

Genus : **Mullerius**

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Muellerius : Morphology

- These are whitish to brownish in colour, commonly known as ‘Nodular lungworm’
- Adult worms are medium-sized and thin .
- Males are shorter than females.
- The body of these worms is covered with a cuticle, which is flexible but rather tough.
- Males is having posterior end which is coiled like a corkscrew.
- The worms have a tubular digestive system with two openings.
- They also have a nervous system but no excretory organs and no circulatory system, i.e. neither a heart nor blood vessels.
- Males have a copulatory bursa with two spicules for attaching to the female during copulation.



Source- Google

Muellerius : in lungs

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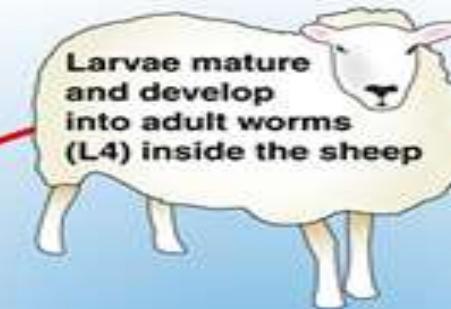
Muellerius : Life cycle

- They have indirect life cycle. Goats, sheep, and other wild ruminants are final hosts and snails (*Helix* and, *Helicella*, *Theba*, *Zebrina*) and slugs (*Limax*, *Agriolimax*) act as intermediate host.
- Adult worms in the lungs lay eggs where L1-larvae developed that hatch still in the bronchi and trachea.
- These larvae are coughed up along with coughing material /sputum and swallowed, then shed with the feces.
- In the environment these larvae penetrate into the snails and develop to infective L3-larvae in a few weeks to several months, strongly depending on weather conditions and snail species.
- The infective larvae can survive up to 2 years inside their intermediate host.
- Livestock becomes infected after eating contaminated snails or slugs while grazing. L3-larvae are released after digestion.
- The larva migrate to lungs where they complete development to adult worms and begin producing eggs.

Worm Life-cycle

**Host stage
16-21 days*
to complete**

Adults lay eggs



Eggs in dung

**Free-living stages
2 - 12 weeks
to complete**



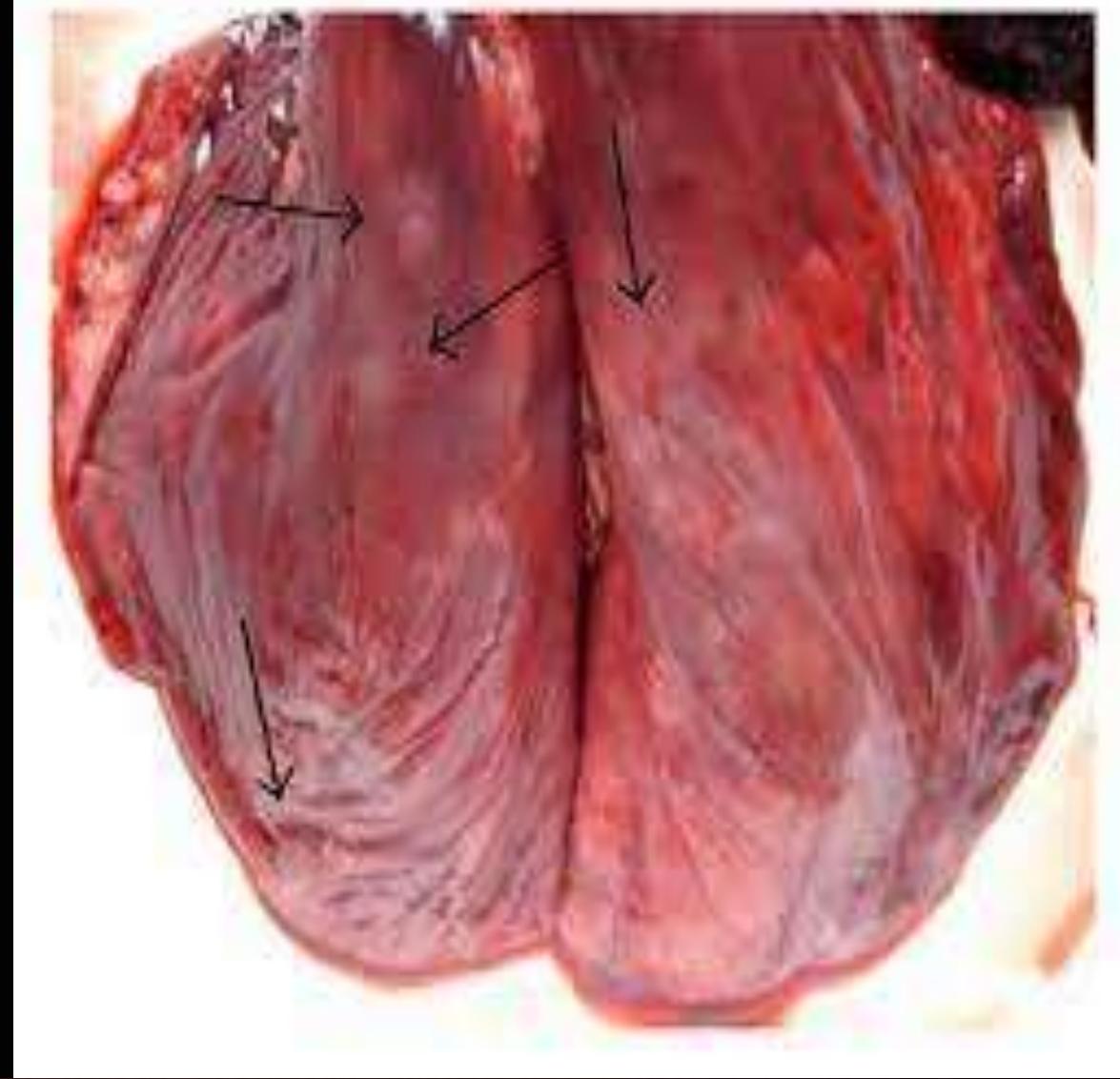
*In the autumn L3 may "arrest" and over-winter in the sheep

1st stage larvae in dung

2nd stage larvae in dung

Muellerius : Pathogenesis

- *M. capillaris* is less pathogenic in sheep, because it normally only affects the subpleural space.
- The affected goats may showing signs of coughing, pneumonia, weight loss, reduced weight gains, and lethargy skin coat.
- More serious infections result in bronchopneumonia and eventually death of the animal.
- Nodular lesions in the lungs will also be visible upon a necropsy, the nodules may be filled with white pus.



Muellerius : in lungs

Source- Google

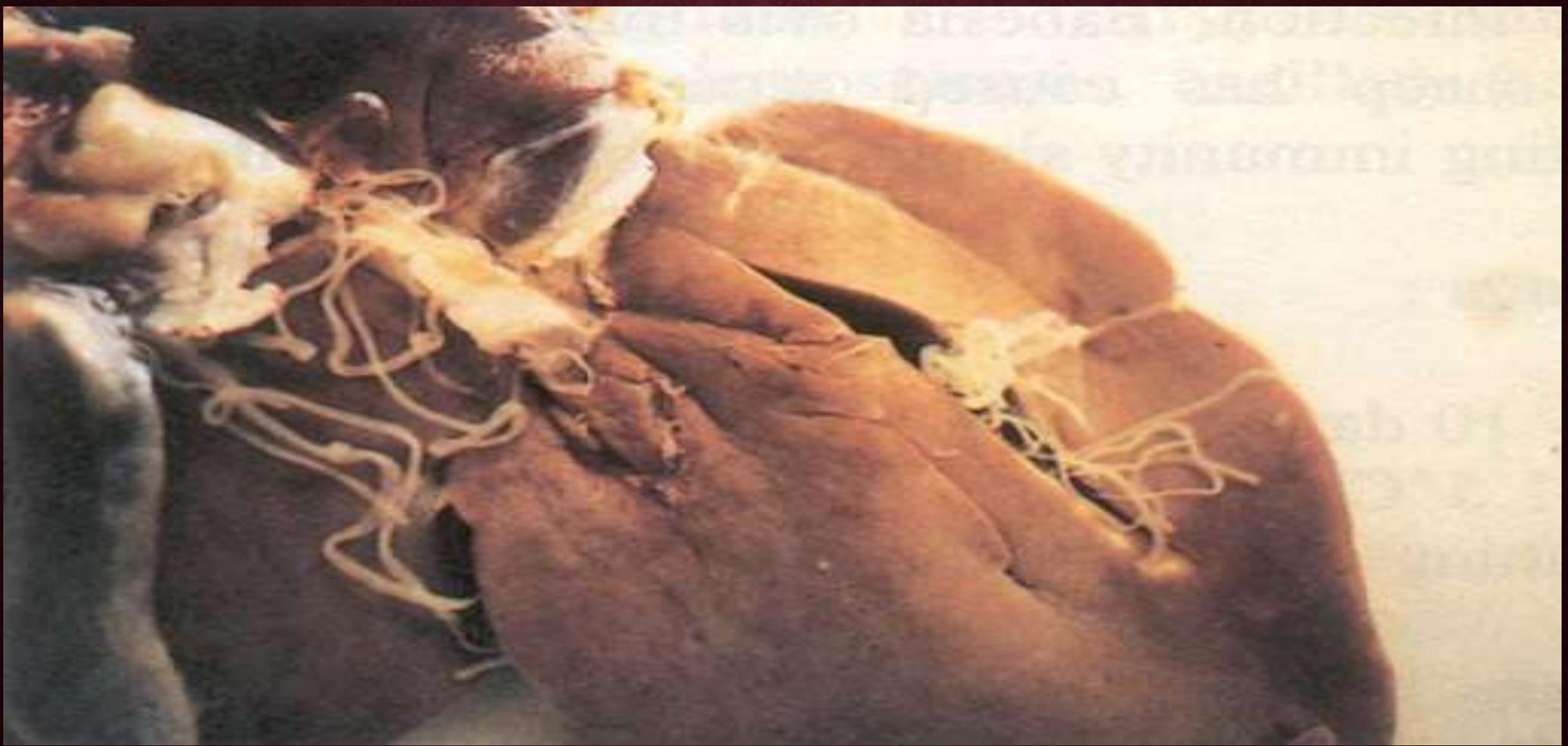
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Source- Google

Nodules on lungs surface

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Source- Google

Muellerius in lungs

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Muellerius : Diagnosis

- Examination of faecal sample for detection of eggs in faeces.
- In postmortem examination, small, white, and threadlike worms can be seen in the lung tissue.
- Pus filled nodular lesions also detected in the lungs during postmortem examination.



Source- Google

Source- Google

Muellerius : Eggs

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Muellerius : Prevention & control

- Prevention and control of *M. capillaris* is difficult, because the snail and slug, the intermediate hosts are present everywhere, and the parasite can survive in the intermediate host for years.
- But effective pasture drainage and use of chemicals may minimize snail and slug populations.
- In sheep the worm is less pathogenic so treatment is normally unnecessary.
- Ivermectin and benzimidazole can be used to kill the adult worms in goats.
- Daily doses of fenbendazole or albendazole for 1-2 weeks will destroy all life stages in goats.