

**Phy.: Nematelminthes**

**Cls.: Nematoda**

**Ord: Strongylida**

**Fam.: Metastrongylidae**

**Protostrongylidae**

**Dictyocaulidae**

- Parasites in the lungs
- Ruminant, Equide, pig, dog and cat

# METASTRONGYLIDAE

Small hair-like worms

Buccal capsule small



Bursa copulatrix (male)

The worms are ovo-viviparous in ruminant, equide, dog and cat.

Oval shaped, small, rough- shelled, larvated eggs in pig

# Direct and Indirect Development

Life cycle



## In catle

### **Dictyocaulus viviparus**

- Trachea, bronchus (2.5-9 cm)
- Boot sahaped spicules
- Serious infection in calves

## In equidae

### **Dictyocaulus arnfieldi**

- Trachea, bronchus (2-7 cm)
  - Boot sahaped spicules
  - Donkeys are important for epidemiology.
- Generally mature parasite doesn't seen in horse.  
Quick breathing and cough in foals.
- Prepatent period 2-4 mounths.

# Species and Morphological Structures

## In sheep and goats

**Dictyocaulus filaria**



- Trachea, bronchus (10-12 cm)
- Boot shaped spicules

**Protostrongylus rufescens**  
**P. unciphorus**



- Trachea, bronchus (2-7 cm)
- Dorsal ray is hemispheric in shape

**Cystocaulus ocreatus**



- Under the pleura (brown colour nodule) (2-12 cm)
- Male-Dorsal ray candlestick shape
- Female- Bell shape cap

**Muellerius capillaris**



- In lung tissue (grey-dark colour nodule) (2-3 cm)
- Spicules diapason shape

**Neostrongylus linearis**



- Bronch (1-2 cm)
- Spicules not equal measurement



*Cystocaulus ocreatus*  
Male dorsal ray

*Cystocaulus ocreatus*  
Female vulvae

*Neostongylus linearis*  
Male-spicules

*Muellerius capillaris*  
Male spicules

*Dictyocaulus filaria*

*Protostrongylus rufescens*

*P. unciphorus*

# BIOLOGY

## Development in nature

- ✓ Dictyocaulus sp. Develop directly
- ✓ L<sub>1</sub> stage of Dictyocaulus sp pass through the outside by feces. L<sub>3</sub> stage develops at the outside and leave from feces by its movement or helping with Pilobolus fungi and ingests when grassing.

## Development in the hosts

- ✓ After ingestion L<sub>3</sub> go through the mesenteric lymph nodes (L<sub>4</sub>)
- ✓ L<sub>4</sub> travels to lungs by lymphatic-vascular route (L<sub>5</sub>) and maturation take places in there
- ✓ The prepatent period is 4 weeks in Dictyocaulus sp and 5-10 weeks in other species.



# BIOLOGY

## Development in nature

- ✓ Others species develop indirectly (mollusks or earthworm)
- ✓ Mollusks or earthworm are used for intermediate hosts in other species. L1 pass into intermediate host and two moults occur in there.
- ✓ L<sub>3</sub> stage is taken with snails when feeding on pasture

## Development in the hosts

- ✓ After ingestion L<sub>3</sub> go through the mesenteric lymph nodes (L<sub>4</sub>)
- ✓ The prepatent period is in 5-10 weeks in other species.

# Pathogenesis in cattle

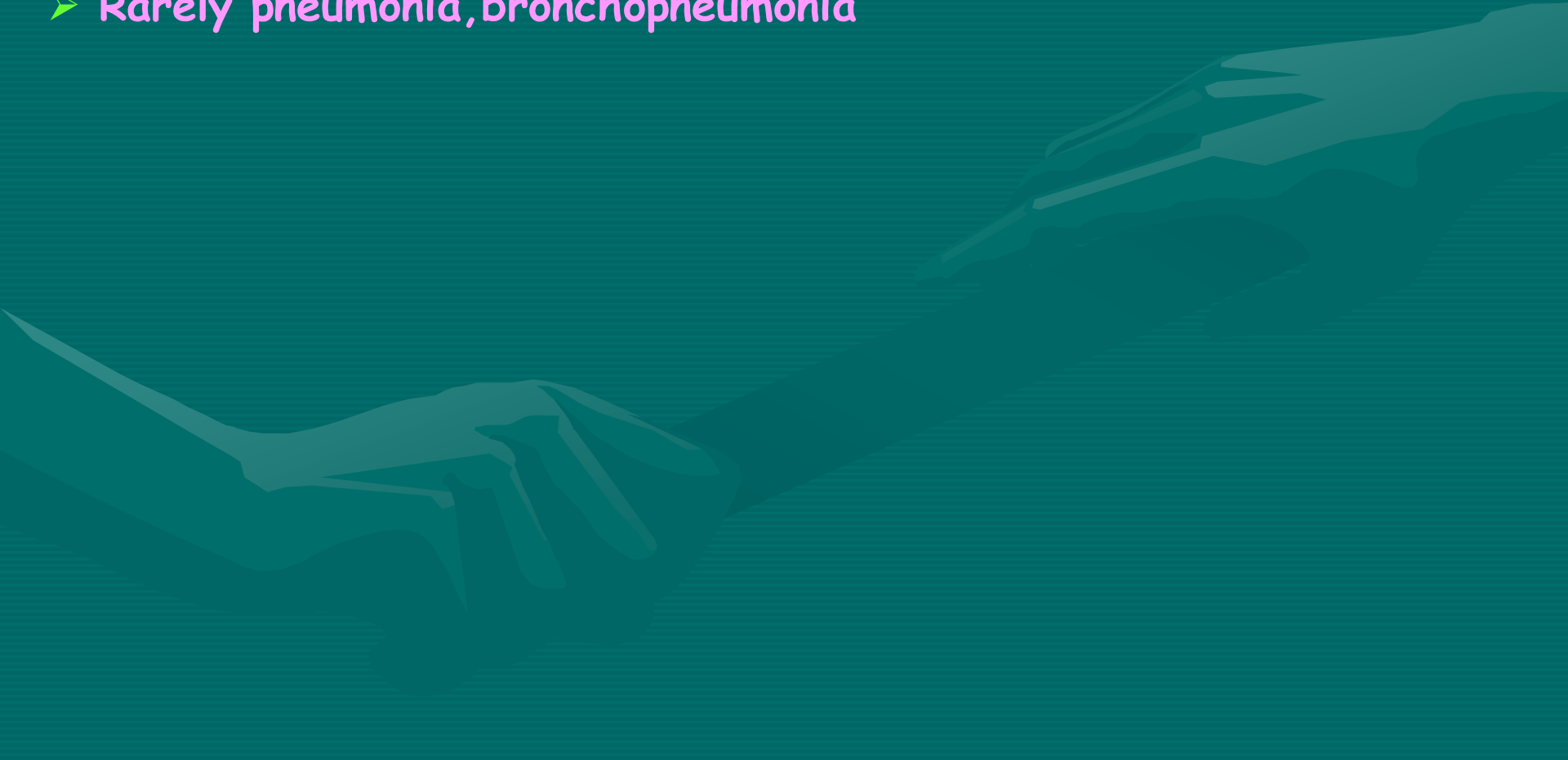
- Important for calves in first grazing period After immunisation, clinical signs are not seen.
- Prepatent period
  - **Larvae**; Alveolitis, bronchiolitis, bronchitis
  - Gathering eosinophilic exudate.
    - Result: Cough, dyspnea
- Patent period
  - **Mature parasite**; Gathering eosinophilic exudate
  - Aspiration of eggs and larvae; obstruction, sclerosis
    - Result: Anorexia, Cough, nasal flow
- Post-patent period
  - **Expelled the parasites**
  - Hyperplasia in alveol epithelium, hyaline membrane
    - Result : Normalisation in lung, No cough

# Pathogenesis in sheep and goats

- Immunity doesn't develop in hosts
- Parasites localised in tissue
  - Local and small lesions
  - Reaction in tissues is very strong
- Parasites localised in bronch and bronchiole
  - Increasing secretion
  - Eozinophilic exudate in abdomen
  - Increase the number of alveole epithelia
  - Mature parasites make irritation and obturation

# Clinical Signs

- Cough
- Nasal flow
- Abnormal pulmonary sound
- Rarely pneumonia, bronchopneumonia



# Identification

- Clinic sings
- Necropsia
- Looking for larvae in feces 

Dictyocaulus filaria L<sub>1</sub>

Müllerius sp. L<sub>1</sub>

Neostongylus sp. L<sub>1</sub>

Cystocaulus sp. L<sub>1</sub>

Protostrongylus sp. L<sub>1</sub>

D. viviparus L<sub>1</sub>

# Treatment

Active ingredient	Dictyocaulus Sheep, goat-----Catle (mg/kg)	Other species Sheep, goat (high dose- more than one)
Albendazole	3.8-10.....p.o.....7.5-10	5-7.5 mg/kg 1 week interval 2 times p.o.
Levamisole	5-7.5..... p.o..... 7.5-15	
Oxfendazole	4.5-5 .....p.o..... 7.5	
Fenbendazole	5 .....p.o..... 7.5-10	
Mebendazole	15-20.....p.o..... -	15 mg/kg 3 days p.o.
Thiabendazole	88 .....p.o..... 88	
Febantel	5 .....p.o..... 7.5-10	
Netomibin	7.5 .....p.o.....7.5-12.5	
Ivermectin	0.2 .....s.c..... 0.2-0.5	0.2 mg/kg 1 week interval 2 times s.c.
Doramectin	0.2 .....s.c..... 0.2	
Eprinomectin	- .....Pour on.....0.5	
Moxidectin	0.2..... s.c.....0.2	
Abamectin	0.2 .....s.c..... 0.2	

# Metastrongylosis in Pig

## •Species

- *Metastrongylus apri*
- *Metastrongylus salmi*
- *Metastrongylus pudendotectus*

•Bronch, Bronchiole, trachea

•1.5-6 cm

•Indirect development,

•Intermediate host-earthworm

•Important pathogenesis - 4-6 mounts piglets

•Contamination with pasture and soil


•Larvae can transport influenza virus

# BIOLOGY

- Embryonated eggs pass out via the feces
- They are eaten by earth worms in which they develop through three larval stages after two moulting
- The cycle is continued by the pig eating earthworm.
- The larvae ( $L_3$ ) from the earthworm penetrate the intestine and go through the mesenterial lymph nodes and 1 moult occur in here
- $L_4$  arrives the lungs via blood and lymph system.
- $L_5$  and mature parasite occur in bronchiole
- Infection is seen, especially in 4-6 months piglets
- Prepatent period is 1 month.



# Clinical signs and identification

- Mild infection - asymptomatic
- Bronchitis, pneumonia
- Growth in mesenteric lymph nodes
- Cough
- Nasal discharge
- Respiratory distress
- Growth retardation
- Eggs are searched in the stool   
(50-60X35-40 μm, oval, thick-shelled, double-wall, embryonated )
- MgSO<sub>4</sub> (denser medium)

# Metastrongylosis in Dog

- **Filaroides osleri**
  - Dog
  - Fibrous nodule in trachea
  - Direct development
- **Aelurostrongylus abstrusus**
  - Cat
  - Pulmonary parenchyma, bronchiole
  - Indirect - Molluscs
- **Angiostrongylus vasorum**
  - Dog, fox
  - A.pulmonalis, right ventricle of the heart
  - Indirect - Molluscs
- **Crenosoma vulpis**
  - Dog, fox
  - Trachea, bronch, bronchiole
  - Indirect - Molluscs

# Syngamus trachea

- Poultry-trachea
- Male 0.5 cm, female 2 cm
- Red colour, “ Y ” shaped
- Parasites in the state of copulation

# BIOLOGY

- Eggs pass outside in feces
- In eggs  $L_1 \rightarrow L_2 \rightarrow L_3$
- Infection occurs with
  - A) Eggs carrying  $L_3$
  - B)  $L_3$
  - C) Paratenic intermediate host carrying  $L_3$  (earth worm, snails, some insects)
- $L_3$  migrate lungs via blood
- Two moults occur in lung ( $L_4, L_5$ )
- Copulation occurs in trachea and bronch
- Prepatent period - 18-20 days

# Clinical signs and identification

- Important in chick
- Tracheitis, pneumoni
- Stretch out their necks, open their mouths and gasp for air producing a hissing noise.
- Asphyxia
- Cough
- Shaking head
  
- Clinical signs
- Necropsy
- The stool are examined for eggs (70-90X40-45  $\mu\text{m}$ , ovale, bioperculate<sup>★</sup> egg)

# Diectophyme renale

❖ *Diectophyme renale* has a wide range of mammalian host species, such as, dog, wolf, cheetah, mink, horse, swine and humans.

❖ *D. renale* lives in the ureter, urinary bladder or urinary canal (kidney).

❖ Mature parasites are red color and 1m long. Males are somewhat smaller and,

❖ Males have one spicule.

**Intermediate host:** Oligochaete annelid worms.

**Paratenic host:** Frog and some freshwater fish.

# *Diectophyme renale* - Life cycle-1

- ❖ Eggs are passed in the urine and thrown by urine.
- ❖ they develop , in water, to the first larval stage (L1) in a month or longer.
- ❖ Larvated are infective to **oligochaete annelid worms**, in which they develop to the infective third larval stage (L3).
- ❖ Last hosts are infected with this annelids or with the crawfish sticks of the annelids.

## Diectophyme renale- Life cycle-2

- ❖ When the intermediate host annelid is ingested by a **fish** or **frogs**, the third stage larvae (L3) encysts in abdominal muscle or wall of the digestive tube and the fish and frogs acts as a paratenic host.
- ❖ If the infected **oligochaete annelid** (or **paratenic host**) is ingested by a dog, **D.renale** larvae mature complete the cycle.
- ❖ Where they migrate from intestine to the kidney and eventually reach sexual maturity.



# Clinical Signs and Diagnosis

- **Clinic signs:** Because of the kidney parenchyma's are destroyed; difficulty in making urine, hematuria, uremia, asites.
- **Diagnosis:** Eggs in **urine**. (if adults are present in the kidney)
- Eggs; barrel 65-71X42-46 microns.
- -saped, shell pitted except at poles.  
Roughly Barrel-shaped, brown, thick-crusted, rough on the outside, plugged in two boxes, unsegmented embryo
- **Treatment and control:** Surgical removal of the parasite. And no raw water products given to the dogs.