

Genus : Protostrongylus

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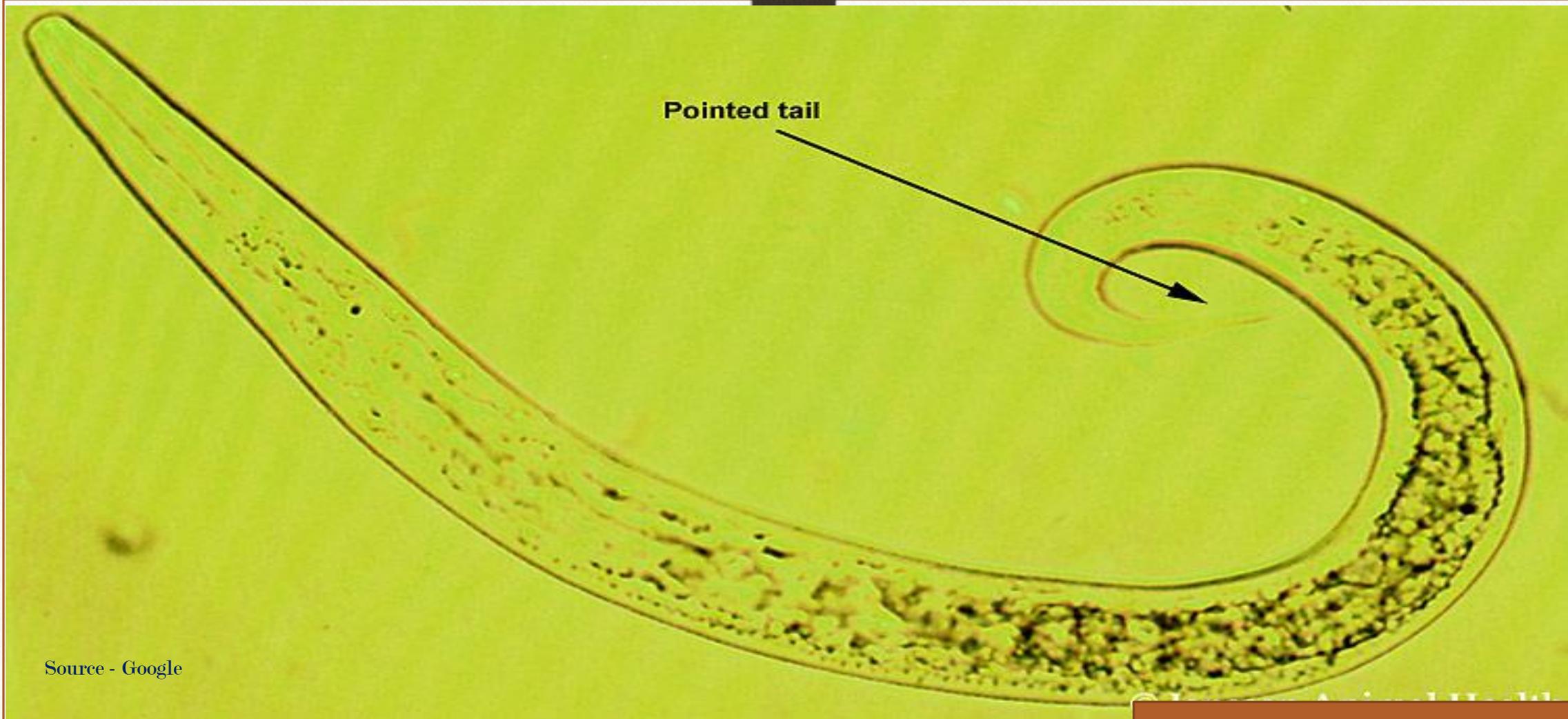
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Protostrongylus : Morphology

- They are of a reddish to brownish color.
- The males are shorter than females.
- The body of these worms is covered with a cuticle, which is flexible.
- 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.



Pointed tail

Source - Google

Protostrongylus

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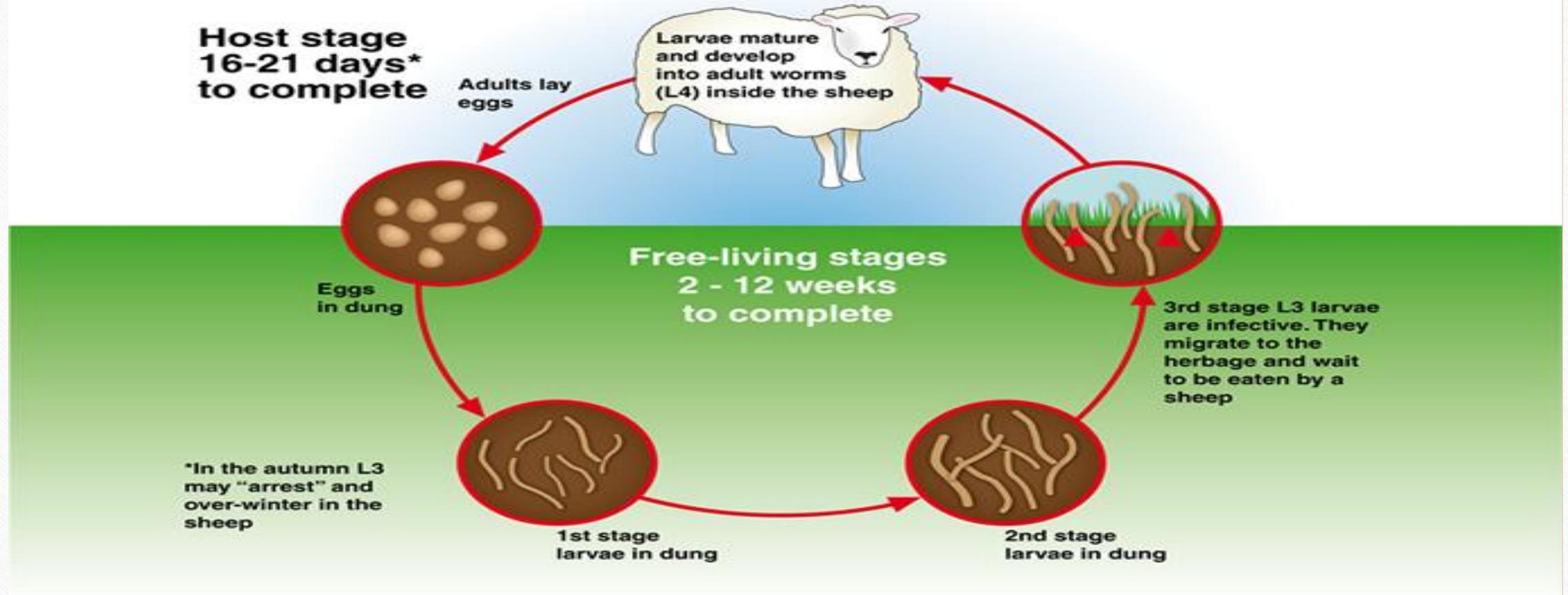
Protostrongylus : Life cycle

- 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.

Protostrongylus : Life cycle.... contd.

- 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



Protostrongylus : life cycle

Protostrongylus : Pathogenesis

- The worms acts as causative agents of verminous bronchitis in sheep and goats.
- Infected animals show light clinical signs such as general weakness or mild respiratory disturbances.
- Heavy infections may cause bronchopneumonia and pleurisy (inflammation of the lining surrounding the lungs), particularly in weak animals .
- Infections with secondary bacteria can also happen.
- Acquired natural resistance of sheep and goats to these worms after repeated exposure seems to be quite low.



Source- Google

Protostrongylus : lesions in lungs

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Source- Google

Protostrongylus : lesions in lungs

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Protostrongylus : Diagnosis

- **Diagnosis** is based on clinical symptoms and is confirmed by larvae found in the feces .
- The larvae can be identified with a characteristic tapering tail and a wavy outline ~~but without dorsal spine.~~
- At necropsy typical nodules are found in the lungs.



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Source- Google

Protostrongylus : Eggs

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Protostrongylus : Prevention & control

- Prevention is difficult because snails and slugs are ubiquitous.
- Effective drainage and keeping the pastures dry will reduce the snail population.
- Chemical control of the snails with molluscicides such as ~~copper sulphate, sodium pentachlorophenate, niclosamide~~, etc.
- Broad spectrum anthelmintics like benzimidazoles and levamisole are only partially effective against these worms.
- So far no vaccine is available against *Protostrongylus rufescens*.