

Lecture 5: Helminths-Nematodes

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Helminthes

Multi-cellular
large. & can be seen by eyes

التصنيف حسب الشكل

Round worms

(Nematodes) cylindrical, unsegmented دائري

Flat worms

① Trematodes:
leaf-like, unsegmented.

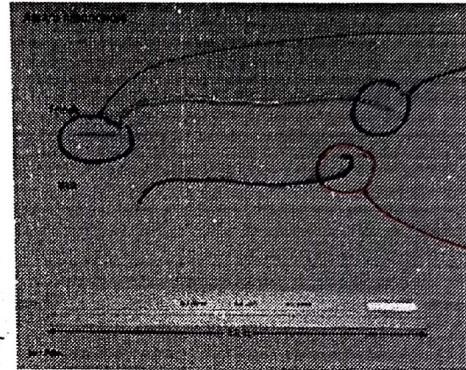
② Cestodes:
tape-like, segmented

Nematodes General Characteristics

(cylindrical)
round

* هذه الامور تبين انه دائري عظما

- Non-segmented cylindrical worms tapering at both ends



* لا تظهر اسهل هون كيف عند

الطرفين تضيق

(tapering at both ends)

- Variable in size, measure <1 cm to about 100cm

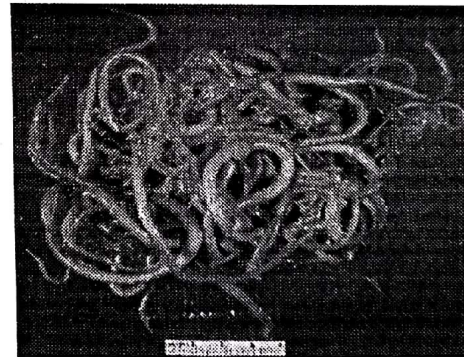
* adult nematodes بنقدرتهم من الحسنة

? Sexes are separate, male is smaller than female & its posterior end is curved ventrally

* Male has ventral curve.

• Live in intestinal tract or tissues

Some of them might migrate from the intestine into other tissues.



* من الجهة الامامية (ال ventral)

يوجد curve

اذا من هاي الرسمة يعرف انه had

male

↳ This picture shows collection of nematodes with a very huge number.

⇒ In this case we will have intestinal obstruction.

Small (L)

Small intestine (لو)

Large intestine (او)

* هون بيترى فينا في حسب المكان الي بيحلو له infection

Classification

* Small Intestine only

✓ *Ascaris lumbricoides* (round worm)

✓ *Necator americanus* (american hook worm)

✓ *Ancylostoma duodenale* (hook worm)

✓ *Strongyloides stercoralis*

Trichinella spiralis (trichina worm)

Capillaria philippinensis

* Caecum and Vermiform appendix

✓ *Enterobius vermicularis* (pin worm)

✓ *Trichuris trichiura* (whip worm)

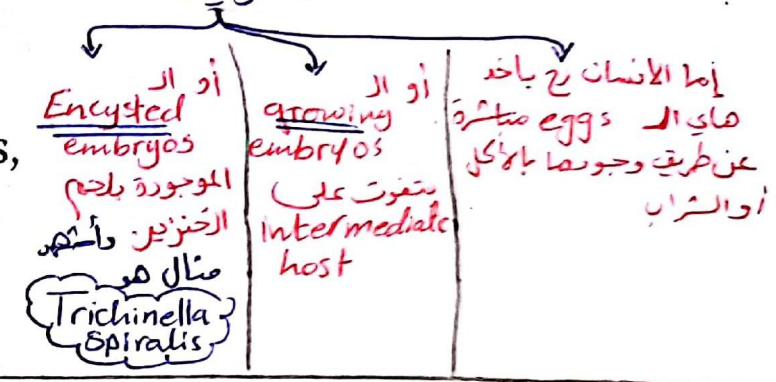
Modes of Infection

The classical & most common way:

1. Ingestion of -

- Embryonated eggs contaminating food & drinks, e.g. *A. lumbricoides*
- Growing embryos in an intermediate host
- Encysted embryos in infected pig's flesh e.g. *Trichinella spiralis*

GIT infectious (تذكري) إنه حكيما إنه أغلبه أو fecal-oral route بتنتقل عن طريقه أو food & water (دواء الحكي مع ينموية كمان على الـ helminths عن طريقه)



- Penetration of skin - filariform larvae bores through the skin e.g. *A. duodenale*, *S. stercoralis*, *N. americanus*
- By blood sucking insects e.g. filarial worms
- Inhalation of infected dust containing embryonated eggs e.g. *A. lumbricoides*, *E. vermicularis*

* الـ Flariform larvae عبارة عن يرقات خيطية حجمها صغير عنها القدرة على اختراق الجلد، وبعضهم تمشي الـ Capillaries وترجع للـ lung or intestine

* من بعد ما يهيم Inhalation of infected ducts


في حال كان يحتوي على embryonated eggs.

مع توهل هاي الـ eggs على الـ Lungs

ومن الـ Lungs بتروح على الـ intestine

1. Ascaris lumbricoides (roundworm)

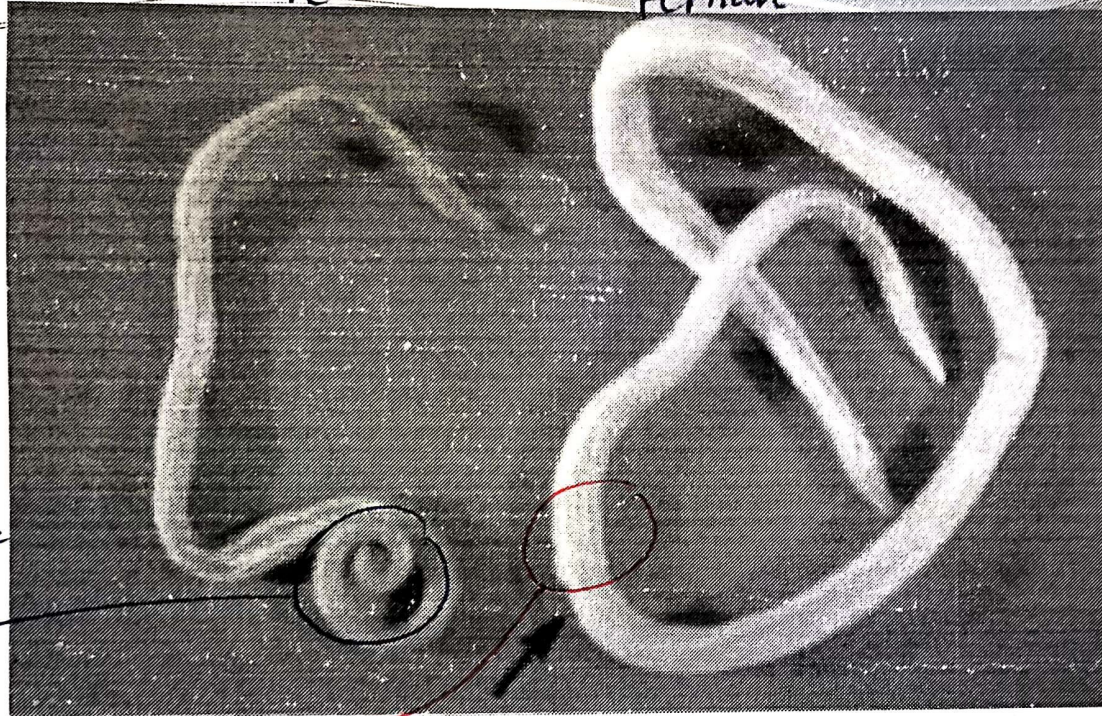
Adult worms	Male 15 to 30 cms Female 20 to 40 cms → Females > Males
Eggs	60 µm, <u>bile stained</u> (ابوي غاصت) Albuminous coat with unsegmented ovum
Infective form	Embryonated eggs
Mode of transmission	Ingestion of the embryonated eggs
Site of localization	Small intestine



This is the thick coat (wall) of the ovum

Male

Female



This is the ventral curve

* تذكر أنهم اللمة واحدة

- ✓ Round
- ✓ Cylindrical
- ✓ Unsegmented
- ✓ Female size > male
- ✓ Ventral curve in male
- ✓ Vulvar waist in female

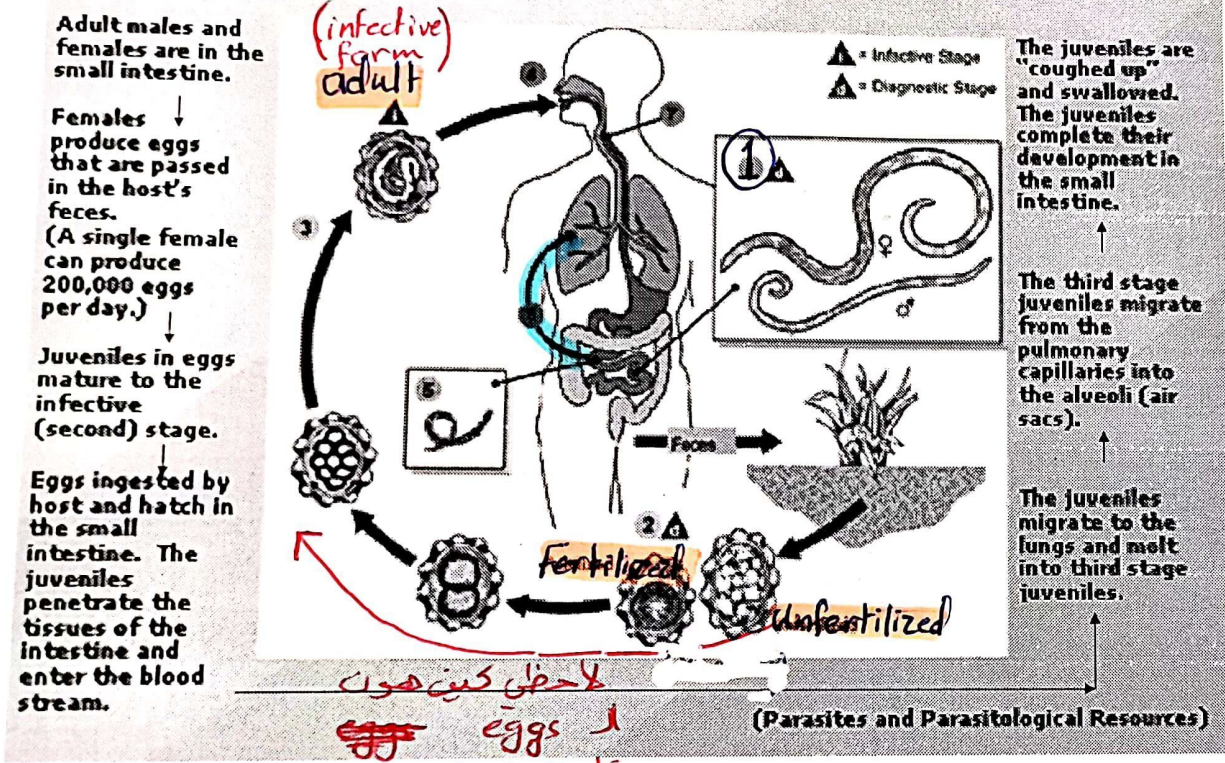
A pair of female and male worms of *A. lumbricoides*.
 Notice the vulvar waist (arrow) of the female worm and the coiled end of the male worm.

* لاحظ وجود حزام بالوسط عند اللمة female worm

① Infection with adult (male & females) in the
 المسوحة ضوئياً بـ CamScanner

The Life Cycle Of ROUNDWORMS

Ascaris Lumbricoides and Ascaris Suum



(infective form adult)

Fertilized Unfertilized

لاحظني كيف هوون
 eggs
 قاعدة بتعمل
 maturation

① Infection with adult worms (male & females) in the small intestine.
 This will cause the clinical manifestation of the intestinal tract.

⇒ These males & females worms will start making, so this will lead in producing eggs.
 ملاحظة: ال female رح تنتج كميان خنفة من ال eggs باليوم الواحد (حوالي ...) وهاي رح تطلع مع ال stool وترجع لـ external environment
 ← ومنهون ممكن توصل الخنبار صلباً
 ← فاذا واحد اكل هاي الخنبار بيون ما يكون مصنولة متبع رح ينتقل اليه ال infection

* ملاحظات مهمة :

① يبي رح ياخده المريض بالأكل ويقاله ingestion هو ال fertilized eggs

② بال small intestine هاي ال fertilized eggs تصبح Adult forms (Male & Female)

③ مرات ال worms الموجودين بال intestine , ممكن يحولوا Extra-intestinal migration ويروحوا لـ lungs
 ← ممكن المريض لما يقح (cough) يطلع دودة بالقحة >> أو يقحها ويرجع بيدها , وترجع توصل ال small intestine مرة تانية.

Pathogenesis

- Ascariasis – infection of *A. lumbricoides*

- # Majority of infections are asymptomatic

وخاضعة في المراحل الأولى من المرض

لأنه يكون ال number of these worms is very low

- Clinical disease is largely restricted to individuals with a high worm load

كل ما زاد عددهم يتبدلش الأعراض تزيد أكثر طبعا

- Symptoms divided into two groups: those produced by

1. Migrating larvae → * هاهي هي بي بتطلع من intestine على ال lungs
2. Adult worms → * هاهي هي المستقرة بال intestine

Symptoms & Complications

- Symptoms produced by Migrating larvae

1. Pneumonia (loeffler's syndrome) - fever, cough, dyspnoea, blood tinged sputum that may contain larva, urticarial rash & eosinophilia

Rarely happens (2)

Visceral larva migrans - if larvae enter systemic circulation (from pulmonary capillaries) to reach other organs like brain, spinal cord, heart, kidney.

Symptoms & Complications

- Symptoms produced by Adult worms

1. Abdominal discomfort, anorexia, nausea & diarrhoea.

2. Protein energy malnutrition (PEM), Vit. A deficiency (night blindness)

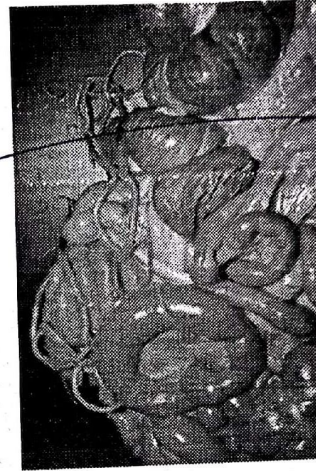
نحن نحتاج للتدخل الجراحي.

3. Intestinal obstruction (particularly in children 1-5 years), intussusception & volvulus

4. Penetration through intestinal ulcer (perforation) - peritonitis

5. Hypersensitivity reactions to worm Ags (toxic body fluids) -
urticaria, edema of face,
conjunctivitis, irritation of URT

لأنه الجسم مليان امساع كثيرة عن العدويان



هاد بيهم لانها هاي ال دلتا adult
 لي نهمس بقتصه كجبة كيسة من الغذاء
 واد nutrients لي يحتاجهم الكريف
 والهدت منه لهاد بيهم تقدر تتكاشر
 وينمو جسمها

(6) Ectopic Ascariasis – due to migration of worm up into the stomach. It may

* بعد از استفراغ
و نیز ممکن است خروج

- be vomited out,
- pass up through the oesophagus at night & comes out through mouth or nose ><
- enter larynx to cause asphyxia. الختناق
- migrate to other organs and cause appendicitis, cholecystitis, biliary colic, cholangitis, pancreatitis

Laboratory Diagnosis Stool analysis *

أم حشرة

- Macroscopic - Direct detection of worm/s in stool or vomit
- Microscopic – direct examination of feces following floatation method: **bile stained eggs**. (eggs may not be seen at least 40 days after infection)

- BC Blood examination – eosinophilia.



تذكرى *
egg
60 μm
Bile stained
thick albuminous coat
unsegmental.

Other modes of diagnosis

- **Imaging** - large collections of worms in abdomen (CT scan, ultra sound)
- **USG** - to diagnose hepatobiliary or pancreatic ascariasis

Serology (Ab detection) - mainly reserved for epidemiological studies.

غرض صفة
• انت تكون
الـ Ab
بـ
مراحل
مناخضه من
infectious

Treatment

- Mebendazole/ Albendazole - drug of choice but contraindicated in pregnancy & heavy infection
- Pyrantel pamoate - single dose
- Levamisole

لا نه بهاي الحالة يوجد عنا
large number of worms
فما تحطى الدواء وبقائها
رح يضل عند كبيره الديدان
التي قاعدة بار intestine
intestinal obstruction فبتعطل

عنا فاهيك بهاي الحالة لازم تقلى اد dose
* gradual killing عنان يكون في

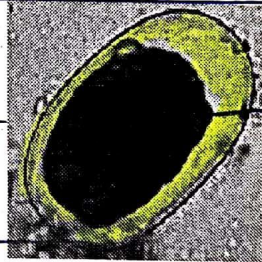
Prevention

- ① • Good sanitation and personal hygiene
- ② • Mass treatments with single dose mebendazole or albendazole for all school-age children every three to four months - serves dual function:
 - treats the children and
 - reduces the overall worm burden in the community



2. *Ancylostoma duodenale* and *Necator americanus* (hook worm)

Adult worms	Male 8 -11mm Female 10-13 mm
Eggs	متل الاسكاريس تقريباً 60 μm, non bile stained (colorless) Segmented, 4 blastomeres
Infective form	3 rd stage filariform larva
Mode of infection	Penetration into skin
Site of localization	Small intestine



حجمها زهيد من حجم الاسكاريس
ركن لاطلي

برهنوهون
Female > Male

افتح السلايدان وضوف
انها هاي المنقطعة
segmented

يوجد
ع حلقات
عبارة عن خلايا
صغيرة جوار ال
egg
(4 blastomeres)

Ancylostoma duodenale

Female

Male

خطاف
علائية

* هاد هو شكل ال hook
يح يساعده الودة انه
تخرس حالها بار
small intestine.



Peter Darben

2mm

Adult worms of *Ancylostoma duodenale*

Necator americanus

Female



1mm

Peter Darben

Male



1mm

* شكل الـ mouth
يختلف بين الـ male & female.
لكن يجب مشا هنته كون .

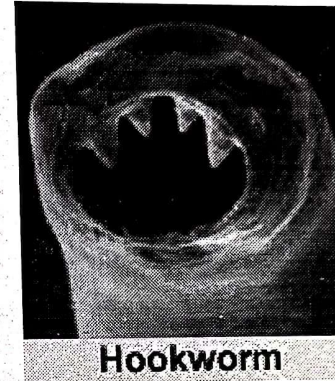
Adult worms of *Necator americanus*

Sites of skin penetration

- **Most common sites are:**

- ✓ 1. Thin skin between toes
- ✓ 2. Dorsum of the feet
- ✓ 3. Inner side of the soles

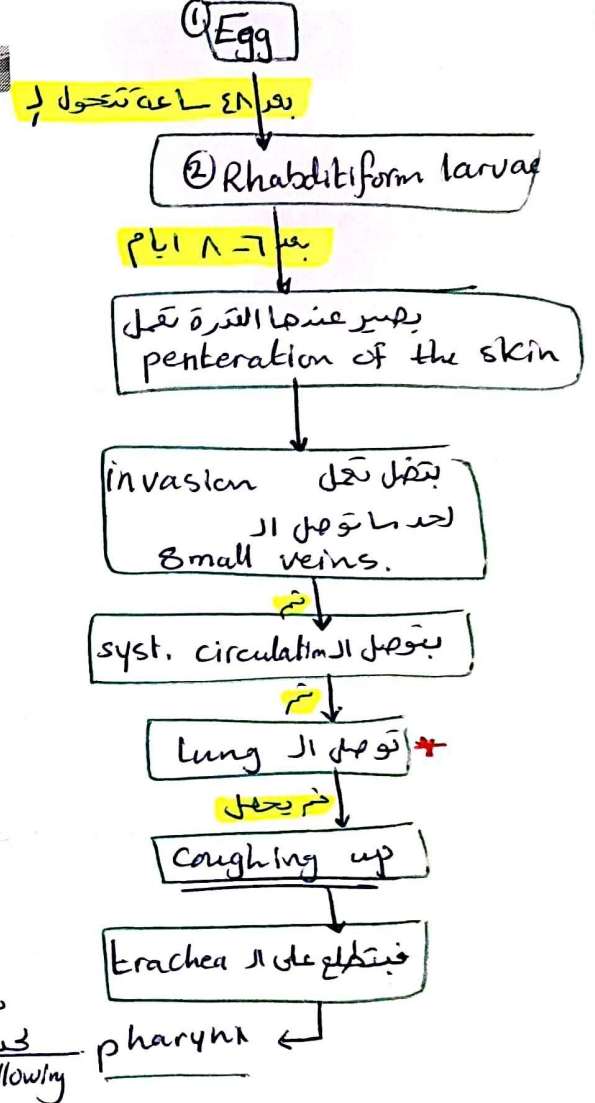
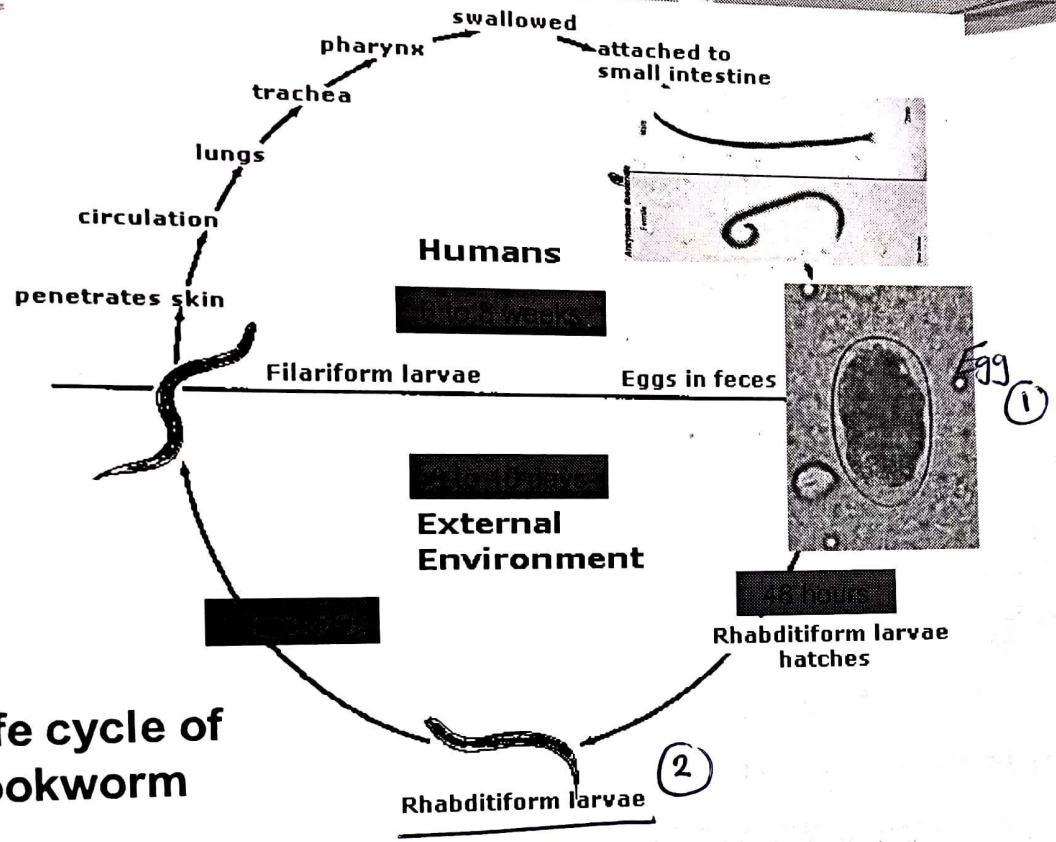
- * Gardeners & miners – skin of hands



Hookworm

mouth. هاد شكل ال
بي يتسخره عشان
تتغز باا intestine
وتصير تاخذ من ال
Blood & Nutrients
of the patient

Life cycle of hookworm



* هون بتخسر بكتل *adult worms*
 Males Females

وكسول بيسيروا بعلوا *mating*
 ويبدن ينبتجوا ال *eggs*
 هكسول ال *eggs* بس
 يطلعوا بار *feces* ويروحوا على ال *environment*
 بيحدث *infection to other host*

Hook worms in the intestine



Pathogenicity & Clinical Features

- Hookworm disease, characterised by iron deficiency anaemia

بالبداهة

- Majority of infections are asymptomatic
- Symptoms develop in heavy infections and divided into two groups: those produced by
 1. Migrating larvae → cause respiratory symptoms
 2. Adult worms → cause intestinal symptoms

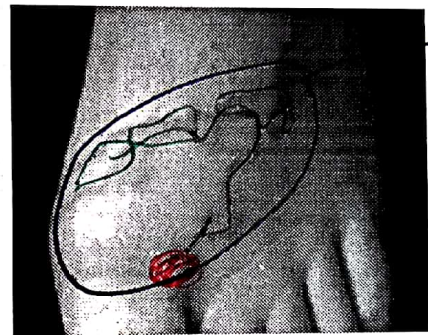
Symptoms produced by larvae

* اول ما تدخل الودة ، الحبر لا يتعادل معها كجسم غريب ، ورح يفعل جهاز المناعة
 ← فبالنتيجة لا نشوخي papule حول ما دخلت الودة . لونها أحمر

مرحلة ما دخلت penetration

Lesions in the skin:

1. Ancylostome dermatitis or Ground itch - occurs at the site of entry (more common in necator), lasts for 2 to 4 weeks
2. Creeping eruption - reddish itchy papule along the path by filariform larvae (migrans)



* الدائرة الحمراء يلي مباشرة عليها (Papule)
 ← هون هو المكان يلي دخلت منه الودة وعلت penetration of the skin

و يدين بلست تسبب تحت الجلد عشان وتحتون ال veins
 ← بعد كـ طايح يتكون الودة اتقلت من ال skin لـ systemic circulation

- Lesions in the lungs - bronchitis & bronchopneumonia.
 (cough w/ blood)
 fever.

شأن هيلع هاد المنظر بروج بعد كـ طايح
 * ملاحظة مهمة : هي الودة بتكبير بار
 * Necator americanus

in the intestine 3.

Symptoms produced by adult worm

- Epigastric pain, diarrhoea & vomiting during early phase of infection.

Chronically 3. ↓

- (Microcytic hypochromic) (Iron deficiency) anaemia – due to chronic blood loss:

- a single adult hookworm sucks 0.2ml of blood/ day 00
- Hemorrhages from punctured sites

Laboratory Diagnosis

- Stool examination –
microscopy: non bile
stained egg, segmented
- Occult blood in stool –
* positive
- Blood examination –
anaemia, eosinophilia



تذكر
أبيض الصائغ
→ 17 colorless coat
21 segmented.

Treatment

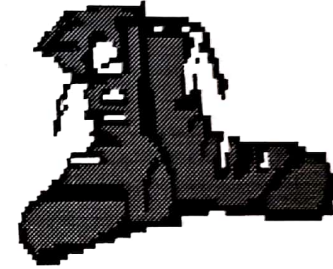
- Mebendazole / Albendazole → Drug of choice
- Pyrantel pamoate
- Oral iron replacement → In case of severe deficiency anemia
- Nutritional support

* لازم نعمل stool analysis
بعد علاج من انتفاخ البطن .
عشان نتأكد اننا لم نبق في ولا
worms أو eggs

Prevention & Control

- Proper sanitation measures & sewage disposal
- Personal hygiene
- Personal protection – wearing boots & gloves
- Simultaneous treatment of carriers & diseased with wholesale treatment of community

لا تترك الانتقال
عن طريق
الجلد .



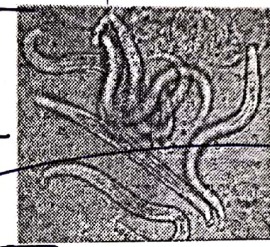
Strongyloides stercoralis

Size :

Ascaris } Hook worm } Strongyloids stercoralis

أبيض من ال hook

Adult worms	2 - 2.5mm, eggs laid in the tissues
Free living worms	Moist soil
Infective form	Filariform <u>larvae</u>
Mode of transmission	Penetration / autoinfection
Site of localization	Wall of Small intestine, mainly duodenum & jejunum



قاعدة

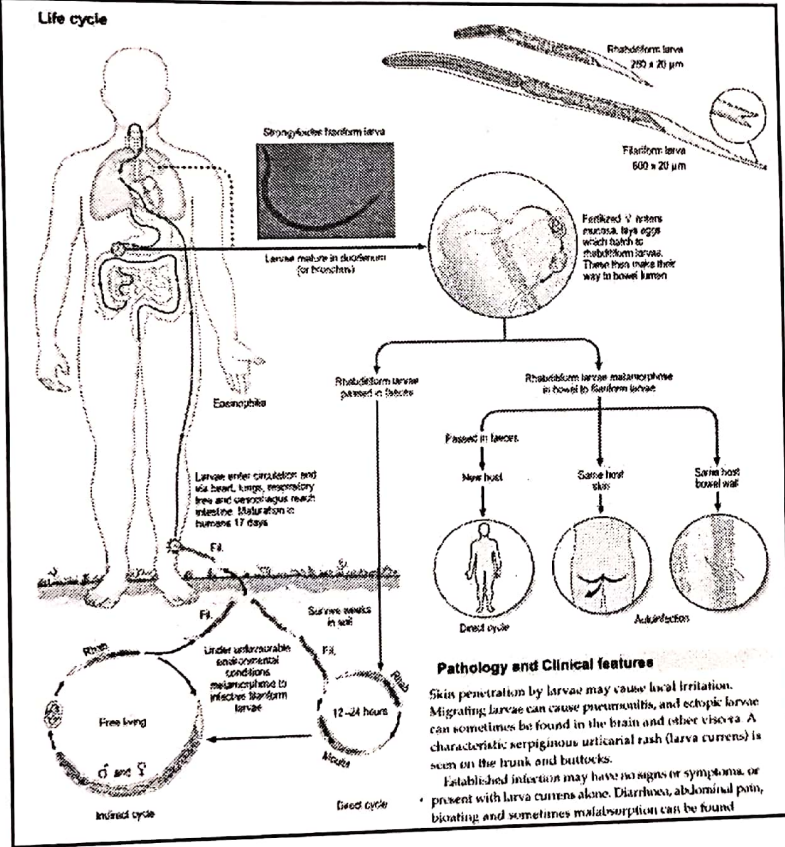
larvae
إذا الانتقال عن طريق ال penetration.

Egg → fecal-oral عن طريق ال

تفيس -

نفس
الأسكاريس

Life Cycle



① Eggs in food (contamination)

↓
Stomach

↓
Small intestine eggs
يحتمل ان
adult form لا تتحول
(Male & Female)

Mating
في رئة يبيستوا يحطوا
eggs
تخرج منهم رئة يطرحها stool
↓
Environment
Infection to other host

* ملاحظة: يمكن تتبوع من اسكاريس في هجوتة بال
lung migration الى ال
ومن lung يمكن تتبوع الى GIT عن طريق

Coughing up --- (نفس الخيطوات في قتل)

Pathogenicity

1. **Skin lesions** (2 types) – “larva currens”
 - ✓• At the site of entry – urticarial rash
 - ✓• In the perianal region – linear, erythematous urticarial wheal
2. **Pulmonary lesions** – due to migrating larva
 - ✓• Alveolar hemorrhages
 - ✓• Bronchopneumonia
3. **Intestinal lesions** – “burrowing lesions”
 - ✓• Epigastric pain
 - ✓• Diarrhoea with blood & mucus
 - ✓• Nausea
 - ✓• Weight loss

Laboratory Diagnosis

* In Ascaris & Hook worms

↳ Mostly we see the eggs (unlikely see the worms & larvae)

الفحص

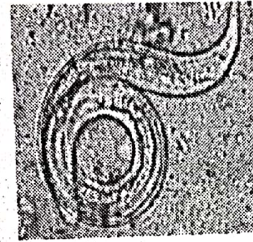
• Stool examination - rhabditiform larva

لورث و دودة

نمل

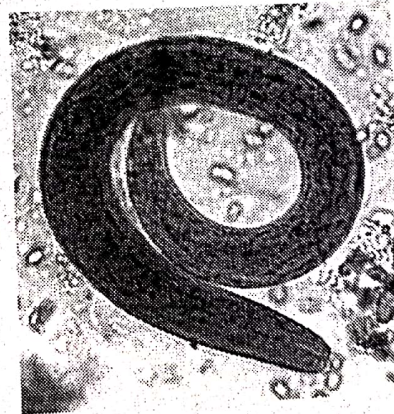
• Culture - larva

• ELISA - to detect Abs



* Strongyloidis stercoralis &

↳ We see the rhabditiform larvae.

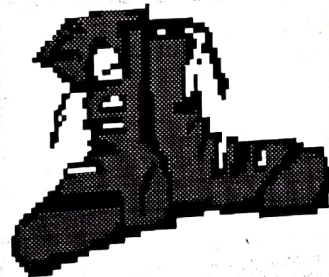


Treatment & Prevention

- Potentially life threatening disease – treat even if its asymptomatic

- Thiabendazole for 2 days

Disseminated strongyloidosis – 5 to 7 days.

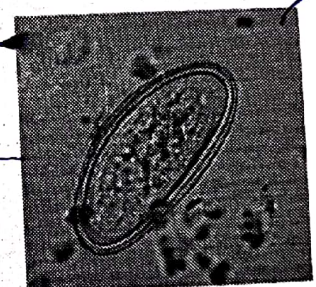


4. Enterobius vermicularis

(Pin Worm, Seatworm)

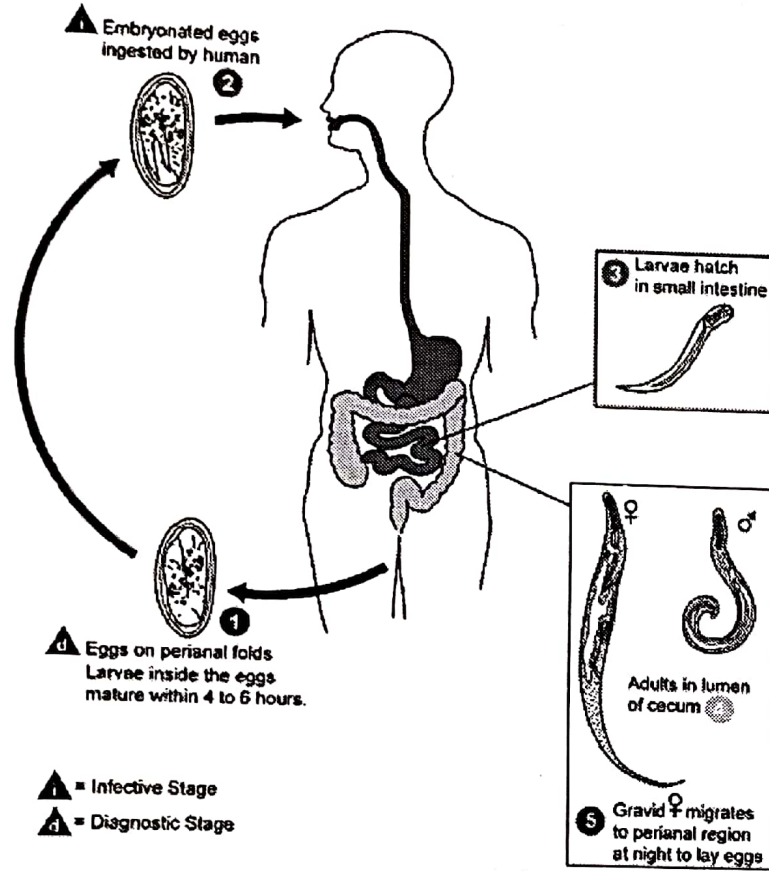
Pin worm →
 مثل الابره
 وحبها صغير

Adult worms	Male 2 - 5 mm Female 8 - 13 mm
Eggs	60 µm, non bile stained Plano-convex with coiled embryo
Infective form	Embryonated egg
Mode of transmission	Ingestion, Autoinfection
* Site of localization	Large intestine – caecum & appendix



convex
مستدي
(D-shaped)
الجزء الاخرى plan
& الجزء الاخرى convex

Life cycle



① Ingestion of eggs

↳ stomach
↳ ~~small~~ small intestine
↳ large intestine

تكون رح تفقس اليرقان (hatching)
وتعطي اليرقان
(Male & Female)

↓
ويعطون بيوتا mating
ويعطون Large num. of eggs

↓
تخرج بيوتهم بفتحة بال Intestine
& جرد يطرح مع ال stool على ال environment

إذا اكل الالهة فترق هو مقبولة منبع
رح يفسد contamination
وينتقل ال infection

XXX لا يمكن أن تحل ال worms ال lungs
(There is no extra-intestinal migration)

Clinical features

- Due to migration of worm - Perianal, perineal & vaginal itching (pruritis) worsens at night

صعوبة بالنوم

غير مرتاح بالنوم

- Insomnia and restlessness

- ✓ • Nocturnal enuresis → ببول لا إرادي

يحدث نتيجة كثرة ال
irritation in the
perianal area.

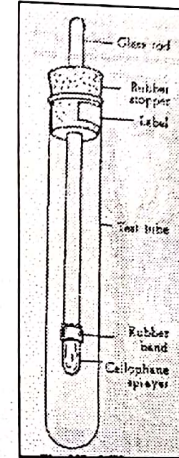
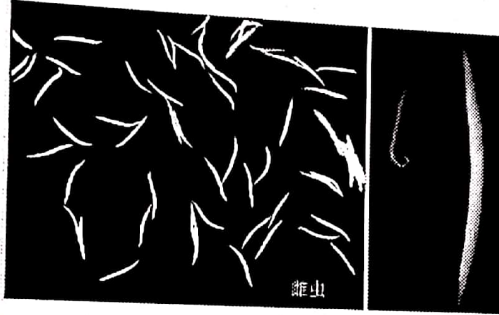
* حكيما إنه هاد النوع موجود بال
Large intestine ← ويكون قريب من ال
perianal area.

← عشان هيل بجهن ال Small worm رح
يسبحوا ويحاولوا يطلعوا عن طريق ال
perianal area لبرا

← فيحصل irritation بهي المنطقة يظهر على شكل

Laboratory Diagnosis & Treatment

- Detection of adult worms in-
 - Feces
 - Perianal region

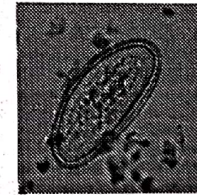
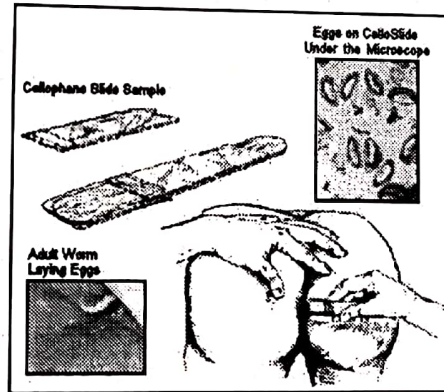


بتنحط على
perianal
area
وبتنترك
طول الليل

• **NIH swab** – scrapings from perianal region.

- Microscopy – non bile stained eggs

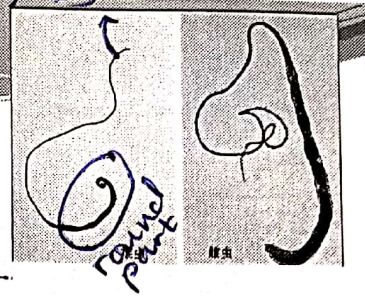
• Mebendazole, pyrantel pamoate



* هاد الجزء شكله بشبه شكل
السوط (whip)

5. Trichuris trichiura

(Whip Worm)



* Adult worm

30 – 50 mm

* Eggs

60 μ m, **bile stained**

* Barrel-shaped with Mucus plug
at each pole
Unsegmented ovum

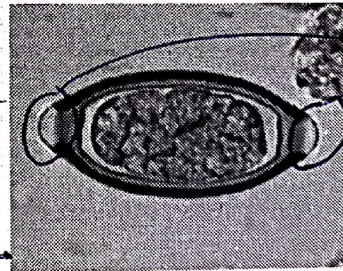
← هاد روح يخاليني
امينهم عن
ال Ascaris
← انظر الشكل

* Infective form

Mature embryonated eggs

* Mode of transmission

Ingestion



هدود عبارة عن
2 bulgs
لاحظ شكل مثل هينيه
الشاوي والقهوة (في يد على العين
و يد على اليسار)

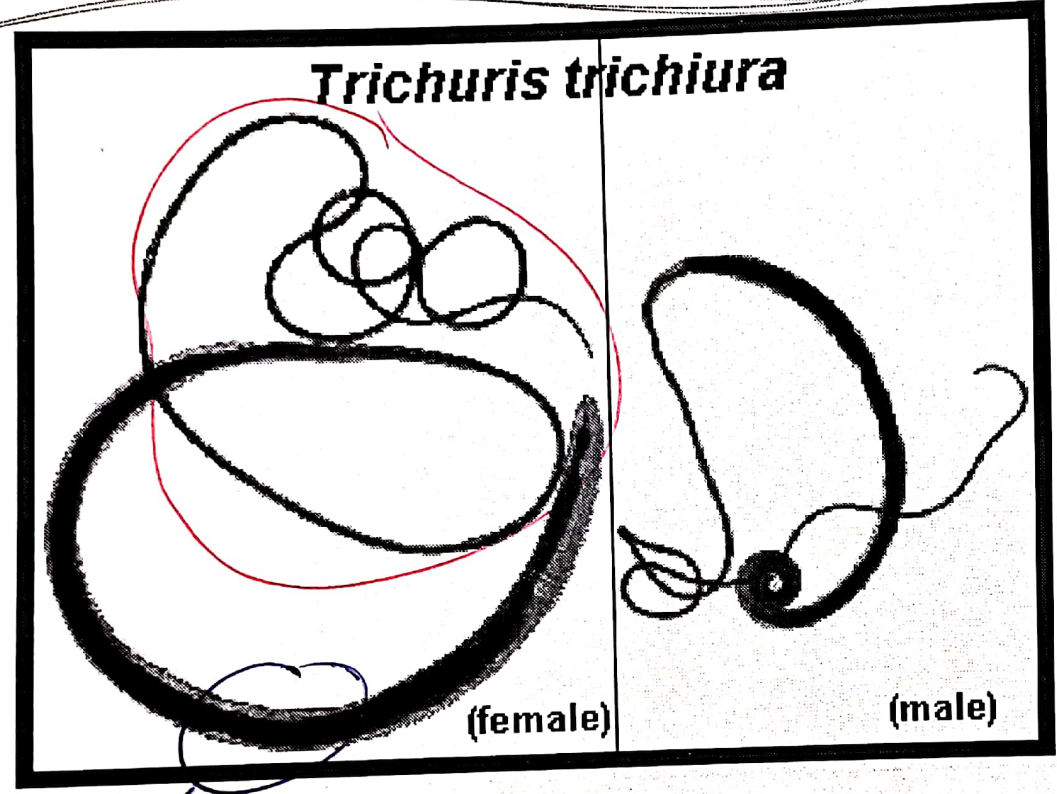
* Site of localization

Large intestine -
caecum

ذكر

الخصائص العامة

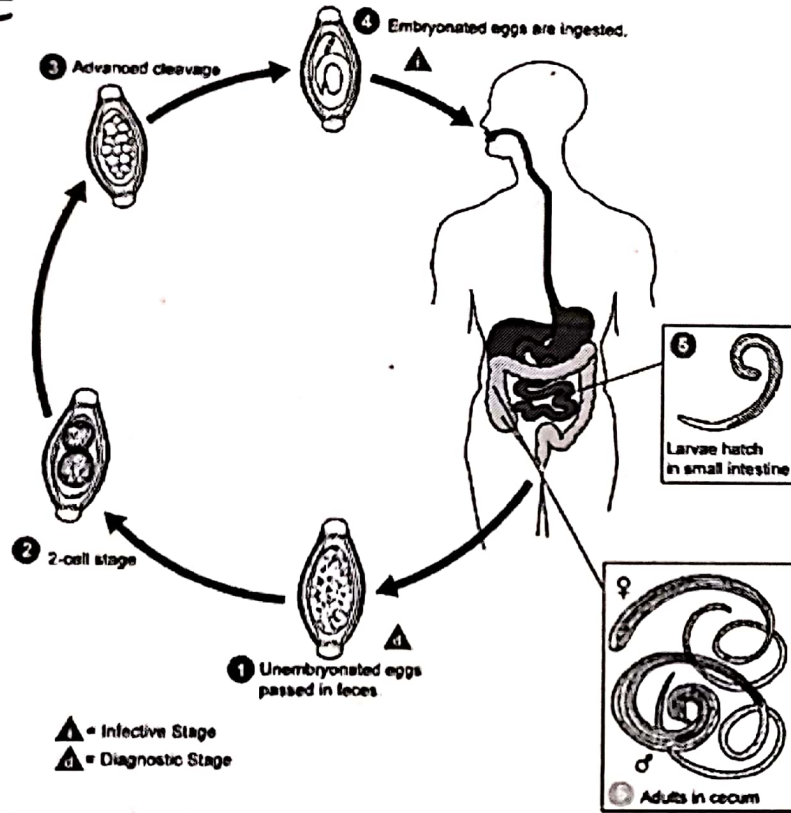
- ↳ Round
- ↳ cylindrical
- ↳ unsegmented
- ↳ Female > male
- ↳ vulvar waist in female
- ↳ The presence of whip لسوط



Trichuris trichiura adults.

← طراد الحزام الوسطي
عند ال
female.

Life cycle



① Ingestion of eggs

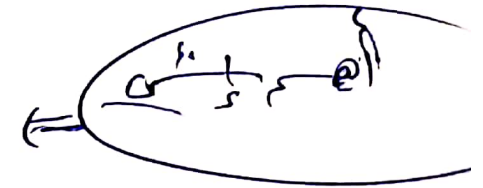
stomach
 small intestine
large intestine

هون بتفتس البيوض
 وبتحلي او adult
 (male & females)

كملو بجملا mating
 فبالكالي بهيروا ينتجوا بيوض

وجود بيوض
 مع ال feces
 على ال environment

جرد بتفتس
 وبتحل ينتج
 more male
 & female
 adults



لانها هاي الدورة بتسبب ال large intestine
 migration to the lungs

migration to the peri-anal area.
 لكن هكنا يفسر هي

②

نفس الحكي

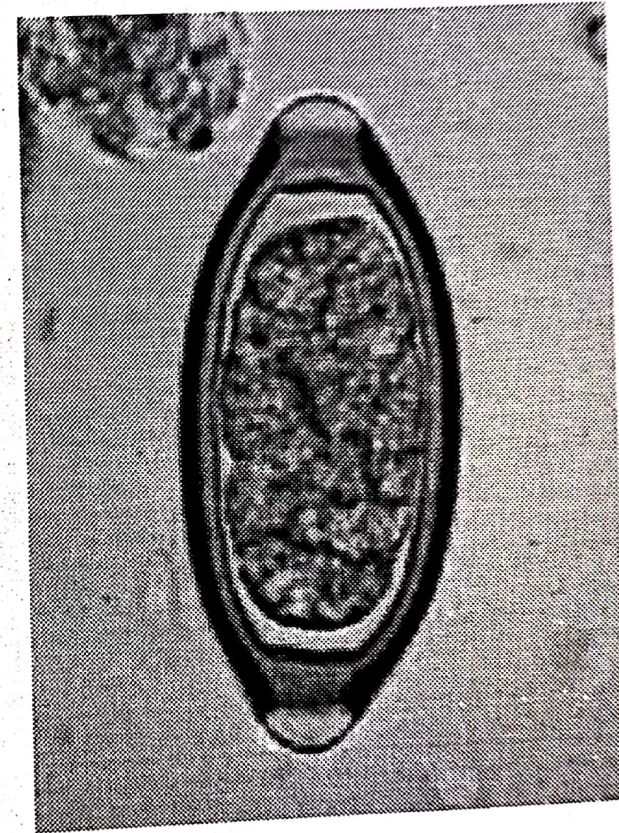
Clinical features

- Infection - Trichuriasis ^{المرص}
- Symptoms depend on worm burden
- ^{بالبداية} Less than 10 worms - asymptomatic
- Heavier infections -
 - ✓ 1. chronic **profuse mucus and bloody diarrhea** with **abdominal pains** and edematous rectum
 - ✓ 2. malnutrition, **weight loss** and anemia

كل ما زاد العدد
بتزيد الاعراض

Laboratory diagnosis & Treatment

- Stool examination – bile stained eggs with bipolar mucus plugs
- Treatment – albendazole / mebendazole
- Prevention –
 - Proper disposal of night soil
 - Prevention of consumption of uncooked vegetables & fruits .



Key to the diagnosis of Intestinal Nematodes

