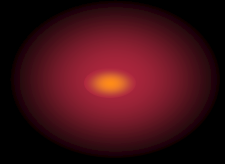


**Phy.: Nematelminthes**  
**Cls.: Nematoda**  
**Fam.: Trichostrongylidae**

- Generally, parasites alimentary tracts
- Ruminant, Equide, poultry, pig, human



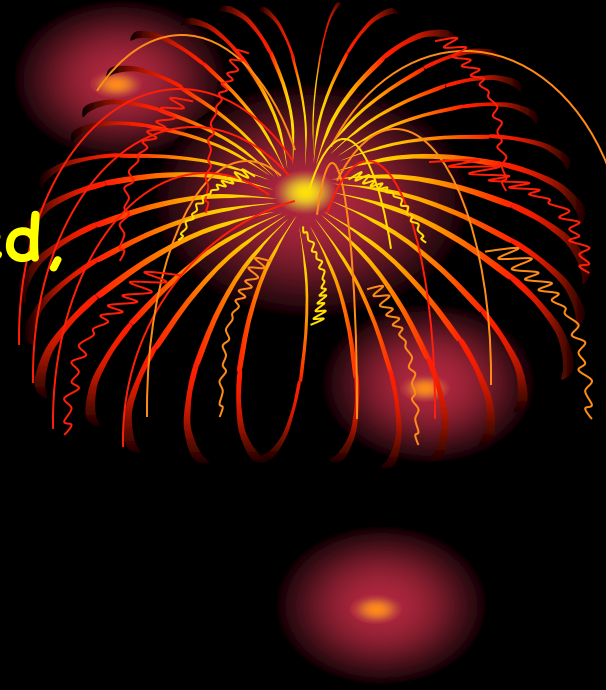
# TRICHOSTRONGYLIDAE

Small hair-like worms



# TRICHOSTRONGYLIDAE

Eggs: Oval shaped, smooth-thin shelled, blastomeres present, double-walled



# TRICHOSTRONGYLIDAE

Direct development

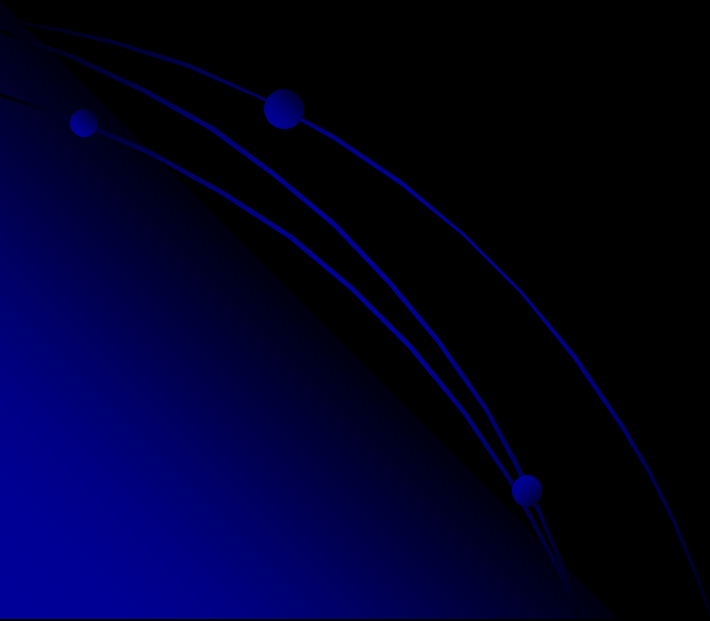


# Genus and Morphological Structures

**Nematodirus**



- **Small-intestine, 2 cm,**
- **Spicules thin and long**
- **Distinct cephalic vesicle**

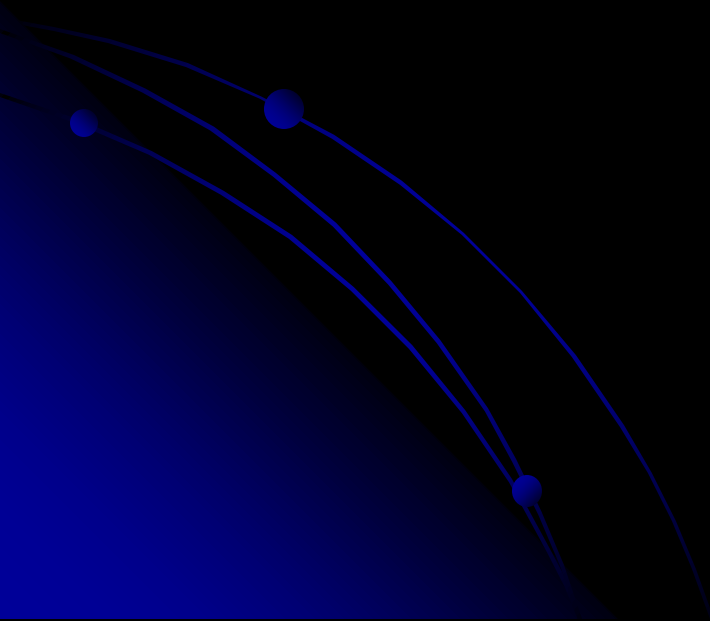


# Morphological Structures

**Cooperia**



- Small-intestine, 0.8-1 cm, gubernaculum absent
- Cephalic vesicle small
- Spicules short

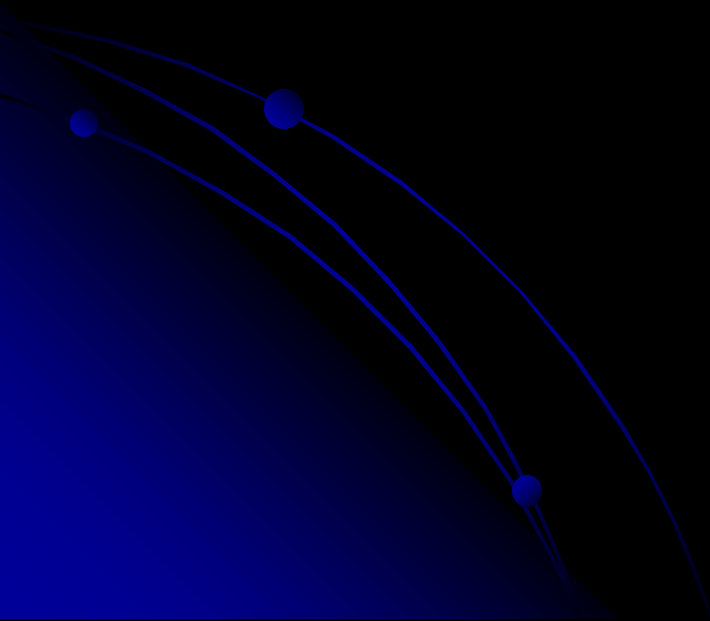


# Morphological Structures

**Trichostrongylus**

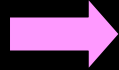


- Small-intestine, < 7 mm,
- No cephalic vesicle
- Excretory notch present

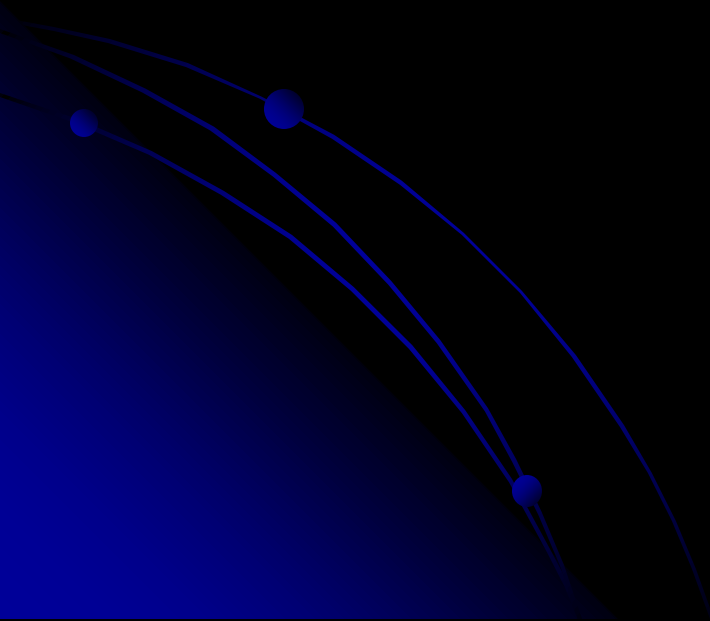


# Morphological Structures

## Haemonchus



- Abomasum, 2-3 cm, large cervical papillae - close distance from anterior end,
- Absence of excretory notch
- Asymmetric dorsal ray
- Large prominent vulval flap in female



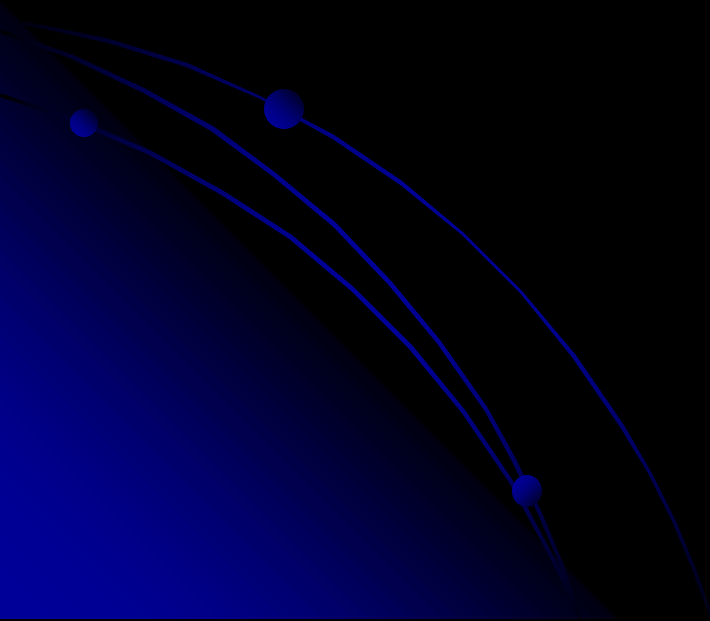


# Morphological Structures

## Ostertagia



- Abomasum 1 cm, small spine-like cervical papillae - far distance from anterior end,
- Symetric dorsal ray
- Vulval flap small or absent in female



# Life Cycle

- The eggs leave the host in the feces.
- L<sub>1</sub> develops and hatches

*Marhallagia (Ostertagia) marshalli* and *Nematodirus sp.* larvae stay in the eggs until L<sub>2</sub> and L<sub>3</sub> stages respectively.

- Infective L<sub>3</sub> is swallowed by oral way.
- Two parasitic moults occur on the tissues or organs to be settled.

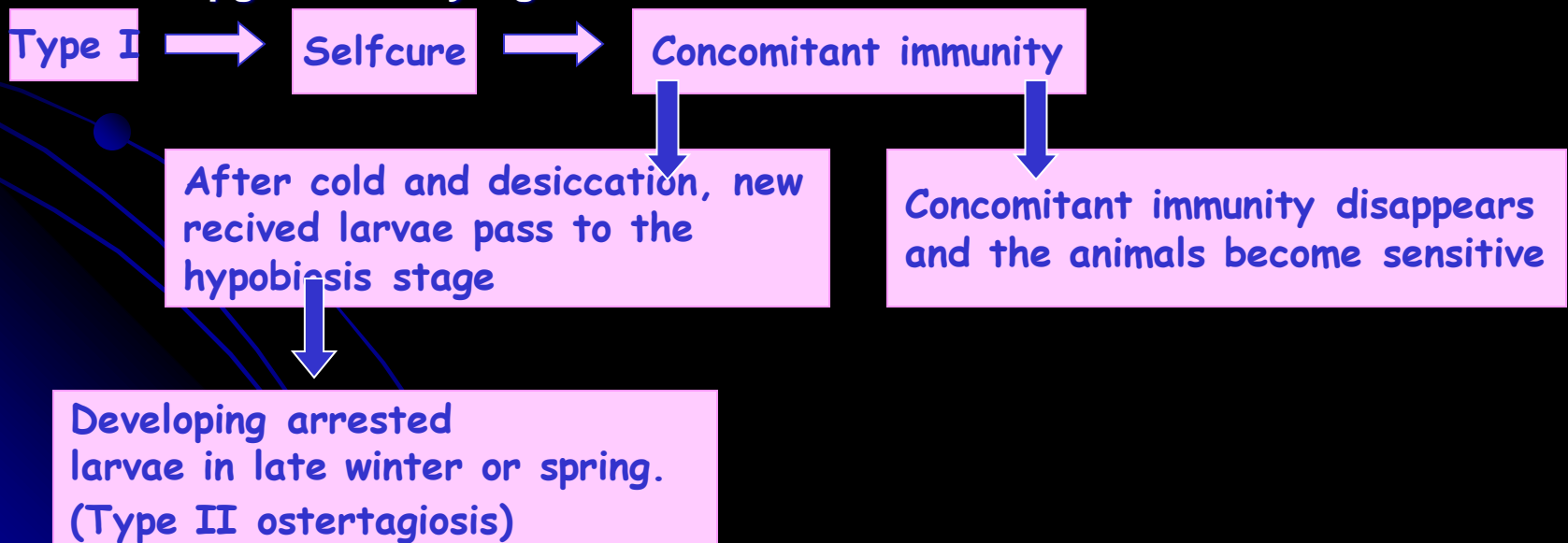
# Patojenite

- They enter the abomasal / intestinal glands during their development
- The most pathogenic species is **Ostertagia**★
  - The least pathogenic is **Cooperia**★
- In abomasum glands
  - HCL and pepsinogen-secreting cells can not function, and recurrent infections result in nodule formation and mucosal loss.
  - pH 2-3 → 7
- Blood lose (L<sub>5</sub>)
  - Anemia (erythrocyte count increased firstly – producing regenerative forms - fatigue of the hemapoetic system and producing regenerative erythrocyte forms )
  - There isn't anemia in **Cooperia** infection.
  - Anemia is very important in **Haemonchus** infection (sheep)

Secondary nodules = morokko leather view

# Ostertagiosis

- Bovine ostertagiosis – *Ostertagia ostertagi*
- Ovine ostertagiosis - *Ostertagia circumcincta*, *O.trifurcata*
- Ostertagiosis occurs in two clinical forms.
  - **Type I (Summer)** = Ingesting larvae develops directly
    - Young cattle during their first grazing season
    - The great number of mature parasite.
    - Epg=1000↑
  - **Type II (Winter)** = Maturation of the arrested larvae
  - In late winter or spring following their first grazing season
    - The great number of larvae
    - Epg is not very high



# CLINICAL SIGNS

- Diarrhea (Brown-black, green=Ostertagia)
- Edema under the jaw
- Anemia (Haemonchus)
  - Acute=1000-10.000, 50-200ml/day
  - Chronic=100-1000, 5-50 ml/day
- Weight loss, weakness
- Deterioration in the quality of wool and leather.

# Diagnosis

- Clinical signs
- Host Age
- Season
- Faecal examination
  - Egg
  - Epg (eggs per gram)
  - Capro culture
- Necropsy

# Treatment and Control

- Treating of the developing larvae and the mature parasites reduces the risk of re-infection (pasture larvae number).
- The calf encounter residual over-wintered larval population on pasture and acquire infection.
- **First treatment; Animals (under 1 year old, around parturition (periparturientrise) and giving birth) are treated at 2.5 weeks after moving to pasture.**

Benzimidazole (albendazole, fenbendazole, oxfendazole), probenzimidazole (febantel, thiophonate, netomibin), levamisole, ivermectin, doramectin, moxidectin, eprinomectin

- In winter old animals can be treated against arrested larvae and prevented Type II ostertagiosis occurred late winter or spring.  
Thus, It is not seen pasture infection with eggs.

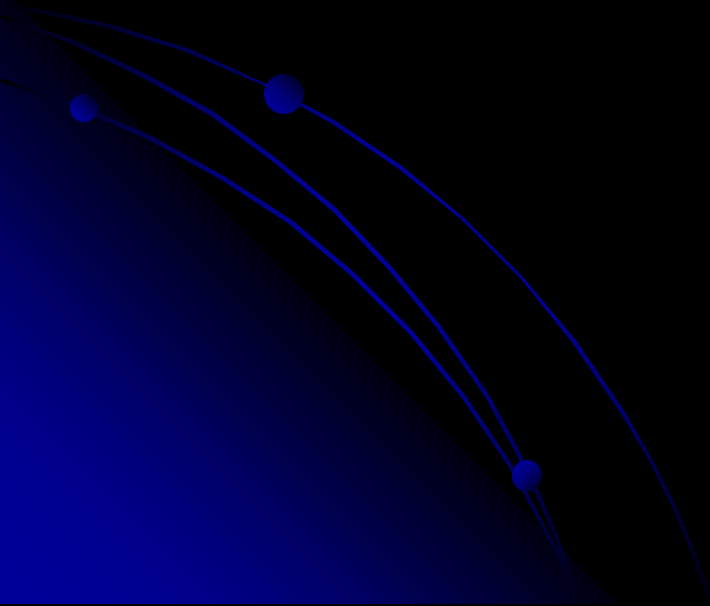
Benzimidazole, ivermectin, doramectin

# Other Species

**Equidae** -----T.axei

**Poultry** -----T.tenuis

**Human** -----T.orientalis, T.axei, T.probolurus,  
O.circumcincta, O.ostertagi,  
H.contortus





# Rhabditis strongyloides

- One rare occasions, it can invade the mammalian skin, causing pruritic, erythematous.
- Rhabditis strongyloides is typically a free-living nematode that is found in decaying organic material (vegetable and fruits).
- The males of this nematode are about 1 mm long, the females are about 1.3 to 1.5 mm long.
- This parasitic infection found that on skin sites that come into contact with the ground. Such as, extremities, ventral abdomen, thorax and perineum.
- Especially in extremital/articular regions, skin lesions, redness, pustules, crusts, erosions or ulcerations.
- **Diagnosis** of the disease is with characteristic skin lesions and on the demonstration of typical larvae in skin scrapings or biopsy.
- Effective **treatment** consists primarily of removing and destroying moist, infested bedding material and moving the animal to clean, dry environment.
  - For puriritis, corticosteroid (short time)
  - Ivermectin 0.2 mg/kg, 2 times at intervals of 14 days
  - Antibiyotics (locally)

# STRONGYLOIDIDAE

- Species:
  - *Strongyloides papillosus*.....ruminants
  - *Strongyloides westeri*.....equide
  - *Strongyloides stercoralis*...carnivorous-human
  - *Strongyloides ransomi*.....swine
  - *Strongyloides avium*.....poultry
- small intestine
- shorter than 1 cm
- esophagus is about 1/3(one of third) of the body length

# Life cycle

- directly
- prepatent period is 8-14 days
- there are parthenogenetic females at last hosts

If the weather conditions are appropriate/suitable

## Heterogonic circle

L<sub>1</sub>, leaves the egg outside, changing the sex, male and female parasite occur, coupling and then laying female parasite.

If the weather conditions are not appropriate,

## Homogonic circle

In the outdoor environment L<sub>1</sub> becomes L<sub>2</sub> and L<sub>3</sub>. Entering the hosts via the skin and mouth(orally). Later, via venous circulation migrates to the lung (L<sub>4</sub>), trachea and intestines. Where they matured, and laying the female parasites. Some of the L<sub>3</sub> larvae enter the hypobosia in the muscles (depending on egg immunity)

Equide, ruminant, pig  
galactogen transmission  
Ruminant, pig  
prenatal transmission  
Human  
auto-infection  
*S.stercoralis*  
endogen development

## PATOGENESIS, CLINICAL SIGNS, DIAGNOSIS

- Redness in the region where the larvae are perforate in the sheep.
- Agents may enter from the lesion area.
- Bleeding focus are seen in larvae migrating.
- Diarrhea in the first week of life in younger people
- weight loss, dehydration
- Resistance develops as age grows.

### • **Diagnosis**, in feces

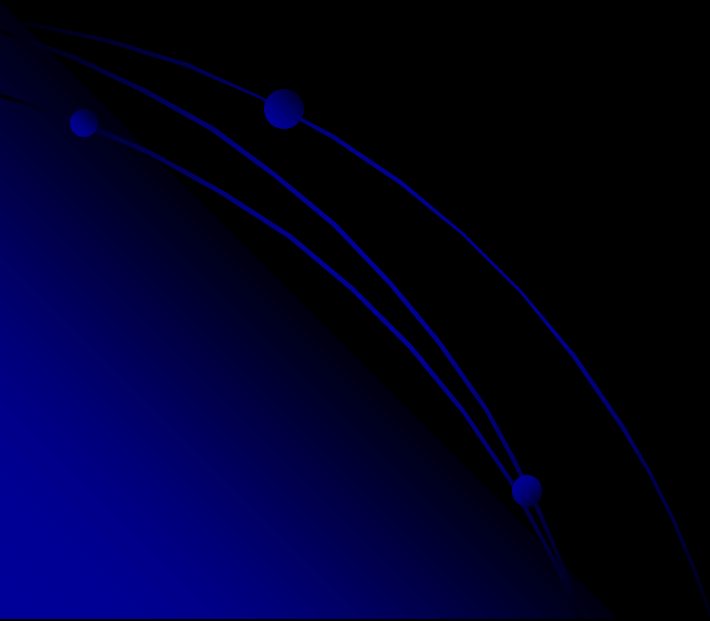
**Egg** (equine, <sup>★</sup>ruminans, pig)

(oval, single walled, 52-56X36-40  $\mu\text{m}$ , with larvae)

**Larvae** (human, carnivor) <sup>★</sup>

## ● Genus: *Trichuris*

- Last hosts; ruminant, carnivour, human, pig, rabbit
- They commonly inhabit the cecum and colon
- Parasite is 4-6 cm long.
- *Trichurid* worms are known as «whip-worms».
- Because the adult body is whip-shaped; the anterior end fine, hairlike, and embedded in the wall of large intestine.



## Some *Trichuris* species

- *Trichuris ovis*.....ruminants
- *Trichuris discolor*.....ruminants
- *Trichuris globulosa*.....ruminants
- *Trichuris skrjabini*.....ruminants
- *Trichuris vulpis*.....carnivorous
- *Trichuris suis*.....swine
- *Trichuris trichura*.....human and primates

# Life cycle and Patogenesis

- The egg of the parasite is thrown the out with feces from last host.
- Parasitic infective period is the eggs carrying L1.
- Infections agent (eggs with L1) is taken by mouth(orally)
- Once eggs are ingested, all development occurs within the epithelium of intestine (i.e. there is no extraintestinal migration).
- The prepatent period of *Trichuris vulpis* in dog is slightly less than 3 mounths, in cattle about 3 mounths, and in swine about 45 days.
- This parasite infection is not important for ruminants.
- Diarrhea in the carnivorous (sometimes bloody diarrhea), anemia.

- Parasite has thick-shelled eggs with bipolar plugs.
- Eggs passed in the feces and become infective in 1.5-3 months in a warm, moist environment.
- Egg, measured at 70-80 $\mu$ m long x 30-42 $\mu$ m width, similar to lemon, bipolar plugs, non-segmented content.

□ **Treatment:** ivermectin  
doramectin } 0.2 mg/kg  
moxidectin  
abamectin

in dogs; mebendazole 22 mg/kg  
fenbendazole 3 mg/kg 3-12 days.

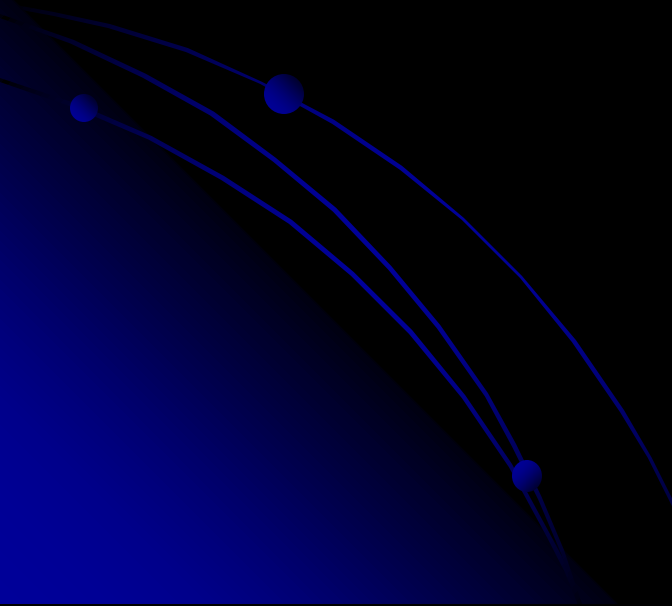


# Genus: Capillaria

## ● Capillaria

- **Ruminant** → small intestine (*C. bovis*, *C. brevipes*)
- **Carnivour** → trachea, bronchi, bronchiol, urinary bladder, kidney, small intestine and renal pelvises (*C. aerophila*, *C. Plica*, *C. felis cati*)
- **Poultry** → small intestine or gizzard/oesophagus
- Mature parasite is 1-5 cm long and yellowish color
- Developments are direct or indirect (earthworm)
- Parasite is not pathogenic in ruminants.
- Symptoms may be seen poultry and carnivorous according to settlements.
- Most dogs and cats are asymptomatic.
- Some carnivorous show signs of pollakiuria, urinary incontinence, and urinating abnormal places.

# Diagnosis

- Eggs are searched with Flotasyon Technique from feces or eggs are searched in the urine and may be found in the urine sediment.
  - **Capillaria** egg, 45-50  $\mu\text{m}$  long  $\times$  22-25  $\mu\text{m}$  width, similar to lemon, slightly bump bipolar plugs (according to Trichuris egg)
- 

# Capillaria treatment

**A) Poultry;** Levamizole.....30 mg / kg (with drinking water)  
Moxidectin.....0.2 mg / kg (intramuscular)  
Fenbendazole.....20 mg / kg (with feed)

## **B) Mammalian;**

**for dog and cat;** Levamizole.....2.5 mg / kg, 5 days

Fenbendazole....50 mg / kg

Ivermectin.....0.2 mg / kg s.c.

**for ruminants;** Doramectin.....0.2 mg / kg

Eprinomectin.....0.5 mg / kg

# Family Thelaziidae

## Genus: *Thelazia*

- **Definitive hosts:** cattle, buffalos, sheep, cats, dogs, humans, camel, horses, pigs
- *Thelezia* species are parasites of the conjunctival and lacrimal sacs of domestic animals.
- Adult *Thelazia* worms are 10-20 mm long, have whitish color and typical slender tubular form of round worms.
- The worm's body is covered with a cuticle, which is flexible but rather tough.
- **Intermediate hosts:** Flies  
(*Musca domestica*, *Musca autumnalis*, *Fannia*, *Morellia*)

humans

# Thelazia-Life cycle

- *Thelazia lacrimalis* in horses, *Thelazia skrjabini* in cattle and horses, *Thelazia gulosa* in cattle, and *Thelazia californiensis* in dogs, sheep, and various wild mammals.
- *Thelazia* eyeworms have an indirect life cycle.
  - *Thelazia* worms are viviparous. The females do not lay eggs.
  - Adult females don't lay eggs but release sheathed L1 larvae.
  - These larvae (L1) reach the tears of infected host.
  - These larvae (L1) ingested by the flies (intermediate host) that feed on these tears.

- Inside the flies these L1 larvae developed to infective L3 larvae in 2 to 4 week.
- When the fly visits a new host for tear-feeding, it transmits the infective larvae to the visited host.
- These infective larvae migrate to the mouth parts of the flies.

# Clinical signs, Diagnosis and Treatment

## □ Symptoms:

- Conjunctivitis, keratitis, photophobia, excessive lacrimation and watery eyes, swollen eyes, excessive light sensitivity.
- Eyeworm infections are more frequently during the fly season, typically from late spring to early autumn in regions with moderate climate.

## □ Diagnosis:

- is done through visual examination of the eyes and surrounding tissues
- or, sediment of centrifuged obtained after eye or lacrimal duct rinsing.

## □ Treatment:

- Mechanical removal with forceps after instillation of a local anesthetic is useful
- Fly control measures, directed especially against the face fly, aid in the control of thelaziasis in horses
- Efficacy has also been reported for febendazole and revamisole
- For dog, cat, cattle, sheep, goat macrocyclic lactones are available mostly (ivermectine, moxidectine, doramectine)

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