

Strongyloides stercoralis

Epidemiology

S. stercoralis is thought to have infected 30-100 million people in 70
.different countries

Infection mainly occurs in tropical and subtropical areas but pockets of
.infection exist in the USA and several areas of Western Europe

Infection is commonly associated with rural areas, institutions and
.unsanitary conditions

The prevalence of the infection is reported to be over 80% in some areas,
eg. Rural Argentina

- **Life cycle**

- o 2 types of life cycles exist:

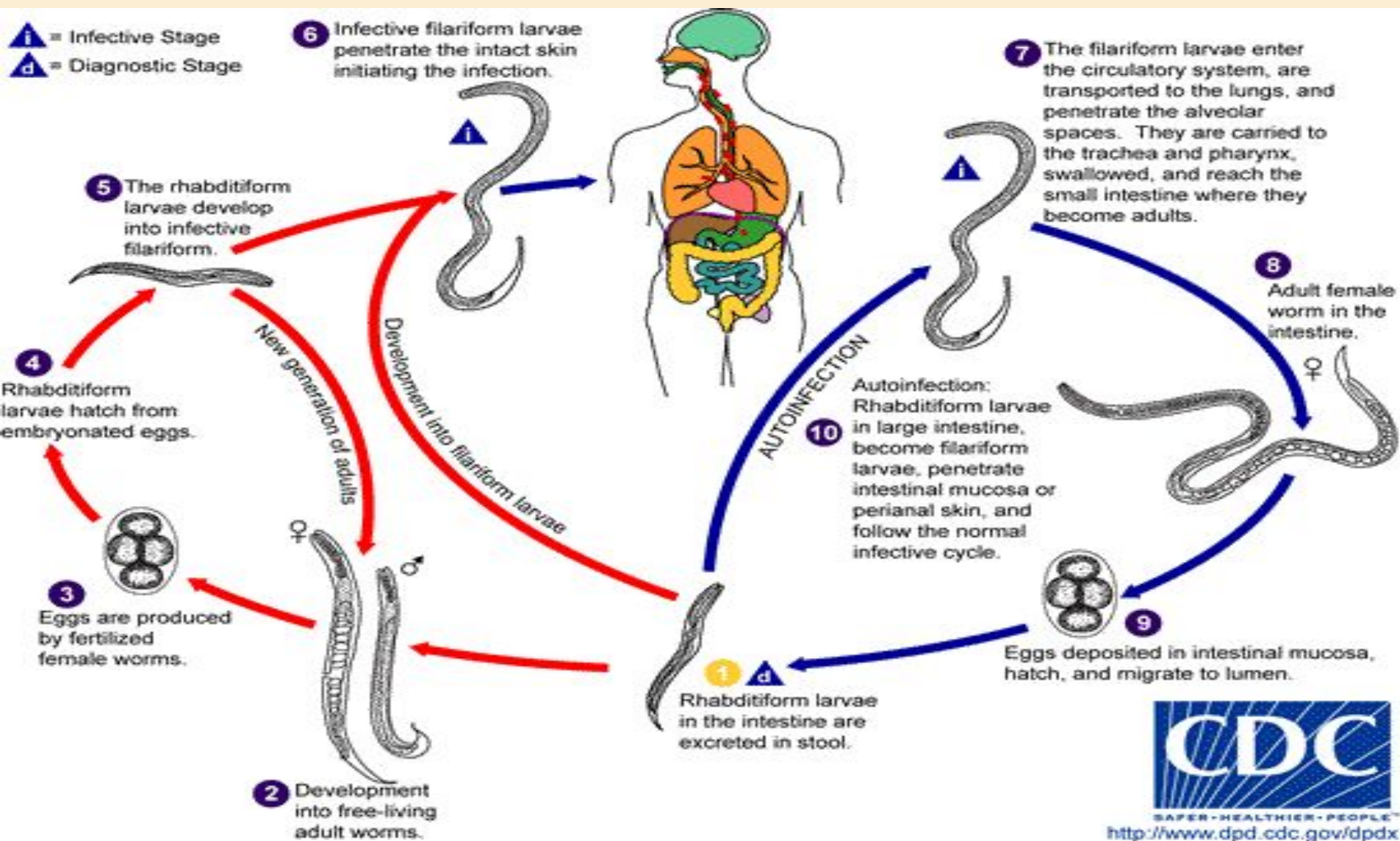
- **Free-living cycle:**

- Starts at step 1 and travels the red routes. They can either, molt twice and become infective larvae (step 6) or they can molt four times and become free-living adults (step 2). From step 2 they can continue to develop more free-living adults or can become infective larvae (step 6).

- **Parasitic cycle:**

- Starts at step 6 and goes through steps 7-9. This cycle is the blue arrows. In this cycle the parasite can cause autoinfection (as seen in step 10).

i = Infective Stage
d = Diagnostic Stage





- **Clinical signs:**

- Frequently asymptomatic, but can have some GI symptoms including abdominal pain and diarrhea.
- Pulmonary symptoms (including Loeffler's Syndrome) can occur when the larvae are migrating through the pulmonary system
- Dermatologic (skin disease): urticarial rashes in the buttocks and waist area
- When disseminated disease occurs (immunosuppressed patients) – abdominal pain, distension, shock, pulmonary and neurologic complications and septicemia, can be fatal
- Blood eosinophilia present in acute and chronic stages, but absent in dissemination.

:Disease State ●

Because of its ability to persist and replicate within its host for decades without showing any signs or symptoms of infection, this parasite can cause life-threatening infection ●

Hyperinfection Syndrome – This is an acceleration of the normal life cycle of this parasite, leading to excessive worm burden (but it remains within in its normal area of infection (GI tract and lungs) ●

Disseminated Strongyloidiasis ●

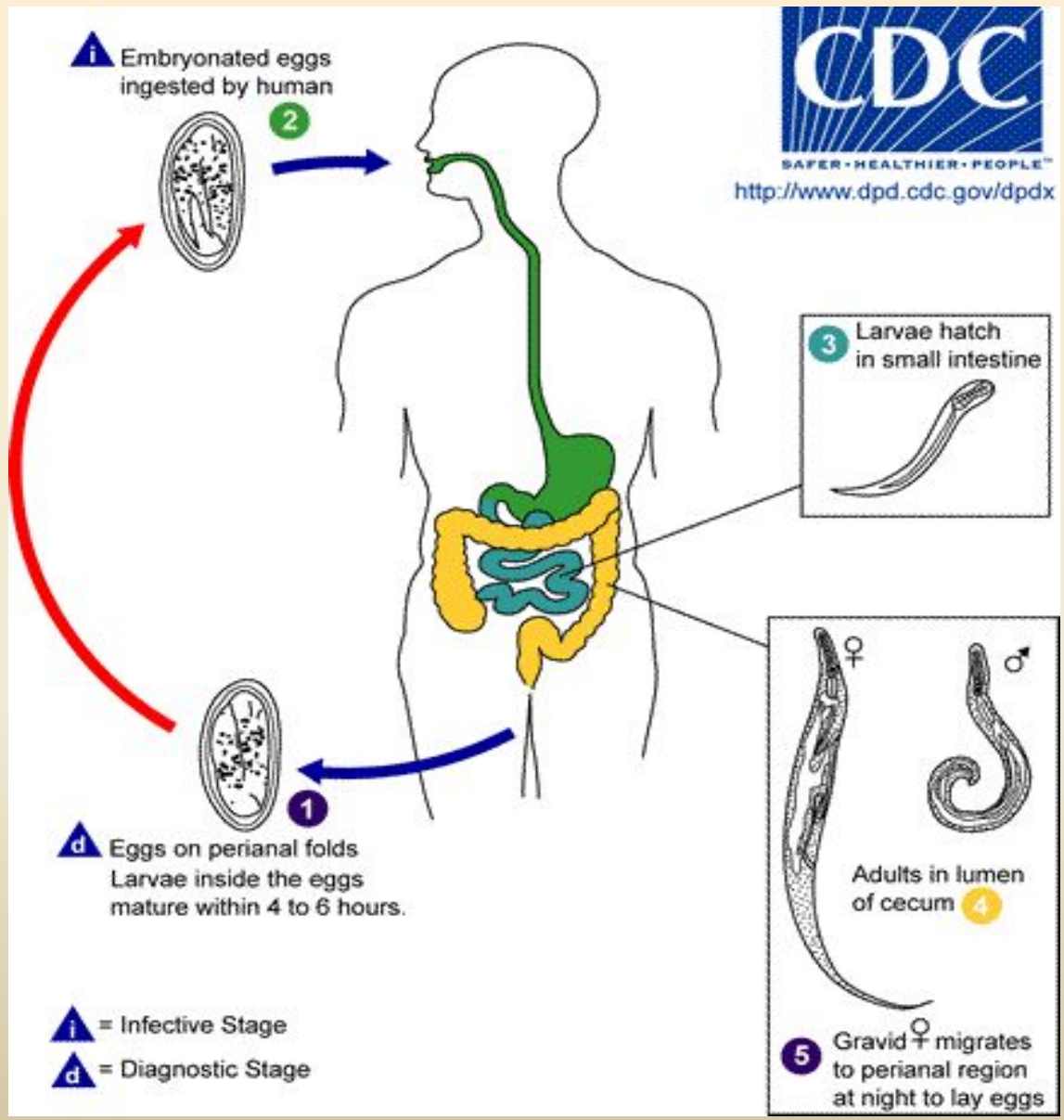
This is widespread dissemination of larvae to extraintestinal organs - (CNS, heart, urinary tract, endocrine organs), which are outside of the parasite's normal life cycle. If it is severe enough it can lead to polychromatophilic erythrocytosis and occasionally meningitis ●

- - **Diagnosis:**
- Microscopic identification of the larvae (rhabditiform, egg and filariform) in the stool or duodenal fluid. However, stool examination is relatively insensitive.
- Larvae may be detected in the sputum from patients with disseminated strongyloidiasis
- - **Management:**
- All patients who are at risk of disseminated strongyloidiasis should be treated
- for uncomplicated strongyloidiasis:
 - Ivermectin:
 - Adults and Pediatrics: 200mcg/kg/d PO x 2d
- Alternative Regimen:
 - Albendazole
 - Adults and Pediatrics: 400mg PO BID x 7-14 d

Enterobius vermicularis

- pinworms – small worms that infect the small intestines
- A second species *Enterobius gregorii* has been reported in Europe, Africa, and Asia (morphology, clinical presentation, and treatment of *E. gregorii* is identical to *E. vermicularis*).
- **Epidemiology**
- Most common worm infection in the U.S.
- Humans are considered to be the only host
- Most common in children under 18, in people who care for infected children, and in people who are institutionalized. Prevalence in these groups can reach 50%.
- Transmission is via person-to-person or by touching bedding, food, or other items contaminated with eggs. Typically, children unknowingly touch pinworm eggs, put their fingers into their mouths, swallow the eggs, and the eggs hatch in the small intestine. The worms mature in the colon. Female worms move into the anal area (mostly at night) and deposit more eggs. This causes itching. If scratched, the eggs can get under the fingernails and are easily spread to other people or items.





● Clinical Presentation

- Intense itching around the anus
- Irritated skin around the anus due to scratching
- Difficulty sleeping due to itching that occurs at night
- Irritability due to itching and interrupted sleep
- Irritation/discomfort of the vagina (if a worm enters vagina instead of anus)
- Loss of appetite and weight (uncommon, but occurs in severe infections)

Diagnosis

Pinworms can be seen in the anal area (especially at night)

Tape test – This test should be done in the morning before using the toilet or bathing. Press transparent tape against the skin around the anus and remove.

.Look for eggs under a microscope

Inspection of the fingernails may also be useful if the person has been

.scratching the anal area

.

● **Management**

- Infection is fully treatable.
- Mebendazole or albendazole (1st choice) or pyrantel (2nd choice) in a single dose – kills the pinworms but not the eggs. Repeat single dose treatment again in 2 weeks (to kill pinworms that hatched since the first treatment).
- More than one household member is likely infected, so the entire household is often treated.
- For egg control: clean toilet seats daily, keep fingernails short and clean, wash bed linens twice a week, and wash hands before meals and after using the toilet.
- Avoid scratching the area around the anus. Keep hands away from nose and mouth unless they are freshly washed.



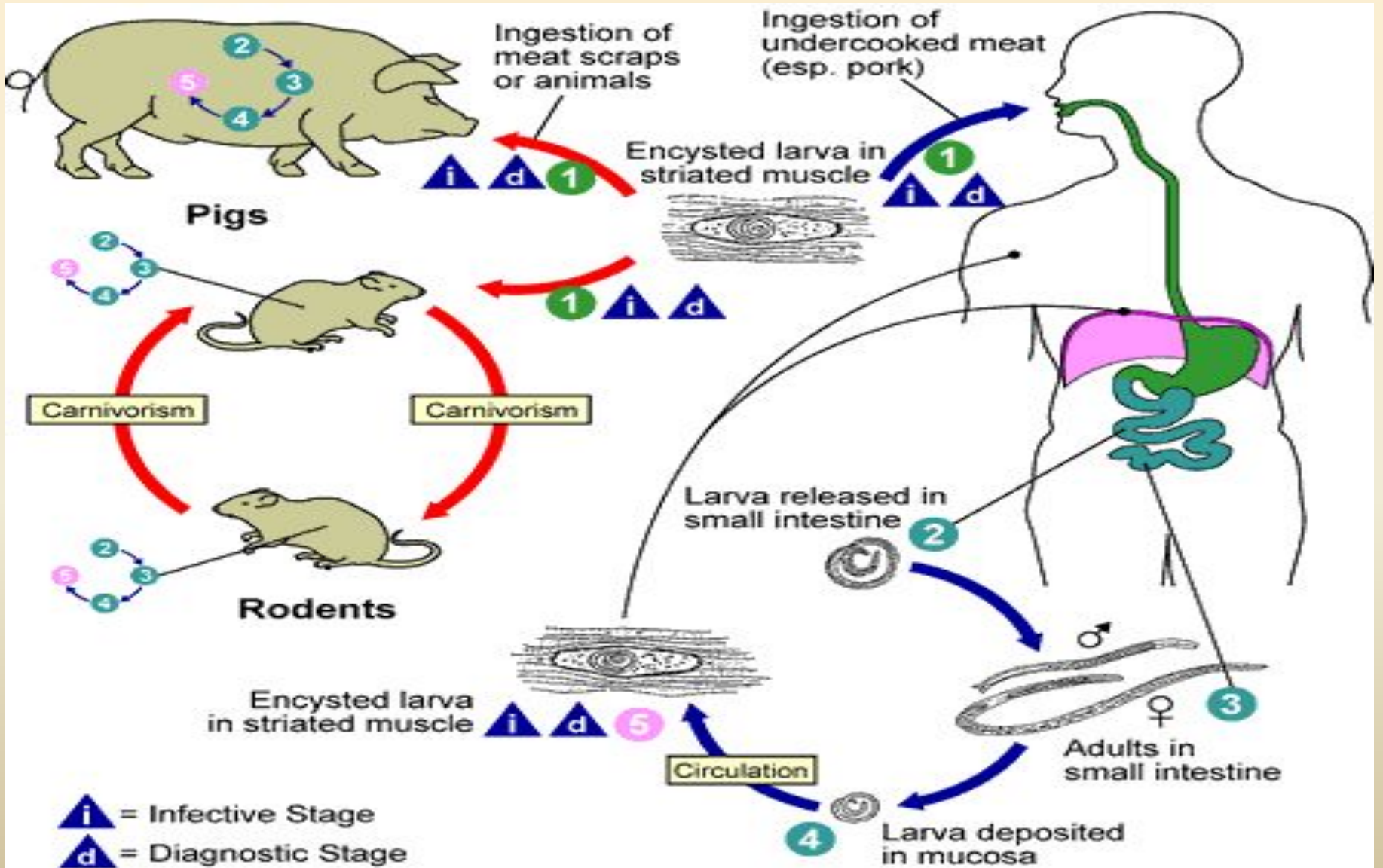
● *Trichinella* species

● **Epidemiology**

- The *Trichinella* species are responsible for causing a parasitic infection known as “Trichinellosis” or “Trichinosis” in humans.
- This infection is associated with consuming raw or undercooked meat infected by cysts of one of the various *Trichinella* species.
- A frequent source of this meat is from domestic pigs, where *Trichinella spiralis* is most commonly found.
- *T. spiralis* exhibits a worldwide distribution, whereas other species are limited in their geography.
- Infections are found in approximately 55 countries throughout the world where an estimated 10,000 cases of Trichinellosis occurs every year, with a death rate of 0.2%.

● Life cycle

- Trichinellosis is acquired by ingesting meat containing encysted larva of *Trichinella*.
- After exposure to gastric acid and pepsin, the larvae are released from the cysts and invade the small bowel mucosa where they develop into adult worms (female 2.2 mm in length, males 1.2 mm; life span in the small bowel: 4 weeks).
- After 1 week, the females release **larvae** that migrate to the striated muscles where they encyst (with the exception of *Trichinella pseudospiralis*.) Encystment is completed in 4 to 5 weeks and the encysted larvae may remain viable for several years.
- Ingestion of the encysted larvae completes the cycle. Rats and rodents are primarily responsible for maintaining the endemicity of this infection. Carnivorous/omnivorous animals, such as pigs or bears, feed on infected rodents or meat from other animals.



● **Clinical Presentation**

- - Trichinellosis presents initially with nonspecific signs such as uneasiness, headache, fever, chills, and occasionally gastrointestinal disorders. The fever usually persists for 1 to 3 weeks, depending on disease severity.
- - Gastrointestinal symptoms such as nausea, diarrhea, abdominal pain, and vomiting occur 1-2 weeks after consumption.
- - The second phase of infection occurs 2 weeks after eating and can last up to 8 weeks. The characteristic symptoms of the second phase include headaches, fevers, fatigue, chills, cough, eye swelling, aching joints, muscle pain, itchy skin, diarrhea, and constipation.
- - Occasional complications of the acute stage of Trichinellosis include myocarditis, thromboembolic disease, and encephalitis.
- - A severe infection may cause uncoordinated movements, heart/breathing problems, and rarely death. Mild to moderate infections symptoms last a few months.



● Disease State

- Trichinellosis can be divided into two phases:
- the intestinal/enteral phase and the muscular/parenteral phase. The larvae are released into the intestinal mucosa, which subsequently migrate to the blood vessels and spread throughout the body until reaching cells of striated skeletal muscle. The migrating *Trichinella* larvae and their metabolites provoke an immediate reaction, which causes immunological, pathological, and metabolic disturbances and the various clinical phenomena observed during the acute stage of the infection.

● **Diagnosis**

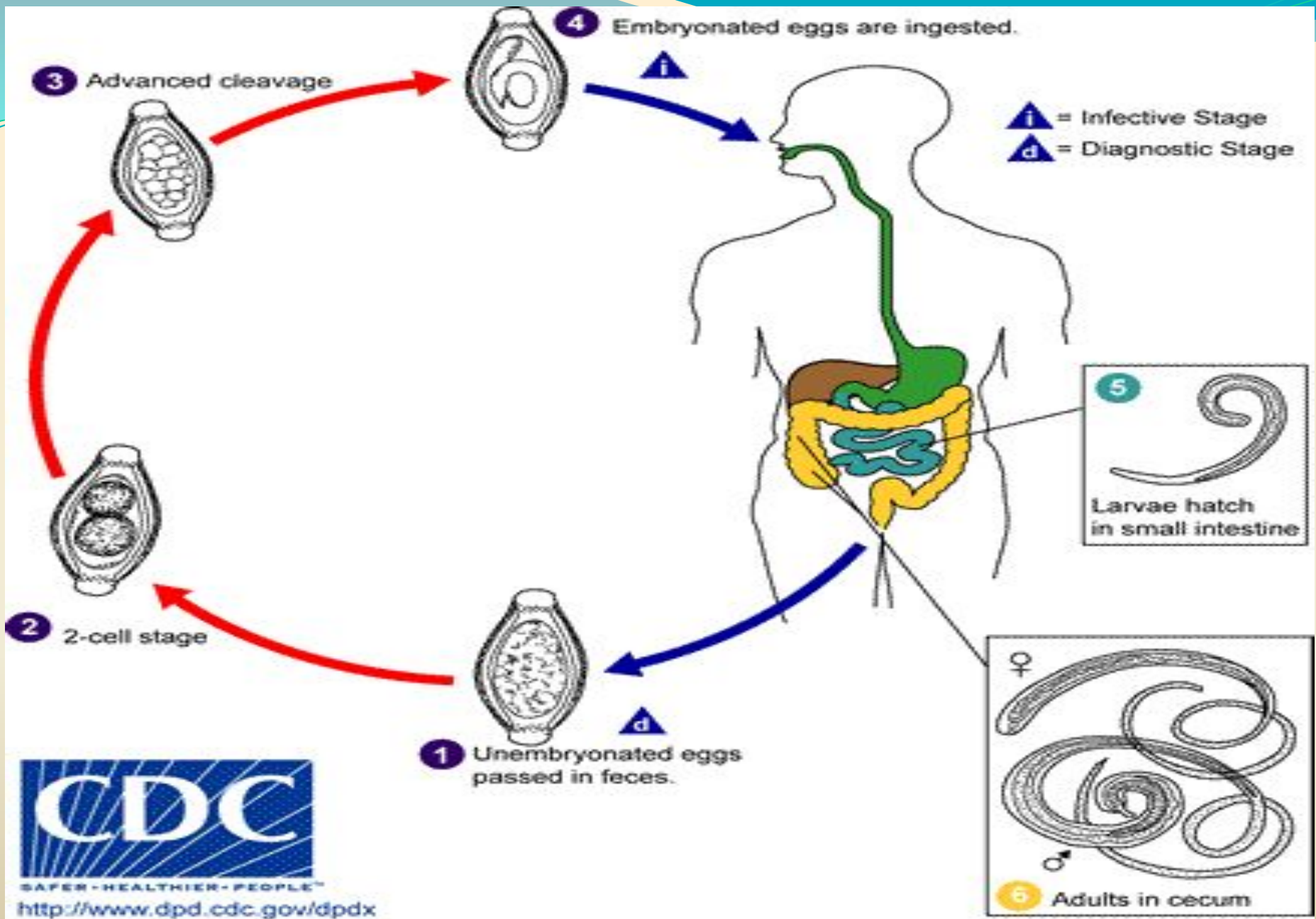
- Diagnosis can be made in patients whose signs and symptoms are compatible with trichinellosis, have a positive laboratory blood test for *Trichinella* antibodies, and who can recall eating raw or undercooked pork or wild game meat.
- Clinical: At least three of the following: fever, muscle soreness/pain, gastrointestinal symptoms, facial edema, eosinophilia, and subconjunctival, subungual, and retinal hemorrhages
- Laboratory: At least one of the following two laboratory tests: demonstration of *Trichinella* larvae in tissue obtained by muscle biopsy and demonstration of *Trichinella*-specific antibody response by indirect immunofluorescence, ELISA, or Western blot (i.e., seroconversion)
- Epidemiological: At least one of the following three: consumption of laboratory-confirmed parasitized meat, consumption of potentially parasitized products from a laboratory-confirmed infected animal, epidemiological link to a laboratory-confirmed human case by exposure to the same common source



- ***Trichuris trichiura***

- The **human tapworm** (*Trichuris trichiura* or *Trichocephalus trichiuris*) is a roundworm that causes trichuriasis when it infects a human large intestine. The name *whipworm* refers to the shape of the worm; it looks like a whip with wider "handles" at the posterior end.

- Life cycle
- The egg are passed with the stool .
- In the soil, the eggs develop into a 2-cell stage: ,
- Advanced cleavage stage ,
- Then the eggs embryonate ;
- Eggs become infective in 15 to 30 days.
- After ingestion (soil-contaminated hands or food), the eggs hatch in the small intestine, and release larvae that mature and establish themselves as adults in the colon .
- The adult worms (approximately 4 cm in length) live in the cecum and ascending colon. The adult worms are fixed in that location, with the anterior portions threaded into the mucosa
- The females begin to oviposit 60 to 70 days after infection. Female worms in the cecum shed between 3,000 and 20,000 eggs per day. The life span of the adults is about 1 year.



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● **Symptoms and pathology**

- Light infestations (<100 worms) are frequently asymptomatic.
- Heavy infestations may have bloody diarrhea.
- Long-standing blood loss Long-standing blood loss may lead to iron-deficiency anemia.
- Rectal prolapse is possible in severe cases.
- Vitamin A deficiency may also result due to infection.
- Mechanical damage to the mucosa may occur as well as toxic or inflammatory damage to the intestines of the host

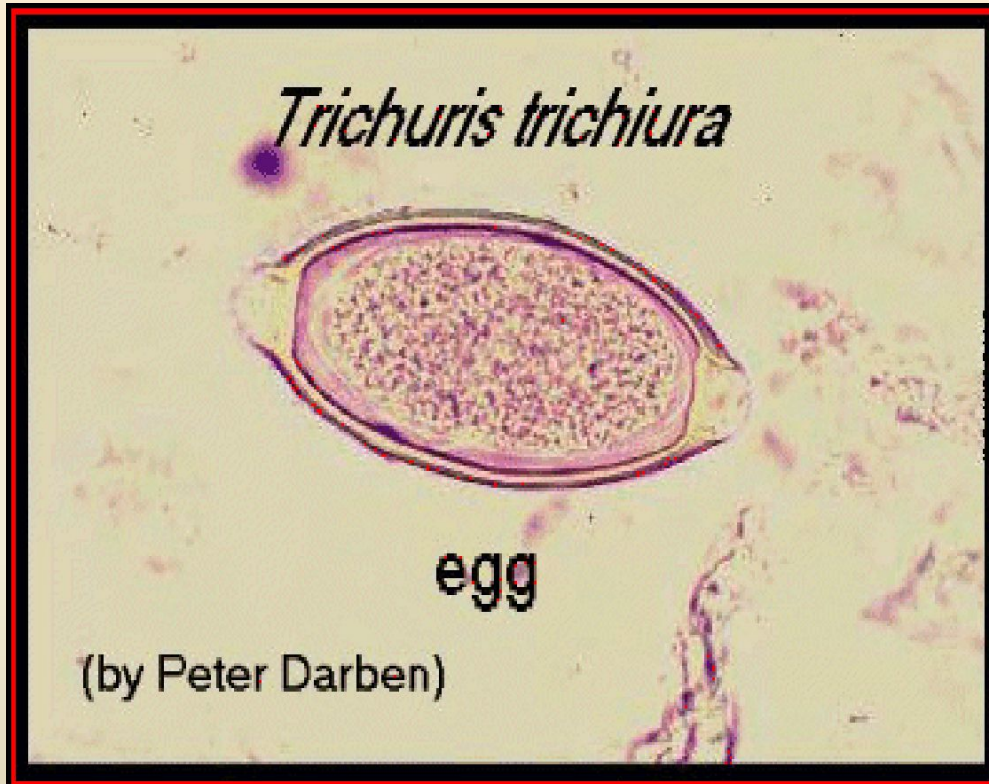
● **Diagnosis**

- Trichuriasis can be diagnosed when *T. trichiura* eggs are detected in stool examination. Eggs will appear barrel-shaped and unembryonated, having bipolar plugs and a smooth shell. Rectal prolapse can be diagnosed easily using defecating proctogram and is one of many methods for imaging the parasitic infection. Sigmoidoscopy show characteristic white bodies of adult hanging from inflamed mucosa (coconut cake rectum).

- **Treatment and control**

- Mebendazole is 90% effective in the first dose, and albendazole may also be offered as an anti-parasitic agent. Adding iron to the bloodstream helps solve the iron deficiency and rectal prolapse.

- Infection can be avoided by proper disposal of human feces, avoiding fecal contamination of food, not eating dirt. Infection can be avoided by proper disposal of human feces, avoiding fecal contamination of food, not eating dirt, and avoiding crops fertilized with night soil. Simple and effective proper hygiene such as washing hands and



Trichuris trichiura

egg

(by Peter Darben)

