**Trichurus trichiura**

**Life Cycle**

1. Eggs hatch in the small intestine
2. Larvae migrate to the liver, lungs, and small intestine
3. Eggs mature and are passed in the stool

- **Egg plugs**

**Trichuris trichiura**

b. note eggs - double plugs
Trichuris spp.

- Over 60 species of Trichuris have been documented, and each has been found to undergo a similar life cycle.
- The human whipworm (T. trichiura) and canine whipworm (T. vulpis) display a relatively high degree of host specificity, with canine whipworms only rarely occurring in humans.

Trichuris trichiura

- Females are capable of producing more than 10,000 eggs in a single day, which are passed out of the host's body with digestive waste and require a warm, moist environment to continue development into the embryonic stage.

- Infection is acquired through the accidental ingestion of eggs and embryos. Because these parasites do not actually multiply within the host, every individual worm inside a host represents an independent infection event.
Order Trichurida

b. *Trichinella spiralis*
   1. omnivore parasite
   2. larvae encyst in muscle, cause "trichinosis"

Life Cycle: Unusual Aspects
a. Adults inhabit intestine, females embed in intestinal wall.
b. Eggs mature in female uterus, larvae (J1) enter blood and lymph, travel to vascularized muscle.
c. Larvae encyst in muscle, wait to be eaten.
d. J4 hatch and mature into adults.
Order Trichurida  
*Capillaria* spp.  
1. Various species infecting birds, carnivores  
2. Eggs shed in feces, eaten by small fish,  
3. Piscivorous animals get nematodes in intesting  
4. Various other life cycles
The nematode (roundworm) *Capillaria philippinensis* is the causative agent of human intestinal capillariasis. It was first discovered in the Philippines in 1963.

**Order Dioctophymatida**

1. *Dioctophyme renale* - kidney worm
   1. parasitic in mink, but also dogs, humans

2. Eggs in urine -> eaten by aquatic oligochaetes
   -> worms eaten by fish or from
   -> mammals infected by eating worms or paratenic host
   -> juveniles leave stomach migrate to liver then to kidney - often right one.
Class Rhabditea
(includes previous Secernentea, Phasmida)
A. Now subdivided into several Subclasses
1. Chromadoria, Monohysteria, Leptolaimia (all free living)
2. Subclass Tylenchia - in plant and insects or free living.
3. Subclass Rhabditia (previously Secernentea, Phasmida)

Subclass Rhabditia
Characteristics
1. Club shaped, cylindrical or bulbed and muscular pharynx.
2. Bilobed copulatory bursa in males.
3. Phasmids present, but often difficult to see.
Subclass Rhabditia
Representative groups (usually orders)
1. Rhabditida - females are only known parasites
2. Strongylida - hookworms
3. Ascarida - intestinal worms
4. Oxyurida - pinworms
5. Spirurida - spirurids, dracunculids, filaroids

Order Rhabditida
A. small parasites, appear to be transitional forms - include for free-living and parasitic forms.
   1. Recognizable by:
      a. Reduced male forms
      1. Led to early conclusion that males were absent.
   2. Appears that females are parasitic, males are often not.

Order Rhabditida
b. Muscular esophagus
   1. Usually with proximal bulb - "rhabditiform"
   2. term also used to describe
      a. muscular pharynxes in general
   b. free living juvenile forms - usually J1
Order Rhabditida
   c. huge diversity of life cycles
   1. usually includes free living stages

*Caenorhabditis elegans*

*Caenorhabditis elegans* is a free-living soil nematode used widely in genetic studies. It reproduces sexually and possesses digestive, excretory and neuromuscular systems, providing a model for complex organ systems in an easily cultured organism.
It is particularly well-suited for genetic studies:

1. It is small, only 1mm in length and easy to culture, and it has a short life cycle (2 wks).
2. It is transparent, and each of its 959 somatic cells is visible through a microscope, making it an ideal organism for developmental studies.

**Family Rhabdiasidae**

1. Lungworms
   a. Common in amphibians and reptiles
   b. Recognizable by short esophagus, irregular cuticle.

**Family Strongyloidae**

a. Long, slender worms (threadworms), with long esophagus (in females).
b. Tend to be parasitic in intestine; females only, males are usually free living.
**Strongyloides stercoralis**

1. Parasite of human intestine
   a. also known as "threadworm"
2. most of pathology associated with larval stages that move through tissues

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**Strongyloides stercoralis**

Life Cycle
a. Females in intestinal mucosa
b. Eggs laid in gut lumen, hatch in gut as J1, passed in feces
c. Two possible routes
1. Free living adults - mate in soil and produce infective eggs.
2. Filariform juveniles (J3) wait in soil and infect new hosts
d. Larvae get to lungs or migrate to intestine however they can.
1. Either coughed up and swallowed or move to intestine directly.
**Strongyloides filariform larva**

**Strongyloides stercoralis**

**Humans**
- Adult worms mature in the intestine where female begin egg production

1. Eggs hatch and develop in a larva (rhabditiform) and passed out in the feces
2. Rhabditiform larva enters the soil
3. Soil temperature is critical
4. Soil-larva enters the rectum
5. Free-living adults in soil

**The Life Cycle of Strongyloides Stercoralis**

- Eggs develop in the intestine
- Larvae develop in the soil
- Free-living adults in soil
**Strongyloides stercoralis**

- Infection can come from freeliving or parasitic adults
- Also, larvae can complete development in gut and remain to autoinfect

**Order Trichurida**

other *Strongyloides (ratti)*

1. Note similarity with *S. stercoralis*

![Diagram of Trichurida lifecycle](image)

**Bursate Rhabditians**

Family Ancylostomatidae

1. Commonly known as hookworms.
   - Anterior end curved dorsally to form hook.
2. Buccal capsule with cutting plates.
   - Distinctive oral attachment structures.
3. Males with conspicuous copulatory bursae.
Necator americanus

1. American hookworm, cause of anemia, lethargy, retardation.
   a. Common in warm humid areas - killed by frost.
   b. A good reason to wear shoes.
   c. Probably came over in slave trade - also found in Old world.