
Intestinal nematodes

Trichuris trichuria

Enterobius vermicularis

Strongyloides stercoralis

Common features

- Present in intestine :
 - T.trichuria – caecum & appendix
 - E.vermicularis – caecum & ascending colon
 - S.stercoralis - jejunum

- Developmental cycle involves single host only
- No intermediate host required

- Differ in nature of egg laying –
 - T.trichuria – egg containing unsegmented ovum which develop in soil
 - E.vermicularis – egg containing lava which hatches out
 - S.stercoralis – larvae in faeces

Trichuris trichuria

Common name : whip worm

Epidemiology

- Worm was discovered by Linnaeus – 1771
 - Morphology of worm resembles whip
 - Lives in large intestine of man –
 - caecum & appendix
 - Distributed world wide –
 - mainly seen in tropical & subtropical countries
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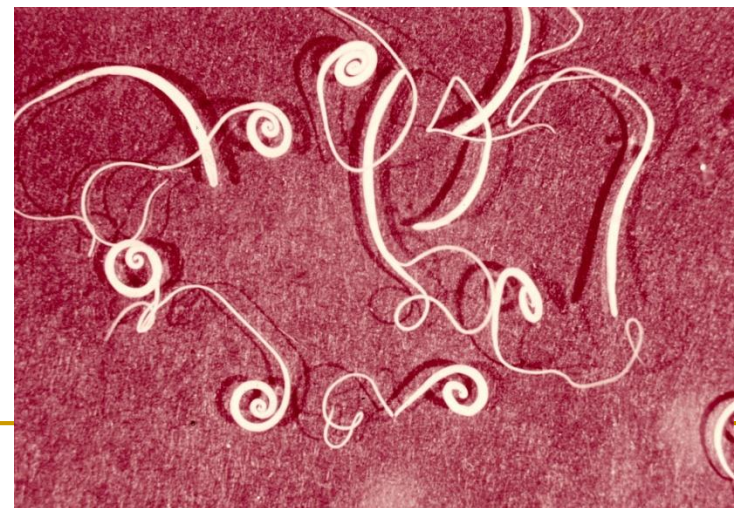
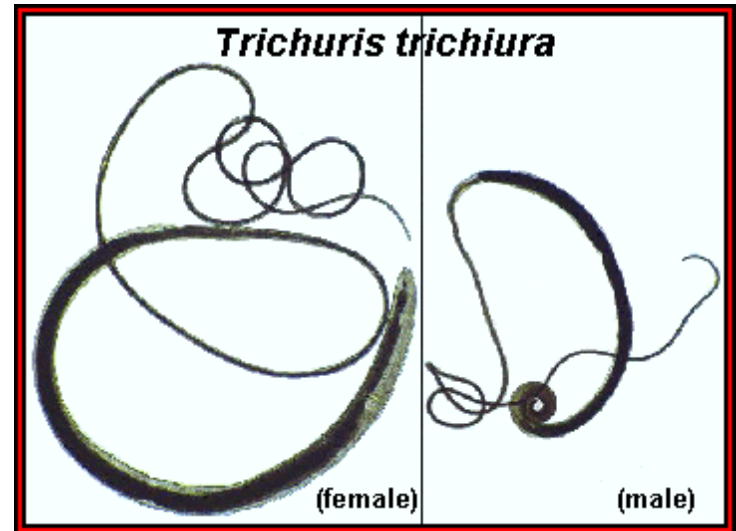
Morphology

- Anterior - 3/5th is thin & hair like
- Posterior - 2/5th is thick resembling handle of a whip
- Anterior – lies embedded in mucosa, contains capillary esophagus
- Posterior – intestine & reproductive organs, hangs free in lumen



Morphology

- White, semitransparent cylindrical
- Male :
 - Smaller than female
 - 3 to 4 cm L
 - Posterior end is coiled ventrally & sharp
- Female :
 - 4 to 5 cm L
 - Posterior end is straight, blunt & rounded
- Life span : up to 10 years

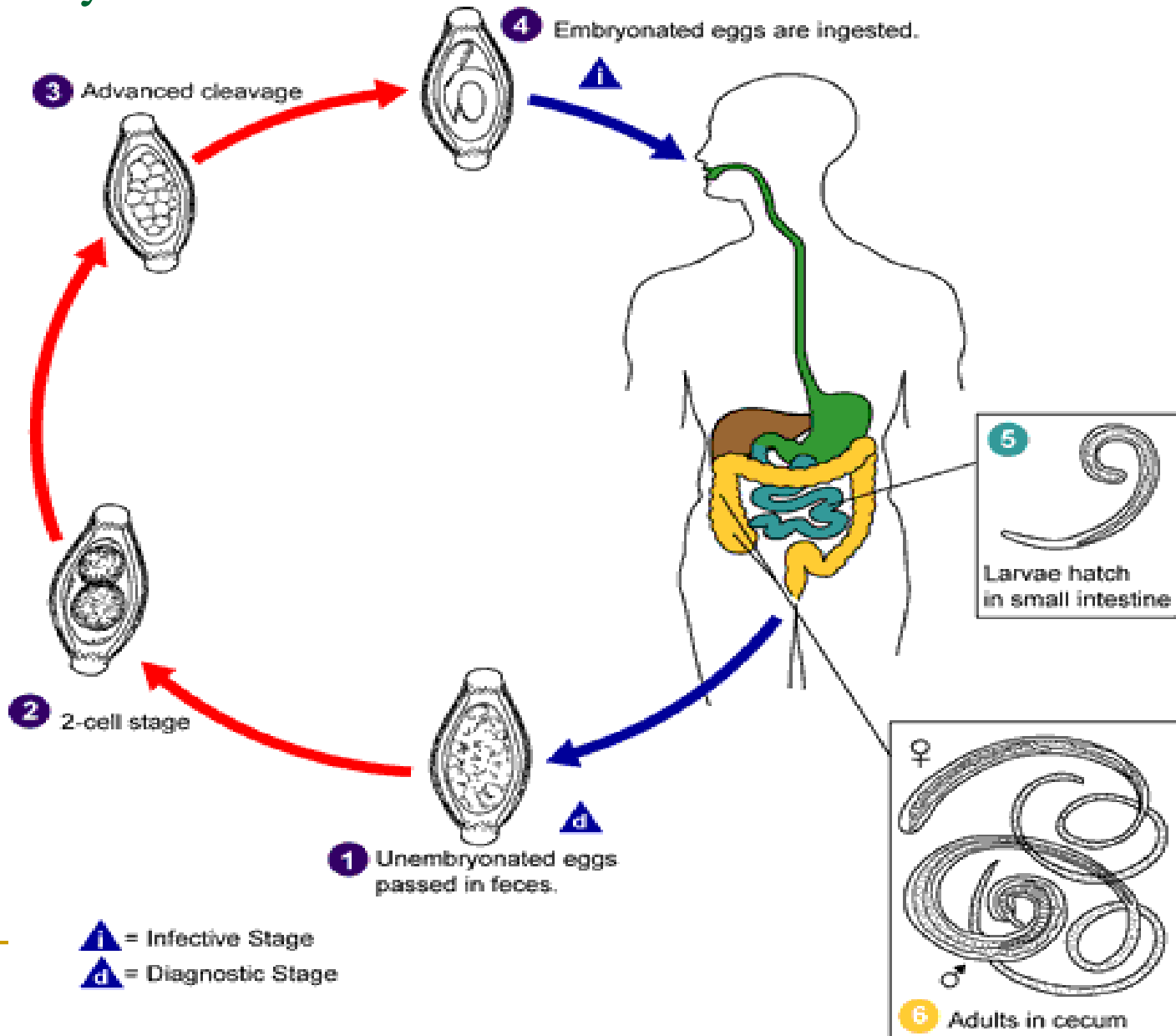


Eggs

- Yellowish brown (Bile stained)
- Double shell
- $50\ \mu \times 25\ \mu$
- Barrel shaped with projecting mucus plug at both poles
- Contains central granular mass (unsegmented ovum)
- Floats in saturated salt solution



Life cycle



Life cycle

- Adult worm living in large intestine produce eggs
 - Each female lays 2000 – 5000 eggs / day
 - Freshly passed eggs – non-infective
 - Eggs develop in warm, moist soil
 - Produce rhabditiform larva in 3 – 4 weeks
 - Eggs containing larva are infective
 - Mode of infection : ingestion
 - After ingestion eggs hatch larvae in small intestine
 - After about week, larvae migrate to large intestine where they develop into adult worms
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Clinical syndromes

- Most infections are *light & asymptomatic*
 - *Heavy infection* – abdominal pain, distension, bloody diarrhea & loss of weight
 - *Appendicitis* may occur if lumen is blocked by worm
 - *Prolapse of rectum* – has occurred in children due to irritation and straining at defecation
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Laboratory diagnosis

- Stool examination
 - Direct wet mount examination
 - Examination after concentration technique



Enterobius vermicularis

Common name : pin worm or thread worm or seat worm

Epidemiology

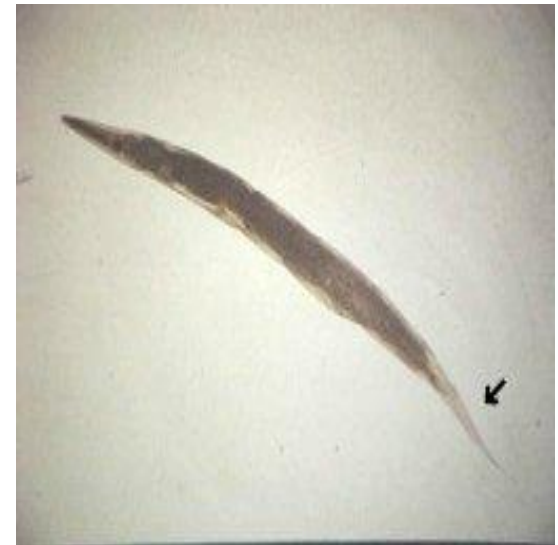
- Cosmopolitan - more prevalent in temperate countries
 - > 1 billion people are infected world wide
 - Incidence is high in children of 5 to 6 years, Adults are less affected
 - The life cycle was worked out by Leuckart in 1865
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Habitat

- Adult worm –remain attached to mucosa of caecum & appendix
 - Sometimes may be found in ascending colon and ileum
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Morphology

- Small, white & cylindrical worm resembles thread
- Pointed at either end
- No buccal capsule
- 3 lips around mouth present



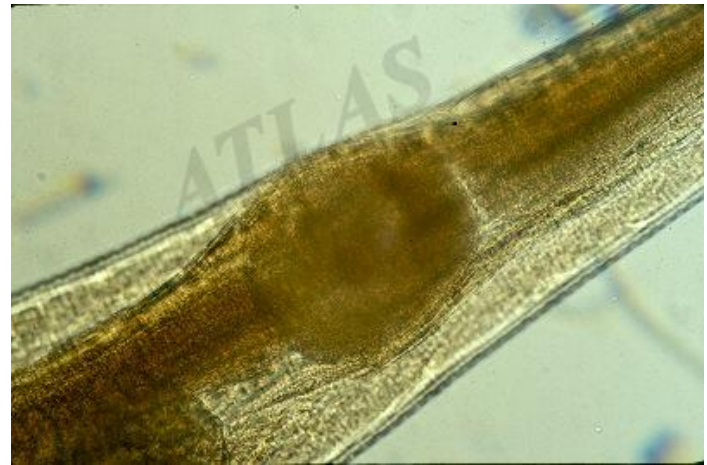
Morphology

- Male :
 - 2-5 mm × 0.1-0.2 mm
 - Posteriorly - tightly curved & carries copulatory bursa
 - Dies after fertilization
- Female :
 - 8-12 mm × 0.3-0.5 mm
 - Posteriorly – straight & drawn into a long tapering thin pointed pin like tail
 - Vulva is situated midventrally
 - Life span : short up to 6 months



Characteristics of worm

- Mouth surrounded by cuticular expansion – ***cervical alae***
- ***Double bulb esophagus*** as a result of expansion of posterior end

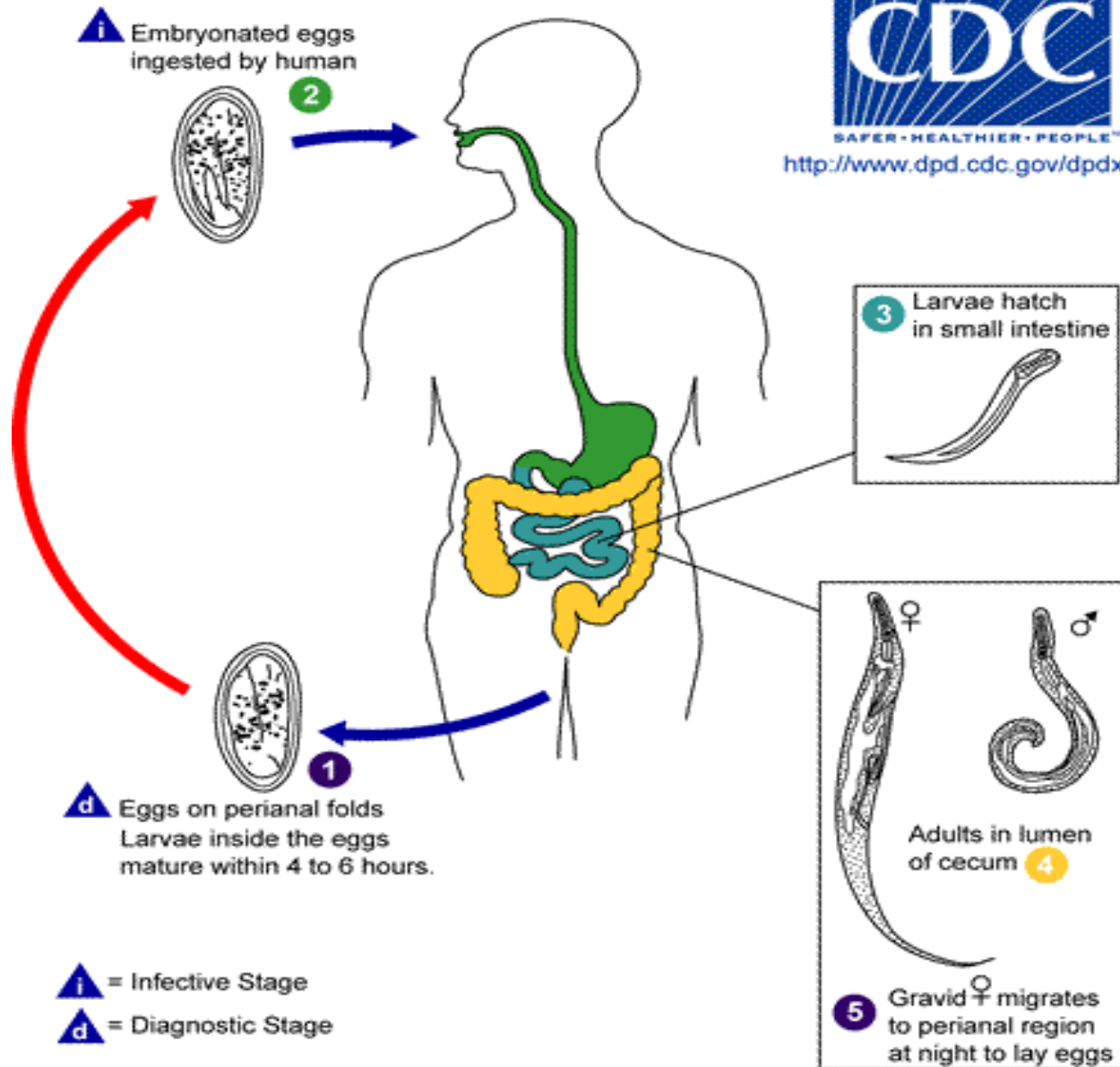


Eggs

- Colorless (Not bile stained) with a clear shell (double shell)
- Shape : Plano convex
- Size : $55 \mu \times 30 \mu$
- Contains a coiled tadpole like larva
- Floats in saturated salt solution



Life cycle



Autoinfection

- Eggs deposited in perianal & perineal area causes intense itching,
↓
 - Leading to scraping of area by fingers -
↓
 - Fingers contaminated with eggs(nail bed)
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 - Lack of hygiene leading to autoinfection
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Retrograde infection

- Sometimes, eggs deposited on perianal area hatches out larvae, which enters body through anus reaching to large intestine causing retrograde infection
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Clinical syndrome

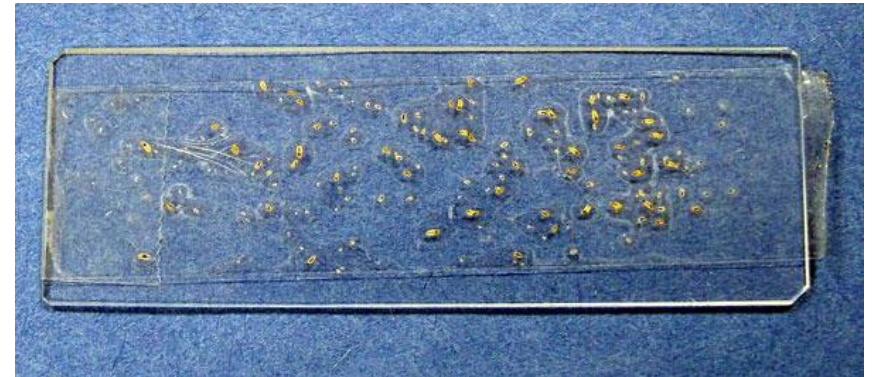
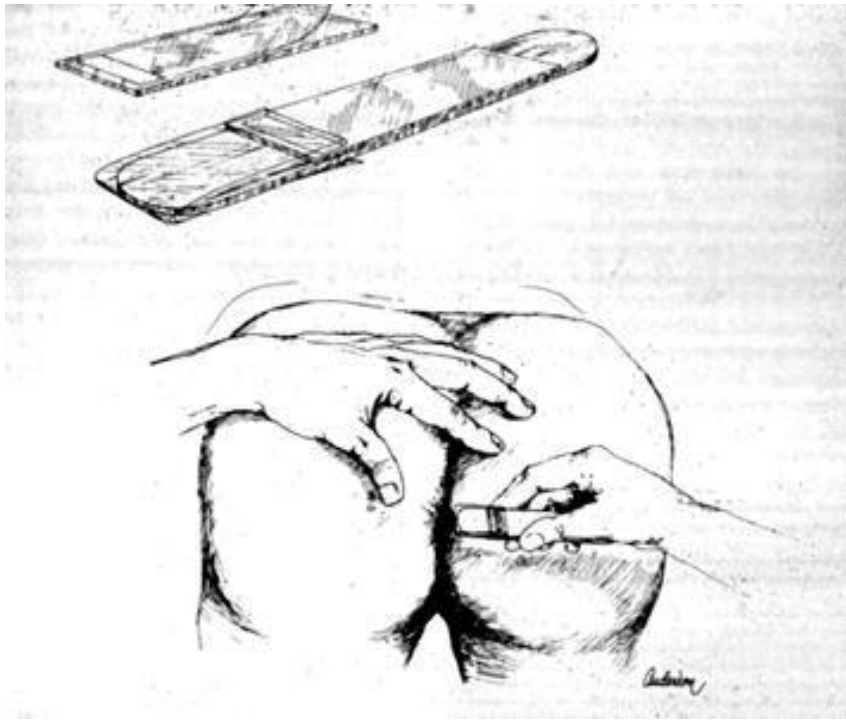
- About 1/3rd of infections are – *Asymptomatic*
 - *Pruritus ani* – in children
 - Worm is also found in appendix causing *appendicitis* in few cases
 - Worm may migrate to ectopic sites like female genital tract causing *vaginitis*
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Laboratory diagnosis

- As eggs are rarely found in faeces, stool examination has got limited role
 - Only in heavy infection – eggs will be present
 - Adult female worms may be found in faeces

 - Collection of sample from perianal area :
 - Cellophane tape test
 - **NIH Swab**
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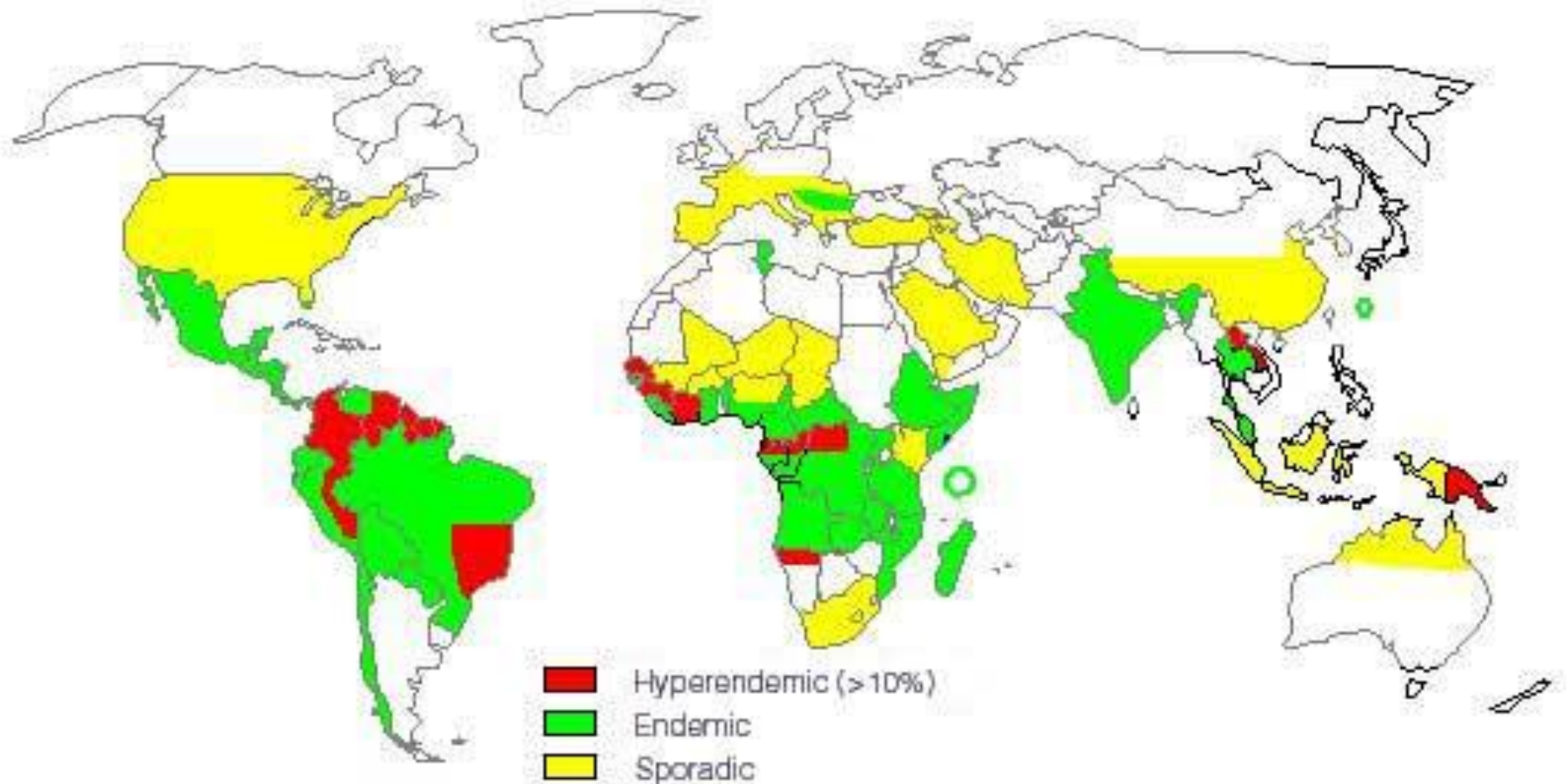
Cellophane tape preparation



Strongyloides stercoralis

Geographical distribution

- Prevalent in tropical and subtropical areas
- More than 5 crore people are affected world wide
- Also prevalent in India



Morphology

- 2 forms are seen : Adult & Larval
 - Adult :
 - Existence of adult male – doubtful
 - Not isolated from stool specimen
 - Main role is to fertilize female
 - Dies after fertilizing female
 - Females – parthenogenetic
 - Minute females live within mucosal epithelium
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Adult female

- Size : 2.5 mm L × 0.05 mm B
- Alimentary canal
 - Mouth has got 3 lips
 - Cylindrical esophagus – in anterior 1/3rd of body
 - Intestine – posterior 2/3rd of body
 - Posterior end is pointed
 - Anus opens midventrally
- Urogenital system
 - Vulva – at junction of middle & posterior thirds of body
 - Eggs are arranged antero-posteriorly in uterus
 - Worms is ovo-viviparous



Eggs

- Present in body
 - $55\ \mu \times 30\ \mu$
 - Transparent & oval
 - Have a thin egg shell
 - Contain larva ready to hatch
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Larvae

- Rhabditiform larva :
 - ❑ 200-250 μ \times 16 μ
 - ❑ Possess a short mouth & double bulb esophagus
 - ❑ May metamorphose within lumen to filariform larva & cause autoinfection
 - ❑ When voided in faeces, undergo development in soil



- Filariform larva :
 - ❑ Longer & slender than rhabditiform larva
 - ❑ 500-600 μ \times 20 μ
 - ❑ Possess short mouth & cylindrical esophagus
 - ❑ Infective form
 - ❑ Enters body by penetrating skin



Life cycle

- Adult female residing in mucosa of small intestine produce eggs
 - Eggs immediately hatch out in lumen to rhabditiform larva
 - Rhabditiform larva passed in stool, transform into filariform larva
 - Filariform larva is infective form enters body by penetration of skin
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- Indirect development :

- Rhabditiform larva in soil develop into free living forms – male & female
 - After mating, female produce eggs which hatch to release next generation first stage rhabditiform larvae in soil
 - Either continue life cycle in similar manner or some of larva develop into filariform larva
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i = Infective Stage
d = Diagnostic Stage

6 Infective filariform larvae penetrate the intact skin initiating the infection.

7 The filariform larvae enter the circulatory system, are transported to the lungs, and penetrate the alveolar spaces. They are carried to the trachea and pharynx, swallowed, and reach the small intestine where they become adults.

8 Adult female worm in the intestine.

10 Autoinfection: Rhabditiform larvae in large intestine, become filariform larvae, penetrate intestinal mucosa or perianal skin, and follow the normal infective cycle.

9 Eggs deposited in intestinal mucosa, hatch, and migrate to lumen.

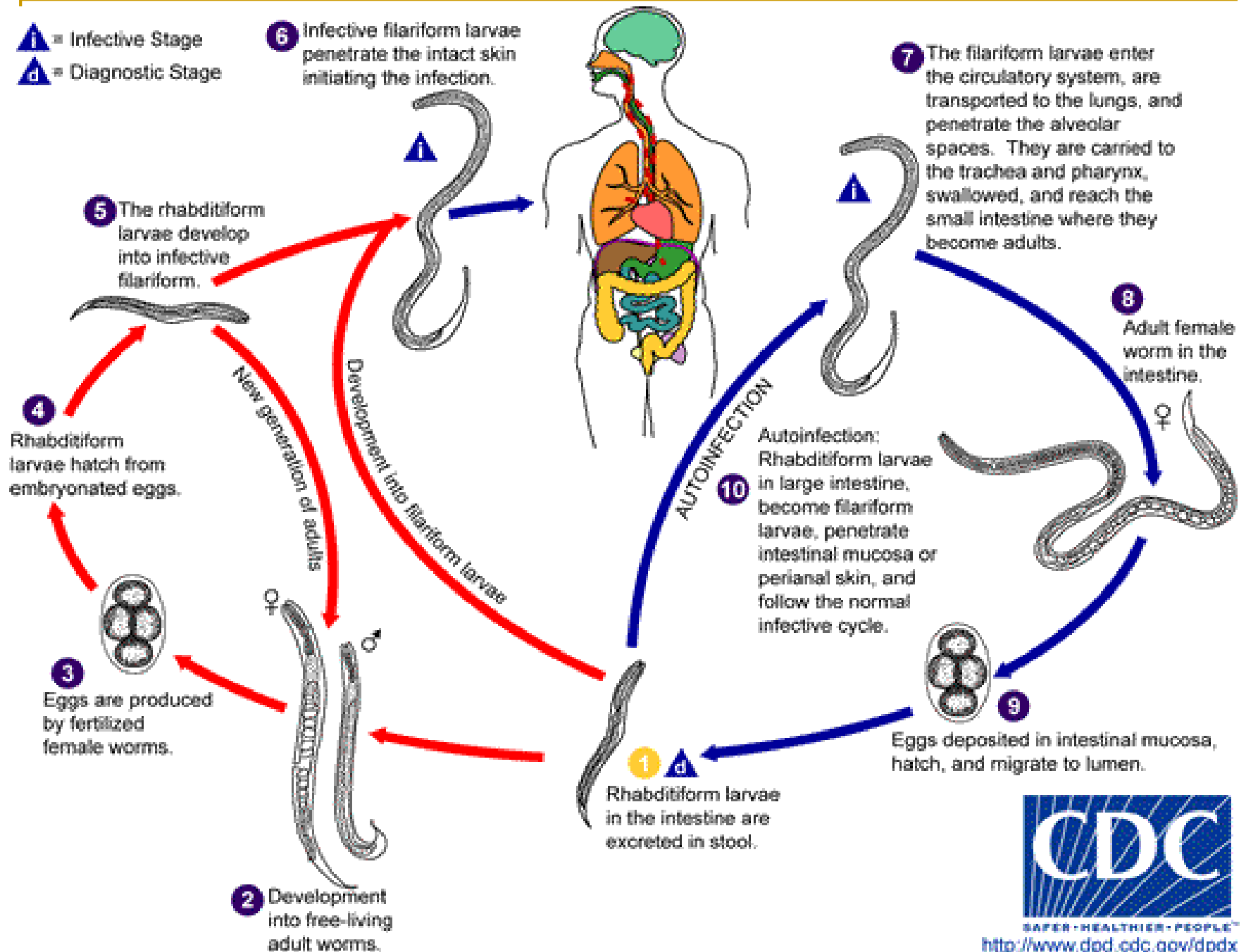
1 **d** Rhabditiform larvae in the intestine are excreted in stool.

2 Development into free-living adult worms.

3 Eggs are produced by fertilized female worms.

4 Rhabditiform larvae hatch from embryonated eggs.

5 The rhabditiform larvae develop into infective filariform.



Clinical syndrome

- In immunocompetent persons :
 - *Ground itch* : at penetration site larvae may cause intense itching leading to dermatitis
 - *Larva migrans or currens*
 - *Pneumonitis*
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Larva currens

Causative agent : filariform larva of *S.stercoralis*

- ❑ **Site : buttocks, trunk or groin**
- ❑ **With repeated infection, patient develop immune response that will prevent larvae from completing life cycle**
- ❑ **Larva may be limited to skin migration causing larva migrans or larva currens**
- ❑ **Rapidly progressing linear or serpiginous urticarial rashes**
- ❑ **Movement of larva is very fast – 10 cm / hour**



Immunocompromised person

- The condition is called as “*Hyper infection syndrome*”
 - Rapid multiplication of parasite within intestine with subsequent invasion of intestinal wall
 - Disseminated form of strongyloidiasis with larvae of all stages in all organs of body – lungs, CNS, heart & liver
 - Life threatening condition – if untreated it is fatal
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Laboratory diagnosis

- Direct evidence :
 - Microscopy
 - Direct wet mount of stool
 - Duodenal aspiration
 - Concentration method of stool
 - Formol-ether technique
 - Indirect evidence :
 - Serological test
 - ELISA, Immunoblot – for antibody detection
 - Blood examination - Eosinophilia
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Thankyou

