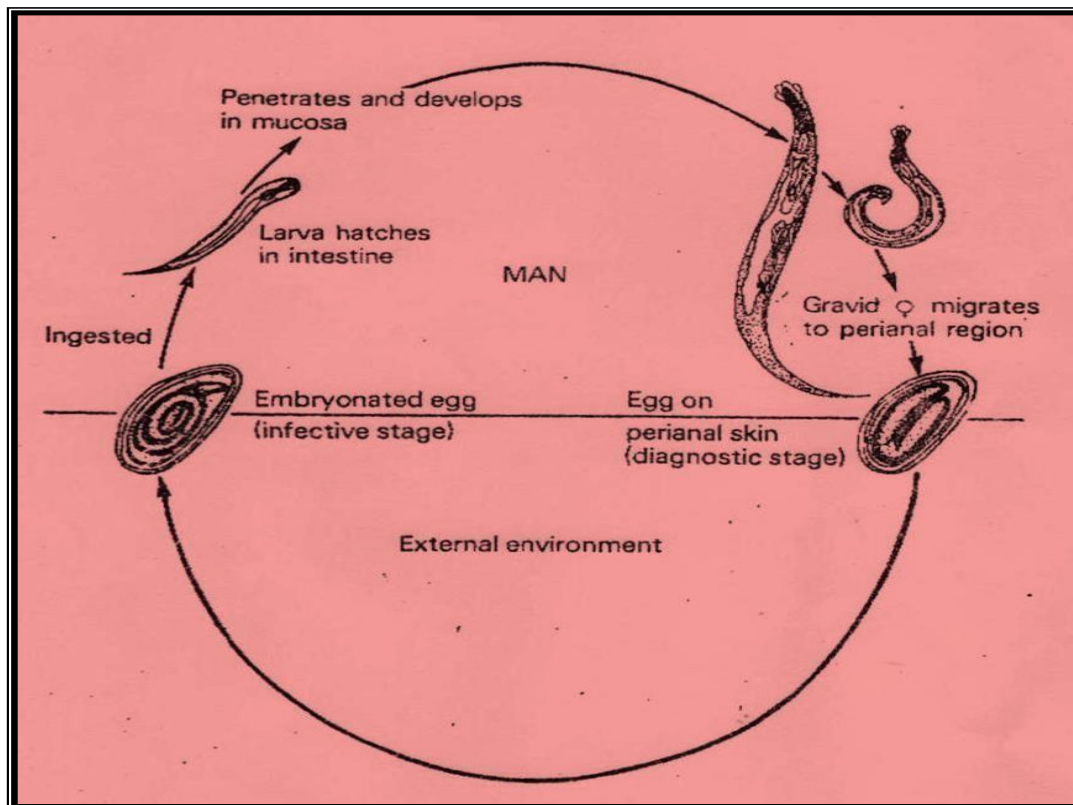
Ova or egg : It is colorless and has a characteristic shape, being elongated ovoid, flattened on one side and convex on the other (**planoconvex**), measuring 50 – 60 μm by 20 - 30 μm , the egg shell is double layered, the outer albuminous layer makes the eggs stick to each other and to clothing or other objects. The egg contains a **tadpole shaped coiled embryo** which becomes infectious only **some 6 hours** after being deposited on the skin



Pathogenicity : The infection occurs mostly in children, it is more common in female than in males. The worm produces irritation and pruritus of the perianal area when it crawls out of the anus to lay eggs, this leads to scratching of the skin around the anus. As the worm migrates out at night, it causes insomnia and restlessness, it disturbs sleep. It may crawling into vulva and vagina causes irritation and a mucoid discharge. The worm may cause appendicitis.

Diagnosis

- *1- by seeing the eggs of *Enterobius vermicularis* in faeces .
- *2- by seeing the adult worm(female) in stool.
- *3-Anal swab either by N.I.H. swab method (National Institutes of Health swab) or by adhesive Cellophane – tape method.



Life cycle of *Enterobius vermicularis*

الاختبار البعدي

Q\what is *Enterobius vermicularis* habitat?

Q\diagnosis *Enterobius vermicularis*?

Trichuris trichura

Common name: The whip worms (Trichuris means a hair – like tail).

Habitat: Adults found in the caecum of large intestine of man, also occur in appendix & colon.

Disease: Trichuriasis or whip worm infection.

Intermediate host: Non (has no intermediate host)

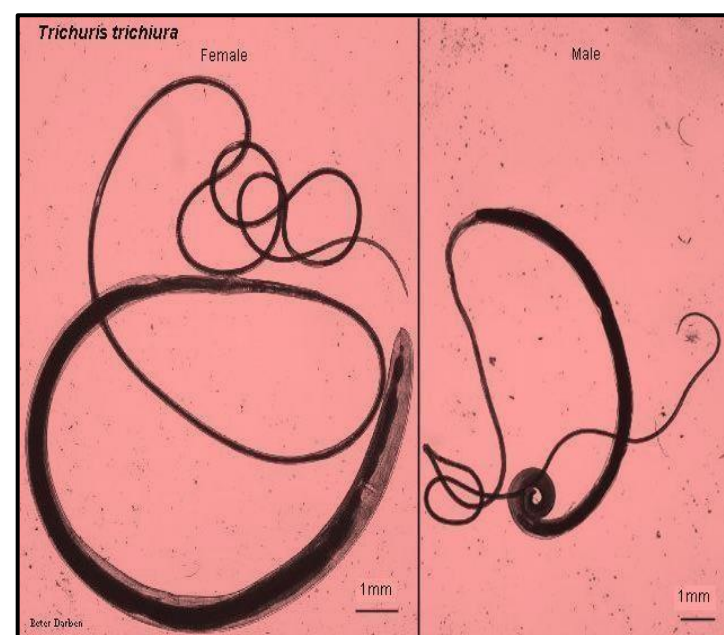
Final host: Man

Infective stage: Eggs with fully developed larvae.

Morphology & life cycle:

The male is 30 mm to 45 mm long while the female is slightly larger about 40 mm to 50 mm. The worm is flesh colored. In shape it resembles a whip, with the anterior three – fifth thin and thread – like, and the posterior two – fifth thick and fleshy, appearing like the handle of a whip. The attenuated anterior portion which contains the capillary oesophagus, is embedded in the mucosa. The posterior part contains the intestines and reproductive organs. The posterior end of the male is coiled ventrally, while the hind end of the female is straight, blunt and rounded. The female lays about 5000 eggs per day.

Ova or egg: Measure about 50 μm in length and 25 μm in breadth. It is brown, barrel – shaped, with a plug at each pole and it contains a fertilized, unsegmented ovum.

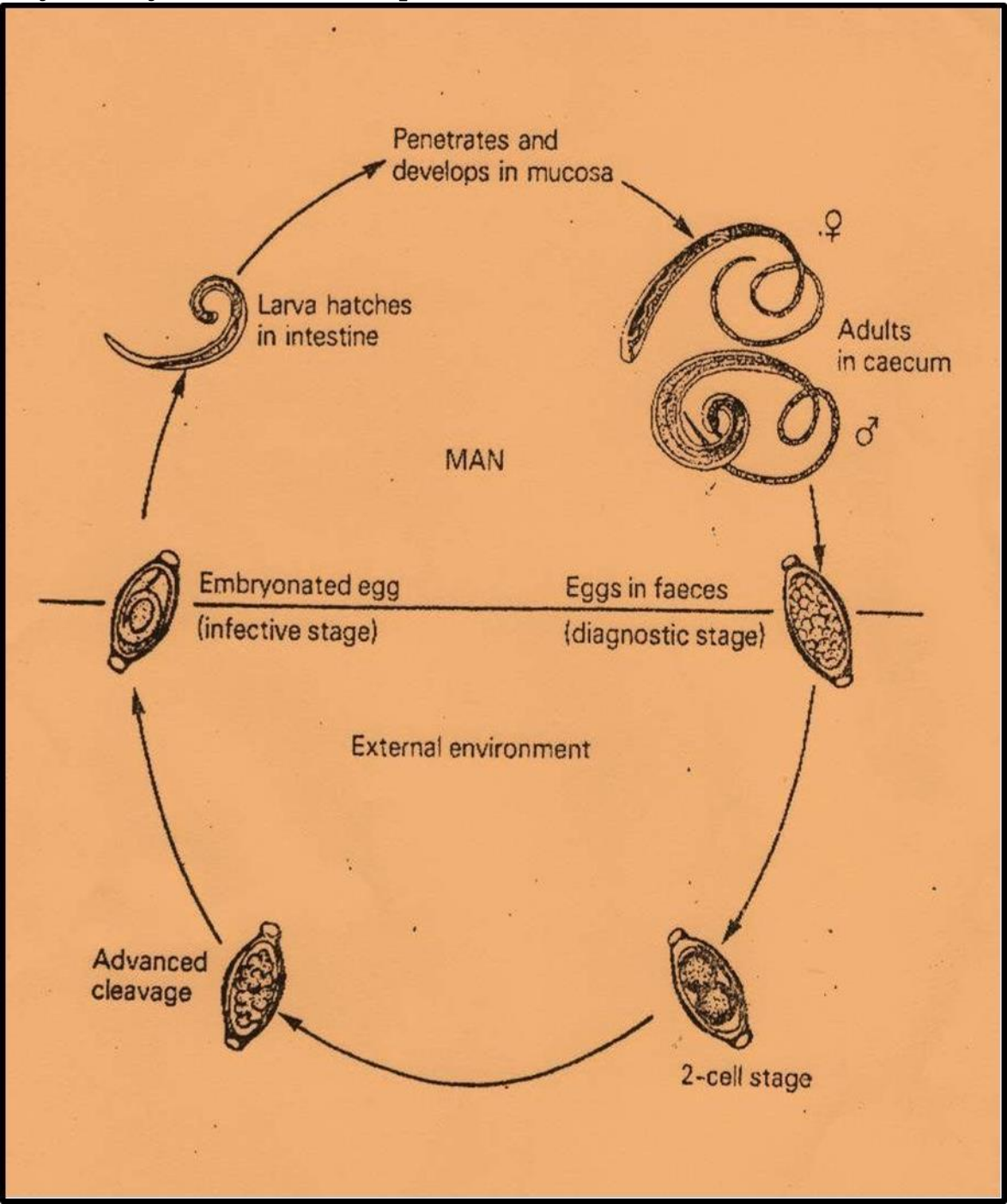


Pathogenicity:

Light infections are asymptomatic. In heavy infection there is colitis with mucous and blood in faeces. Over a period of time the blood loss may lead to anemia and malnutrition. It may cause acute appendicitis. Some patients, particularly young children may develop rectal prolapse.

Diagnosis:

This depends on the finding of the typical eggs of *Trichuris trichura* in the feces of the patient, in case of dysentery the faeces also contain Charcot-Leyden crystals and eosinophils.



Ascaris lumbricoides

Common name: Round worm (The giant intestinal round worm)

Habitat: Adults in small intestine of man (ileum).

Disease: Ascariasis .

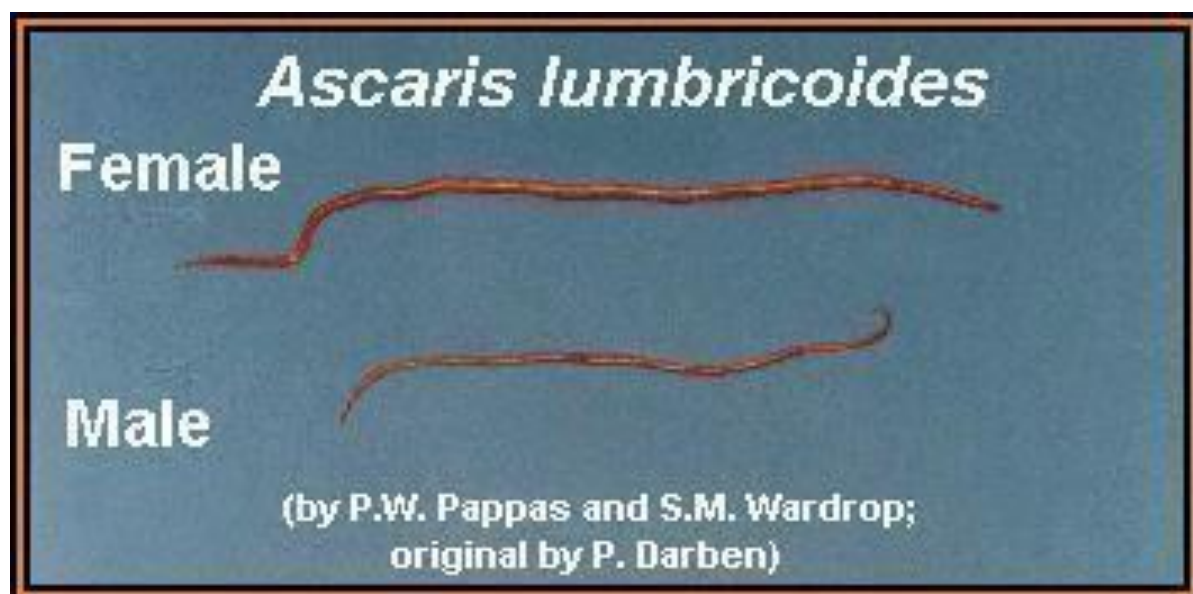
Intermediate host: non (has no intermediate host)

Final host: Man

Infectivestage: Fully developed eggs (egg with larva)

Morphology:

The adult worms of *Ascaris lumbricoides* are the largest nematode parasite in the human intestine. They are cylindrical worms with tapering ends, they are pale pink or flesh coloured when passed in stool, but become white outside the body. The mouth at the anterior end has 3 rounded lips which carry minute teeth or denticles along their margins. The male measures 12 – 30 cm in length and 2 – 4 mm in thickness. Its posterior end is curved ventrally to form a hook and carries **two copulatory spicules**. The female measures 20 – 40 cm in long and 3 – 6 mm in thick. Its posterior extremity is straight and conical. produce 200000 eggs / da



Ova or egg:

****** There are two types of eggs :

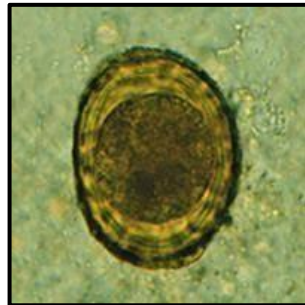
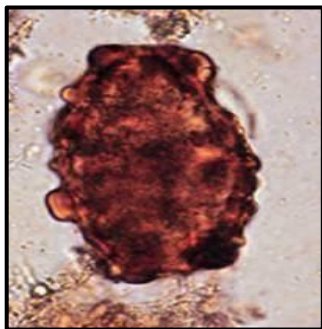
a-Fertilized egg: Round or oval in shape, brownish in color and measures 60 – 75 μm in length and 40 – 50 μm in breadth, this type has 3 layers:

- 1- The outer layer : coarsely mammillated albuminoidal coat (golden brown).
- 2- Middle layer : thick transparent composed of glycogen.
- 3- Inner layer : lipoidal vitelline membrane.

b-Unfertilized egg: passed by unfertilized female, this ova is :

- 4- Longer and narrower than fertilized egg.
- 5- Absent of vitelline membrane.
- 6- The shell is thinner.
- 7- The outer mammillated coat scanty and very irregular.

Some eggs are found in feces without the outer coat, called Decorticated fertilized egg and Decorticated unfertilized egg.



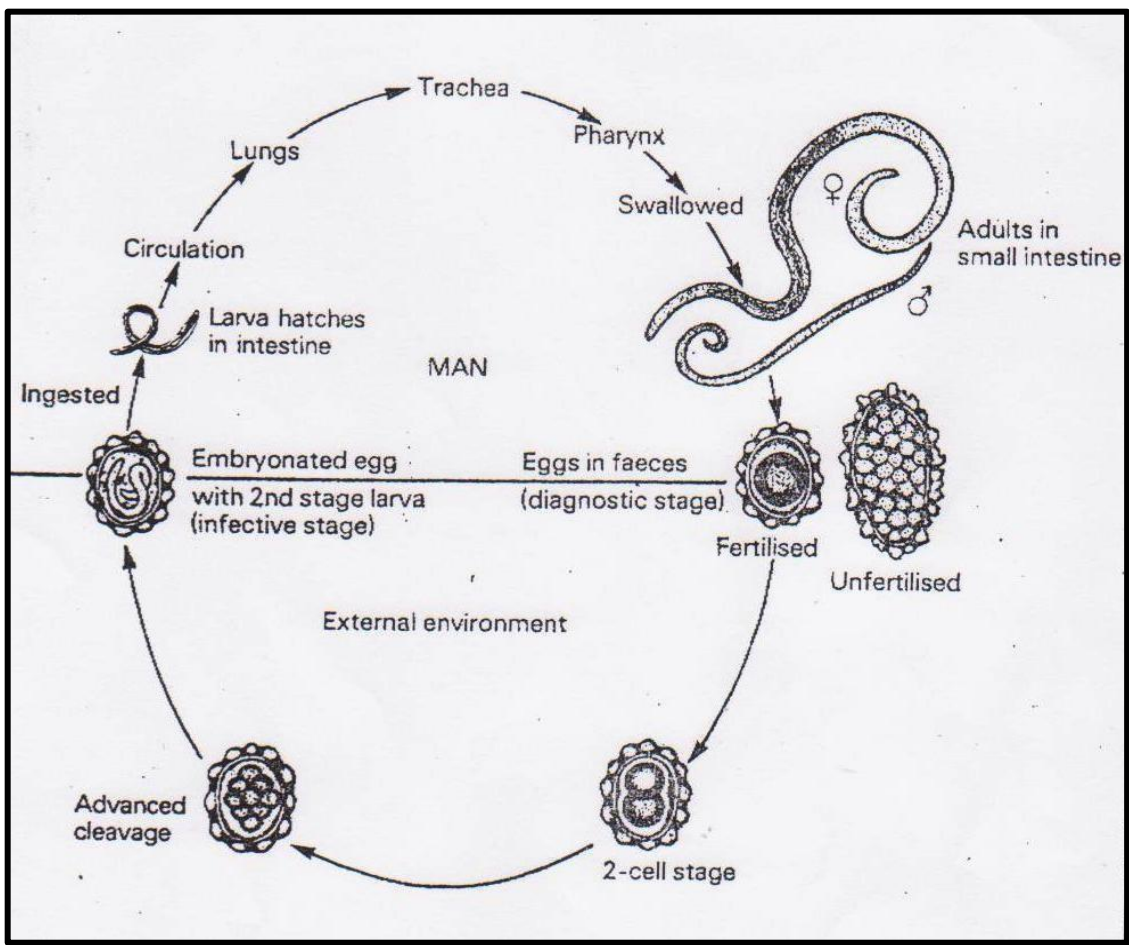
Pathogenicity:

The larval migration of *Ascaris* through the liver and lungs produce an inflammatory reaction of a varying degree. The intestinal symptoms are absent in the majority of cases.

Occasionally the worms may migrate to ectopic sites and produce severe disease. The ectopic sites include the appendix, common bile duct and Meckel's diverticulum. In heavy infections intestinal obstruction and intussusception may occur.

Diagnosis: This is based on finding the eggs of *Ascaris lumbricoides* in the feces. X- rays taken after barium meal reveal the presence of worms.

Life cycle of Ascaris lumbricoides



Fasciola hepatica

Common name: sheep liver fluke

Habitat: Bile ducts or Biliary passages of sheeps, goats, cattle, rare in man

Disease: Fascioliasis or liver rot

Intermediate host: snail genus(*Lymnaea truncatula*)

Final host: sheeps, goats, cattle, rare in man

Infective stage: metacercaria(in water plants)

Morphology: it's the largest and most common liver fluke found in humans, measures up to 3cm in length and 1.2 cm in breadth, gray or brown in color, it has a cephalic cone (conical projection)and shoulders anteriorley and it is rounded posteriorly.

Causes the economically important disease (liver rot) in sheep. The main morphological features are extensive branching of the vitelline glands, testes and intestinal caecae. Man is occasionally infected by ingestion of metacercaria found on vegetation (water plants). The worms are located in the biliary tract and the eggs are passed in the stool

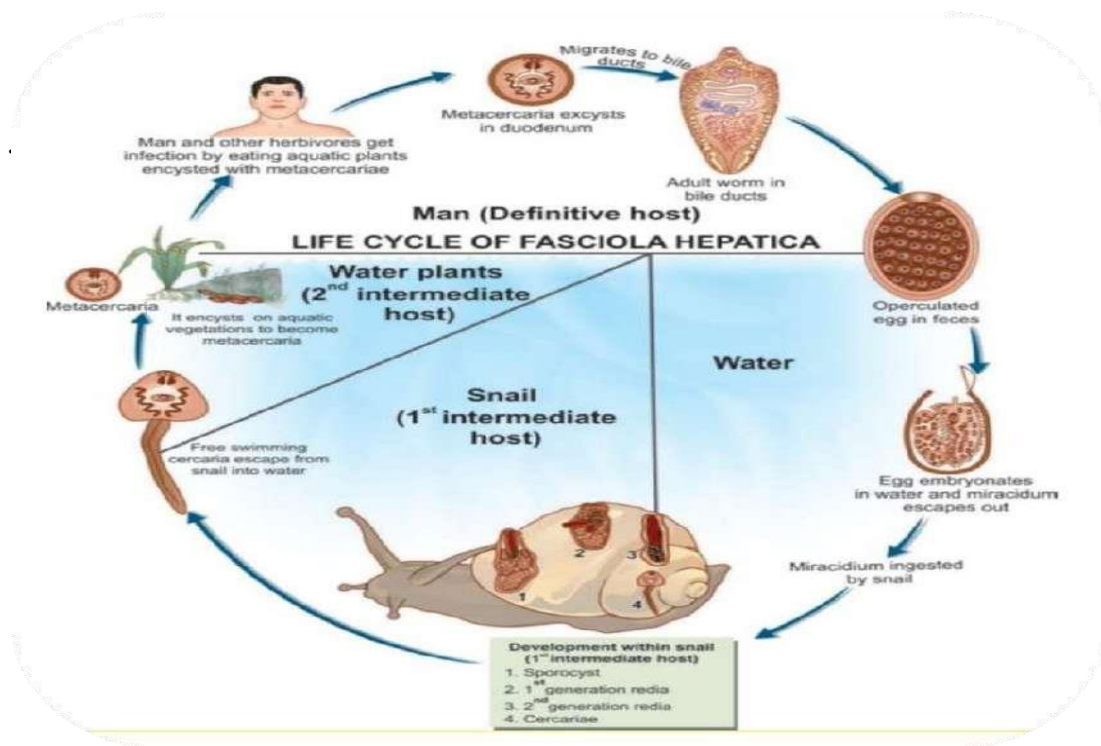
Life cycle:

The life cycle of *F. hepatica* is illustrated in. Immature eggs are discharged in the biliary ducts and in the stool Eggs become embryonated in water, hatch and release miracidia, which invade a suitable snail intermediate host. Development of the larval stages only occurs in snails which belong to the family Lymnaeidae which are freshwater snails

Several developmental stages (sporocysts, rediae, and cercariae. Occur in snail. The cercariae are released from the snail and encyst as metacercariae mainly on aquatic vegetation. Mammals acquire the infection by eating vegetation-containing metacercariae. Humans can become infected by ingesting metacercariae-containing freshwater plants

, especially watercress. After ingestion, the metacercariae exist in the duodenum and migrate through the intestinal wall, the peritoneal cavity, And the liver parenchyma into the biliary ducts, where they develop into adults

In humans, maturation from metacercariae into adult flukes takes approximately 3 to 4 months and the adult worms may live for 9 years in the bile ducts



Pathogenicity:

The toxic products of the larvae may cause hyperplasia of the bile ducts. Although some infected persons are asymptomatic, symptoms associated with the larval stage include fever and gastric pain. In addition, mild to moderate anemia, eosinophilia and leukocytosis occur in many patients the adult worms can produce biliary colic, gaundice, generalized abdominal pain. Cholecystitis and cholelithiasis. In the later stages there is cirrhosis of the liver and general toxemia

Ova or eggs: are large, ovoid, operculated, bile stained and about 130-140 μ X 60 – 90 μ .

Diagnosis: is made by the demonstration of eggs of *Fasciola hepatica* in the feces or aspiration bile is the best method of diagnosis. The eggs can be detected in the feces either by direct microscopy or by concentration techniques. In heavy infections, adult worms can be detected in the stool, especially during treatment..

Intestinal flukes

1- *Fasciolopsis buski*

Common name: the giant intestinal flukes

Habitat: Adult in the small intestine (duodenum or jejunum) of man and Pigs.

Disease: Fasciolopsiasis

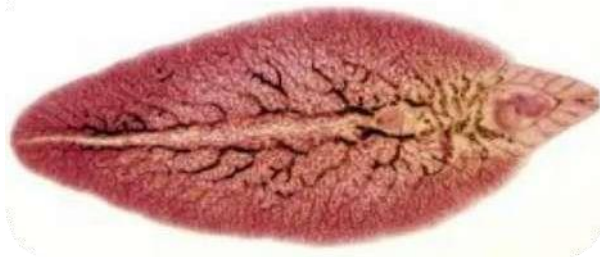
Intermediate host: snail genus (segmentina)

Final host: Man and Pigs

Infective stage: Metacercaria (in water plants)

Morphology: It is the largest trematode infecting humans, measuring from 2-7cm in length and from 5mm to 2cm in breadth, It is elongated ovoid in shape and located in the small intestine. The worm resembles *Fasciola hepatica*, but the cone and shoulders at the anterior end are absent

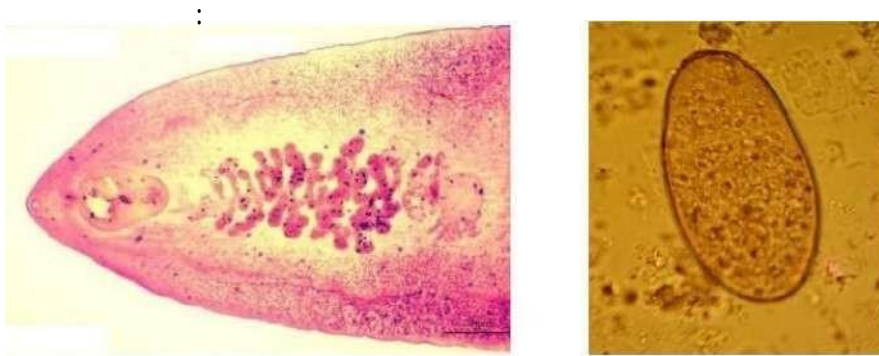
The main morphological features are extensive, highly branched testes which occupy almost the posterior two-thirds of the body. The oral sucker is smaller than the ventral sucker. There is a small branched ovary and a short convoluted uterus. Man is infected by ingesting the metacercaria from various aquatic plants. The larva excites in the duodenum and matures in about 3 months time.



Pathogenicity:

Light infections are generally asymptomatic. In having infections various gastro- intestinal symptoms such as colic, diarrhea and vomiting may occur. There is generally a marked eosinophilia and in some cases Oedema of the face.

Diagnosis: This is made by the presence of eggs of *Fasciolopsis buski* in the faeces



2-Heterophyes heterophyes

Habitat: Adult in the small intestine of cats, dogs, foxes and less commonly in man.

Disease: Heterophiasis

First intermediate host: snail genus (Pironella and cerithidea)

Second intermediate host: Fishes of Mugil and Tilapia

Final host: Cats, dogs, foxes, other fish eating mammals and man

Infective stage: Metacercaria (in certain fresh water fishes as mugil)

Morphology: It measures only 0.5 to 0.8 mm in width and 0.8 to 2 mm in length and has a broadly rounded posterior end. This worm is unique as the adult fluke has three suckers, a small oral sucker (subterminal and represents one third of the size that of the ventral sucker), a large ventral sucker in the middle and a genital sucker with 70- 80 spines. The seminal vesicle is located posterior-dorsally to the genital sucker. The ovary is round and is located in front of two testes, which are located at the lower part of the body. Vitelline follicles are scattered as masses over posterior sides of the worm. Adult flukes release embryonated eggs (30 x 15 μ m) each with a fully developed miracidium, and eggs are passed outside the host in feces.

. **Heterophyes heterophyes**

(adultworms)

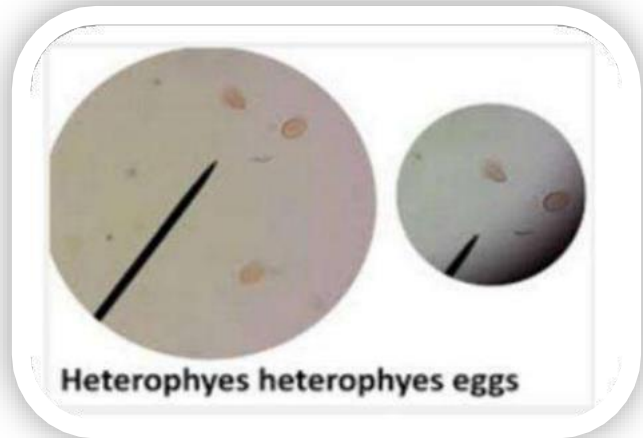
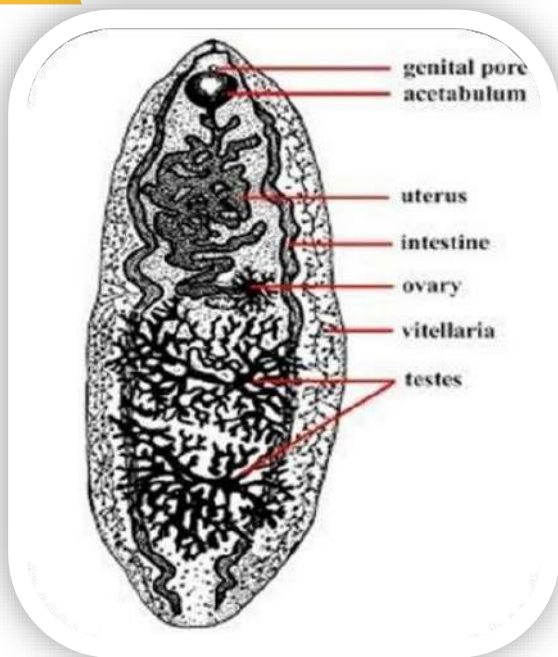
Life cycle:

The life cycle of this worm is simple. The eggs are characterized of being embryonated when they are released and contain a fully-developed miracidium. After ingestion by a suitable snail (first intermediate host), the eggs hatch and release miracidia which penetrate the snail's intestine. Genera *Cerithidia* and *Pironella* are important snail hosts in Asia and the Middle East, respectively. The miracidia undergo several developmental stages in the snail (i.e. sporocysts, rediae, and cercariae).

Many cercariae are produced from each redia. The cercariae are released from the snail and encyst as metacercariae in the tissues of a suitable fresh/brackish water fish (second intermediate host). The final host becomes infected by ingesting undercooked or salted fish containing metacercariae. After ingestion, the metacercariae excyst, attach to the mucosa of the small intestine and mature into adults. In addition to humans, various fish-eating mammals (e.g., cats and dogs) and birds can be infected by *H. heterophyes*.

Pathogenicity: In heavy infections they may produce diarrhea and colic. Sometimes the worms penetrate the mucous membrane and release the eggs into the circulatory system. In such cases the eggs may produced lesions in various organs of the body including the heart.

Diagnosis: is made by the presence of the eggs of *Heterophyes heterophyes* in the faeces.



Class Trematoda

Trematodes (Flukes)

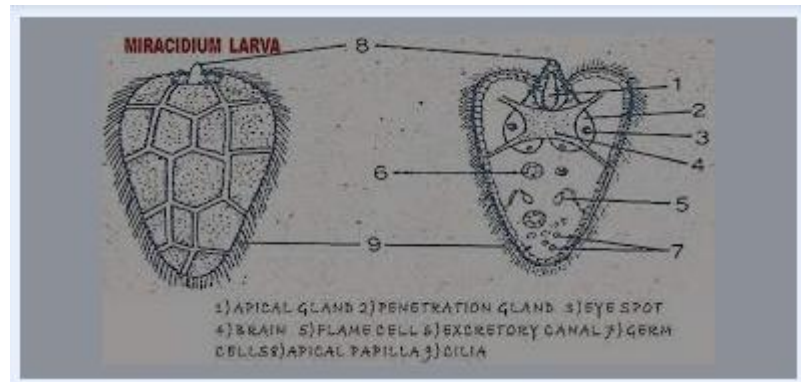
General characters:

The trematoda, or flukes, constitute one class of the phylum Platyhelminthes. Adult trematodes are unsegmented organisms. Some are flattened dorso-ventrally, others are rounded and fleshy, and few are long and nematode-like. With the exception of one family (Schistosomatidae), digenean trematodes are hermaphrodite. The most important trematodes from a clinical point of view are blood flukes, *Schistosoma mansoni*, *S. japonicum* and *S. hematobium*. Other trematodes of medical importance are intestinal fluke, *Fasciolopsis buski*, liver fluke, *Clonorchis sinensis* and lung fluke, *Paragonimus westermani*.

The general digenean life cycle : The life cycle is always indirect, the first intermediate host is mostly a snail, usually aquatic with some exceptions (for example *Dicrocoelium dendriticum*, which uses a land snail as an intermediate host). In some cycles, there is a secondary intermediate host, rarely, a third. With few exceptions, life cycles are entirely dependent on the availability of water. In their life cycle, digenean flukes pass through a series of morphologically distinct larval stages. In a few cycles one of these stages may be omitted and another repeated. **Egg:** Usually ovoid or ellipsoidal with an operculum at one end. The egg contains a morula when laid that develops into the first larval stage usually after the egg has left the definitive host. The first larval stage is a miracidium

1-Miracidium:

The miracidium hatches in response to specific stimuli such as light. It is ciliated and swims rapidly in water. Its life-span is short and it must meet a suitable snail host within a few hours in order to develop further. The miracidium enters the snail usually by penetrating its integument using enzymes. As it enters the snail's tissues, it loses its cilia and becomes the second larval stage, the sporocyst.

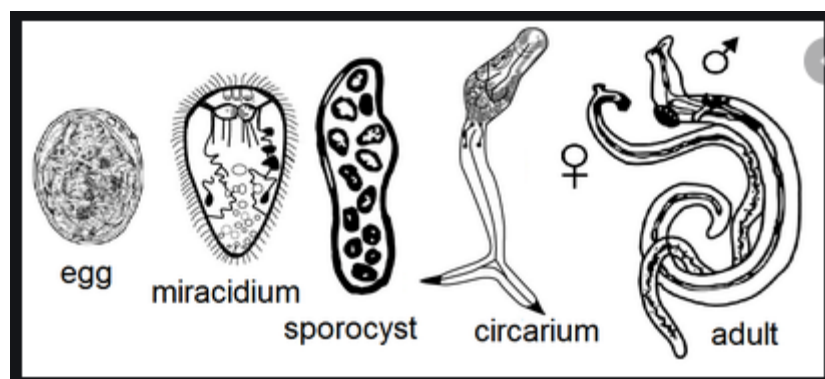


2-Sporocyst:

The sporocyst is usually a sac-like structure containing germinal cells that develop into the next stage, the redia. Several rediae develop in each sporocyst and when mature burst through the sporocyst wall. Sporocysts of some species become large and branched (usually in life cycle where the redia stage is omitted).

3-Redia:

The redia is elongate and has a mouth and simple gut. It is motile and usually migrates to the digestive gland (hepato-pancreas) of the snail which provides a highly nutritive medium. Germinal cells within the redia develop into the next stage, the cercaria. Many cercariae are formed in each redia; when mature they leave the redia through a "birth pore".



4-Cercaria: The cercaria consists of a body and a tail. The body has suckers, a gut and flame cells. The tail, attached posteriorly, is used to propel the cercaria in water. The cercariae are the last stage to develop in the snail host, in most species, leave it when fully developed. With few exceptions, the cercariae encyst to become metacercariae; they start to secrete a cyst around themselves and shed their tails. Encystment occurs in different situations depending on the species. It may occur on vegetation in water, on or in the intermediate host, on or in a second intermediate host (commonly a fish). The definitive host becomes infected by ingestion of the metacercaria which excysts in the intestine and develops to maturity either there or after migrating to the appropriate site. In some trematodes (e.g. schistosomes) the infective stage is the cercaria which infects the definitive host by penetrating its skin. Another exception to the general trend of life cycles is seen in the life cycle of *Dicrocoelium dendriticum* that lives in the livers of ruminants in Europe and Asia; where its life cycle involves land snails and ants as intermediate hosts.

Intestinal flukes Treatment and control The drug of choice is praziquantel. Other effective drugs include hexachloroparaxylol and bithionol (bitin). Control measures include the treatment of the patients, carriers and pigs, health education, improved hygiene, appropriate disposal of fecal waste, and adequate washing of contaminated plant material. Sewage should be treated before disposal.

Trematodes infecting humans can be classified as following :

A-Monoecious hermaphroditic flukes which live in the lumen of various tracts:

1-Liver flukes: *Fasciola hepatica* 3-Lung flukes : *paragonimus westerman*

2-Intestinal flukes: *Fasciolopsis buski* and heterophytes.

B-Dioecious trematodes Scistosomes which live inside veins in various locations.

1- Blood flukes

Schistosomes (Bilharzia).

The three main species infecting man are :

1-Schistosoma haematobium.

2-Schistosoma mansoni.

3-Schistosoma japonicum

Schistosomes are **dioecious** trematodes in which the sexes are separate. The male is broader than the female and has a deep ventral groove known as the (**gynaecophoric canal**) in which the female is held (lies) **during copulation**. Both sexes have 2 suckers, an anterior and a ventral sucker.

Schistosoma haematobium.

Habitat: adult worms live in the vesical plexuses of veins of urinary bladder and pelvic vein.

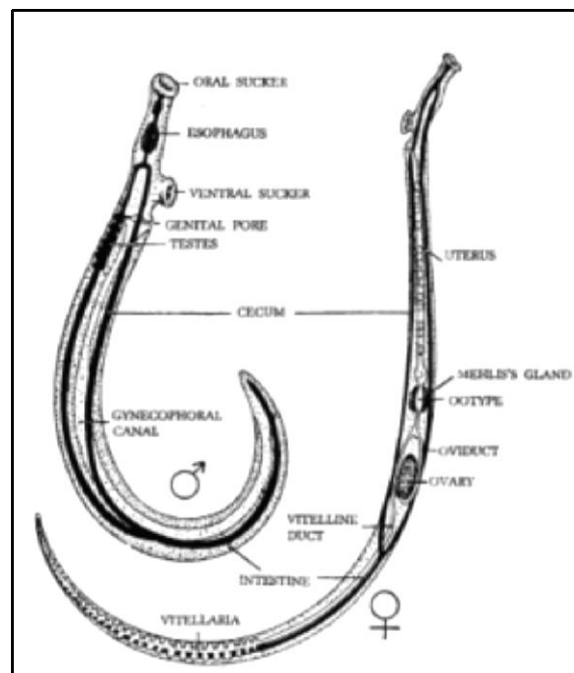
Disease: urinary schistosomiasis, urinary bilharziasis, vesical schistosomiasis or schistosomal hematuria.

Intermediate host: snail genus (*Bulinus*).

Final host: Humans are the only natural definitive hosts. No animal reservoir is known.

Infective stage: cercaria (forked tail).

Ova: 150 μ X 60 μ , oval with **terminal spine**.



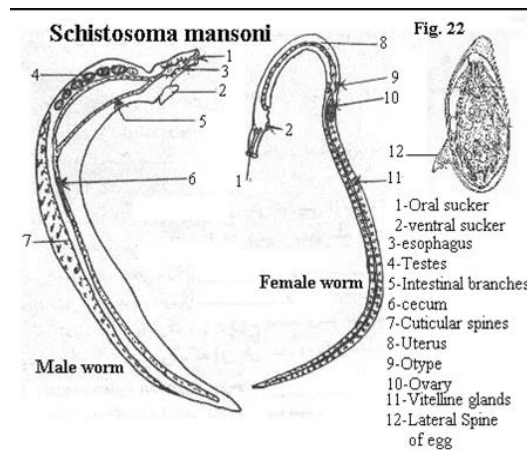
Schistosoma mansoni.

Habitat: adult worms live in the inferior mesenteric vein.

Disease: intestinal schistosomiasis or intestinal bilharziasis.

Intermediate host: snail genus (*Biomphalaria*).

Final host: Humans are the only natural definitive hosts, though in endemic areas monkeys and baboons have been found infected.



Infective stage: cercaria (forked tail).

Ova: 140μ X 60 μ, oval with **lateral spine**.

***Schistosoma japonicum*.**

Habitat: adult worms live in the superior mesenteric vein.

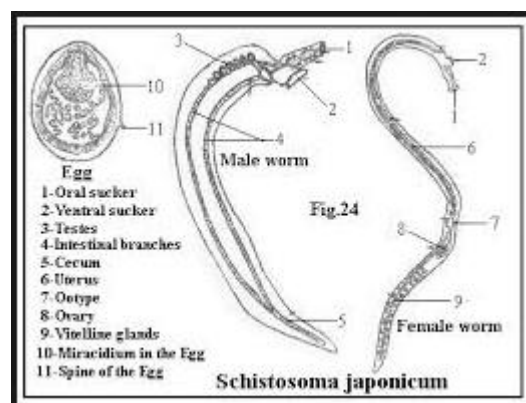
Disease: Oriental schistosomiasis or Katayama disease

Intermediate host: snail genus (*Oncomelania*).

Final host: man is the definitive host, but in endemic areas, several domestic animals and rodents act as reservoirs of infection.

Infective stage: cercaria (forked tail). discarded

Ova: 80μ X 60 μ, roundish with **rudimentary spine or lateral knob**.



Differential characteristics of Schistosomes:

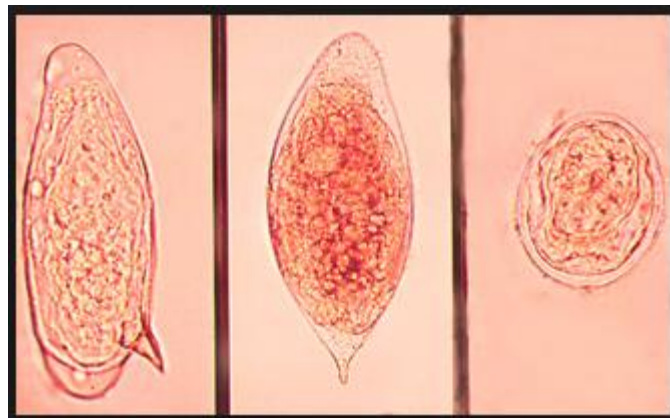
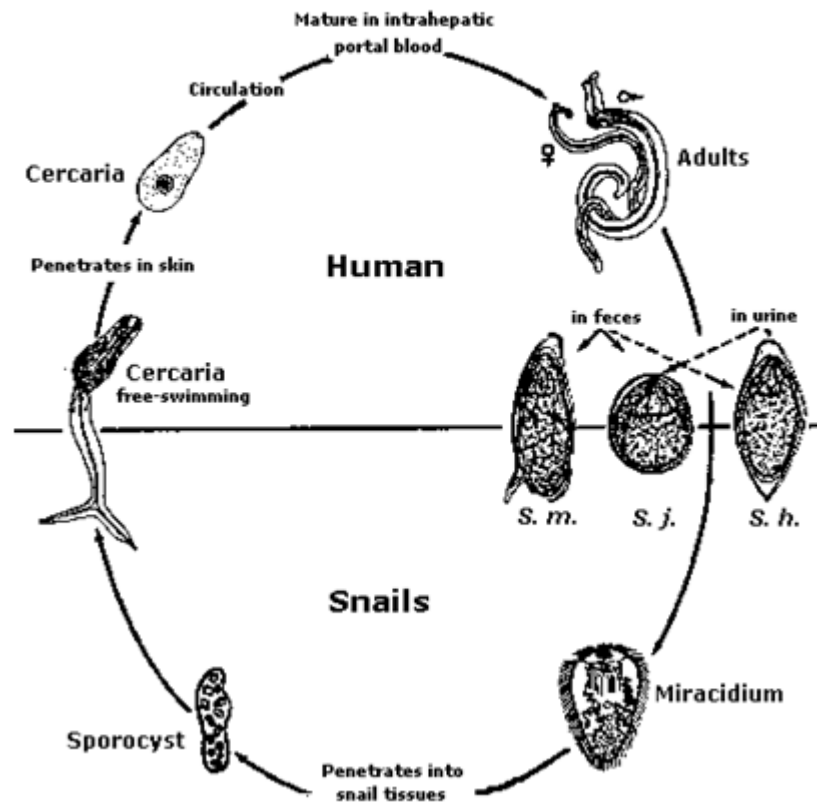
Characters	<i>S. haematobium</i>	<i>S. mansoni</i>	<i>S. japonicum</i>
Male			
Tuberculations or cuticle	Fine	Coarse	None
Caecal junction	Middle of the body	Anterior third of the body	posterior third of the body
No. of testes	4 – 5	6 – 9	6 – 7
Female			
Position of ovary	posterior half of the body	Anterior half of the body	Middle of the body
Uterus	Long contains 20 - 30 ova	Short contains 3 - 4 ova	Long contains 50 –100 ova

Pathogenicity: heavy infection of *Schistosoma haematobium* may produce chronic cystitis and urethritis, fibrosis and eventually obstruction of the urethral orifice may lead to hydronephrosis and renal failure. The infection may also predispose to bladder stones and carcinoma. The eggs may be dispersed into various other organs of the body via the circulatory system. In *Schistosoma mansoni* and *Schistosoma japonicum* eggs are first carried to the liver and from there they enter the systemic circulation resulting in lesions in various other organs of the body. In the liver they may give rise to fibrosis and portal hypertension and give rise to splenomegaly, ascites, oesophageal varices and haemorrhoids.

Diagnosis: 1.in case of *Schistosoma haematobium*: By finding terminal spined eggs in microscopic examination of centrifuged deposits of urine, more rarely in the faeces. Eggs are present in greatest numbers in the last part of the urine passed and after exercise. Eggs are more abundant in the blood and pus passed by patients at the end of micturition. They can also be seen in seminal fluid. They may occasionally be found in feces, or more often in vesical or rectal biopsies.

2. in case of *Schistosoma mansoni* and *Schistosoma japonicum*:By finding characteristic lateral spined eggs in the faeces in light infection rectal biopsy is useful. Cystoscopy is similarly of value in *Schistosoma haematobium* infection. Various immunodiagnostic tests are available these include intradermal cercarian hüllen reaction (CHR). The fluorescent antibody test using cercaria (FAT) and the circumoval precipitin reaction (COP).

Life cycle of *Schistosoma spp*



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