Practical # 5 - Nematodes 1

General morphology of nematodes and trichostrongylid nematodes of ruminants

(Prac manual, p. 90-112)

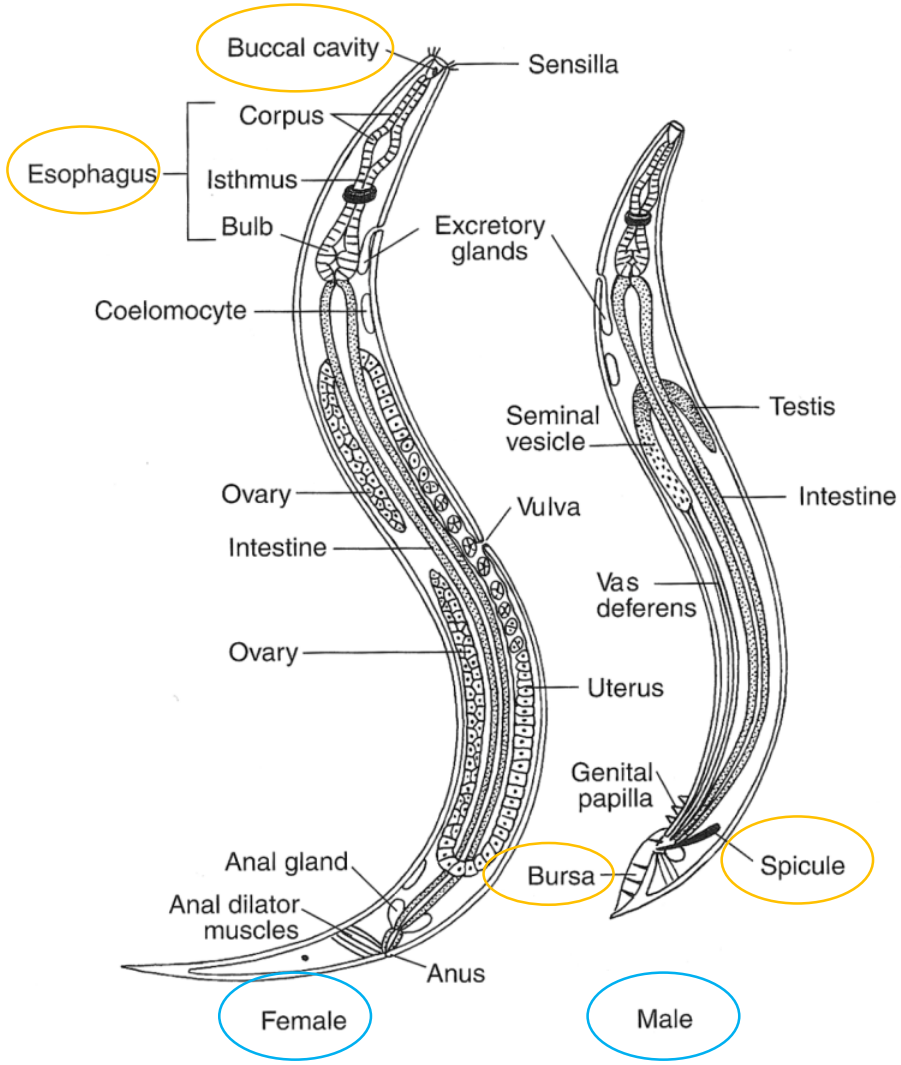
Intended Learning Outcomes

- To identify nematodes grossly and histologically
- To observe the motility of nematodes
- To identify various genera of trichostrongyloid nematodes using their morphological characteristics
- To differentiate various species of *Trichostrongylus* using their spicule morphology
- To setup the faecal culture for identification of nematodes
- To observe the morphology of L3 of *Haemonchus contortus*

Part A - General features of nematodes

Identification of nematodes

- The images on the right show general morphology of nematodes. Spot the differences between female (left) and male (right) worms.



Nematode general characteristics

General features of nematodes (video):
https://www.youtube.com/watch?v=BniTH0so70I

- This video compares the morphology of male and female nematodes

Free-living rhabditids

Caenorhabditis elegans under the microscope (video):
https://www.youtube.com/watch?v=Y0rRmkFmROw

- This video demonstrates different stages of nematodes, their motility, ingestion of food by them.

Soil nematodes infecting insects

Entomopathogenic nematodes (video):
https://www.youtube.com/watch?time_continue=38&v=jM4kZsQntxU&feature=emb_logo

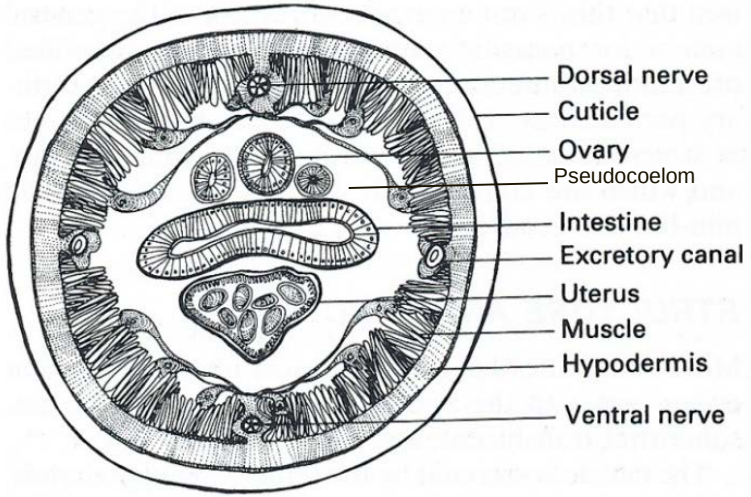
- This video demonstrates how some nematodes could be beneficial in controlling insects of plants.

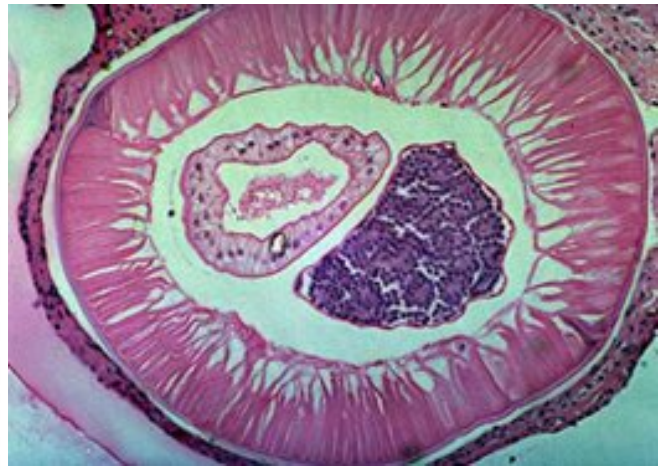
Part A - General features of nematodes

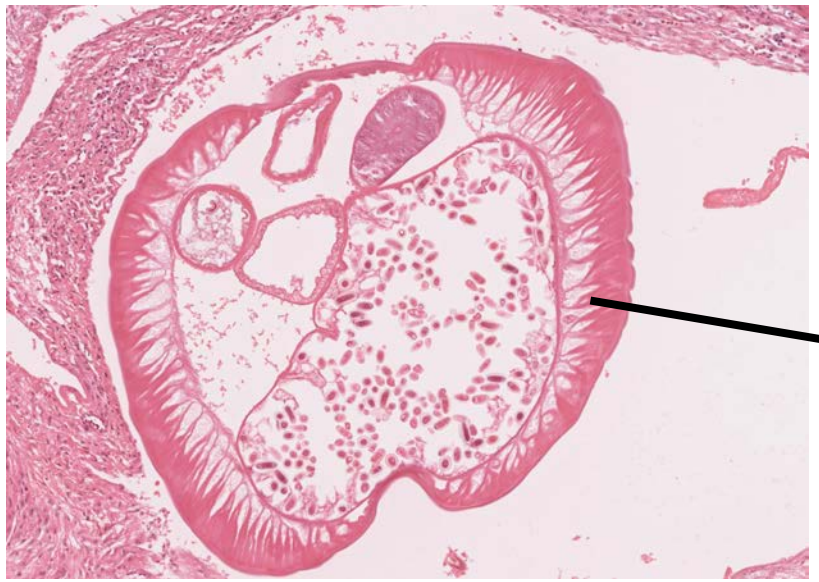
Histological sections of *Serratospiculum sp*. (filarioid nematode found in air sacs of birds)

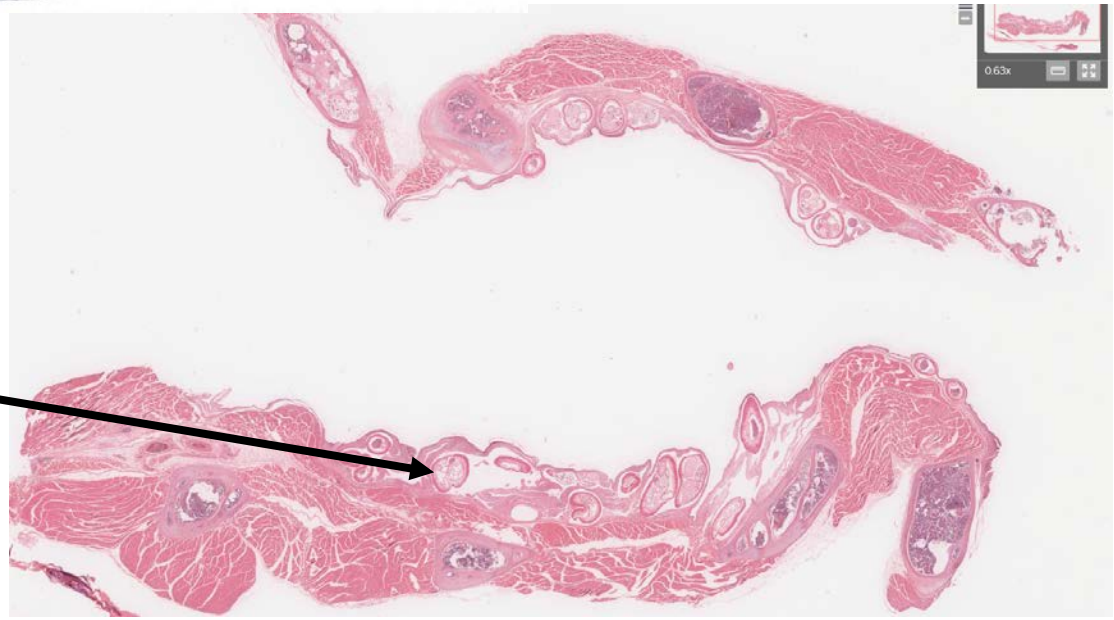
Transverse sections of typical nematode (*Serratospiculum sp*.). Refer to general morphology of nematodes p.91, lab manual

Cross sections of nematodes









Histological section of the air sac of a falcon infected with *Serratospiculum sp*

Part B – Identification of strongylid nematodes

SIMPLIFIED KEY TO THE GENERA AND SUBFAMILIES OF STRONGYLIDA

1a.	Buccal capsule well developed	2
1b.	Buccal capsule vestigial	8
2a.	Buccal capsule bent dorsally	Ancylostomatoidea 3
2b.	Buccal capsule directed anteriorly or ventrally	Strongyloidea 4
3a.	Teeth present at mouth opening	*Ancylostoma*
3b.	Cutting plates present	*Uncinaria*
4a.	Mouth hexagonal, very large, parasites of respiratory or urinary systems	Syngamidae
4b.	Mouth opening circular, parasites of gastrointestinal tract	5
5a.	Dorsal ray with 3 pairs of branches, parasites of horses	6
5b.	Dorsal ray with 2 pairs of branches, parasites of ruminants	7
6a.	Buccal capsule globular	Strongylinae
6b.	Buccal capsule cylindrical	Cyathostominae
7a.	Buccal capsule globular	*Chabertia*
7b.	Buccal capsule cylindrical	*Oesophagostomum*
8a.	Bursa well developed	Trichostrongyloidea 9
8b.	Bursa vestigial, lungworms	Metastrongyloidea (lungworms)
9a.	Spicule material spongy, parasitic in bronchi	*Dictyocaulus*
9b.	Spicules solid, parasitic in gut	10
10a.	Female viviparous, in stomach of cat, fox, pig	*Ollulanus*
10b.	Female oviparous	Trichostrongylidae 11
11a.	Spicules long, slender	*Nematodirus*
11b.	Spicules short, complex	12
12a.	Dorsal ray asymmetrical	*Haemonchus*
12b.	Dorsay ray symmetrical	13
13a.	Cephalic swelling present	*Cooperia*
13b.	Cephalic swelling absent	*14*
14a.	Parasitic in abomasum; cervical papillae prominent	**Teladorsagia/Ostertagia*
14b.	Parasitic in intestine (except *T. axei*); cervical papillae unapparent	*Trichostrongylus*

**Teladorsagia* sp. (sheep and goats) = *Ostertagia* sp. (cattle)

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5a. Dorsal ray with 3 pairs of branches, parasites of horses 6
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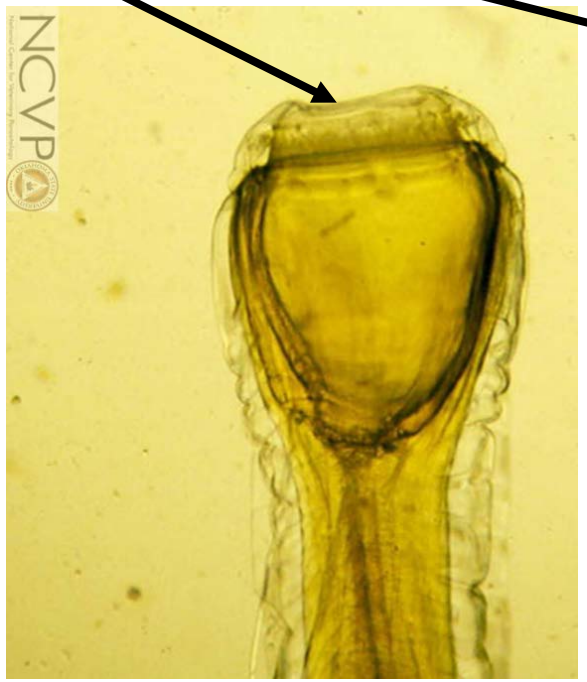
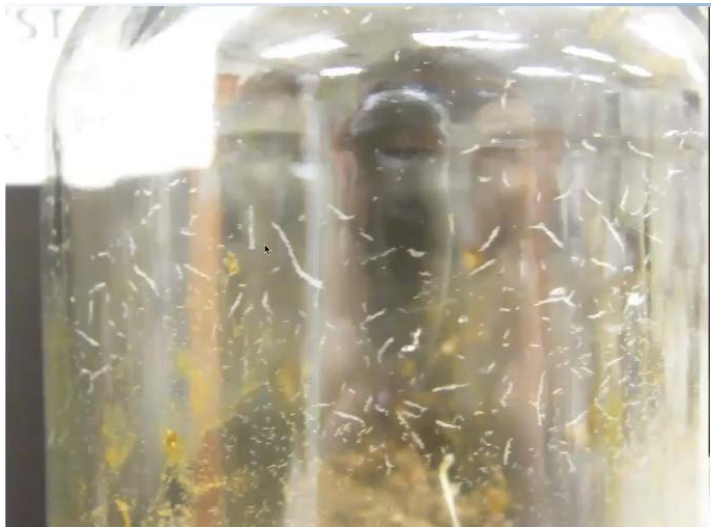


Part C – Identification of nematodes (faecal culture/coproculture/larval culture)

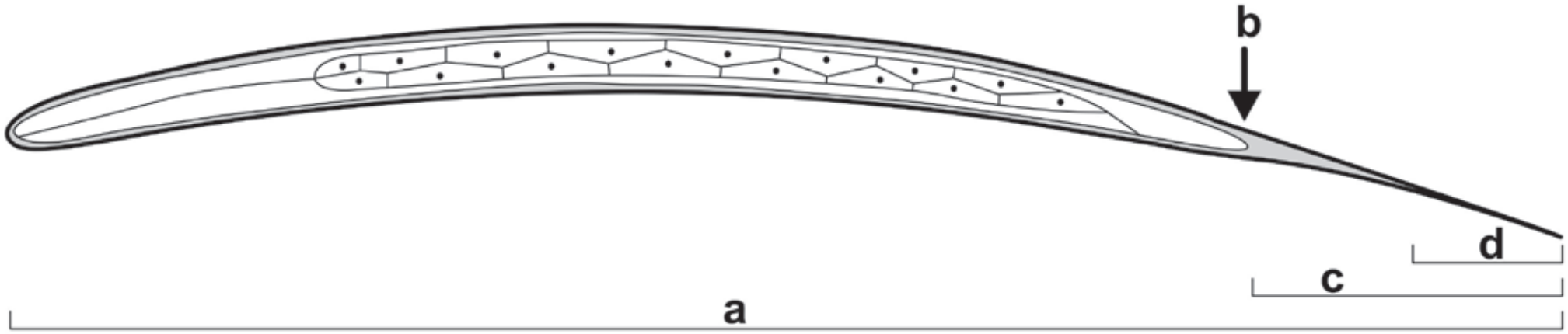
It is often essential to know which species/genera of nematode are present in sheep. If an autopsy and total (differential) worm count is not possible, the culture of larvae from the faeces of an infected animal will allow identification of trichostrongylid nematodes.

Method of faecal culture - see page 259 of lab manual (Appendix)
Larval culture preparation (video): https://www.youtube.com/watch?v=OrhyvK7k8Qw

Identification of infective nematode larvae - see page 260-264 of lab manual (Appendix)

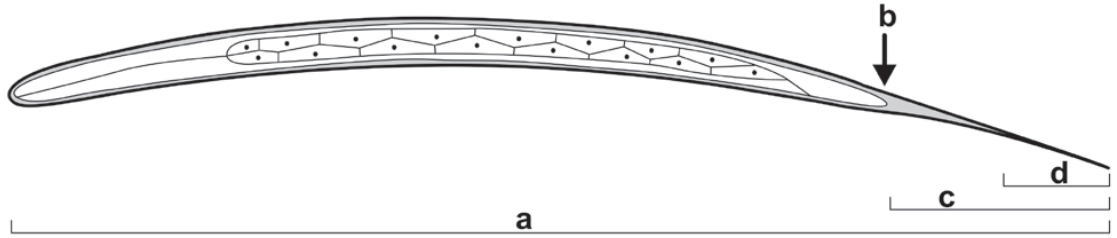


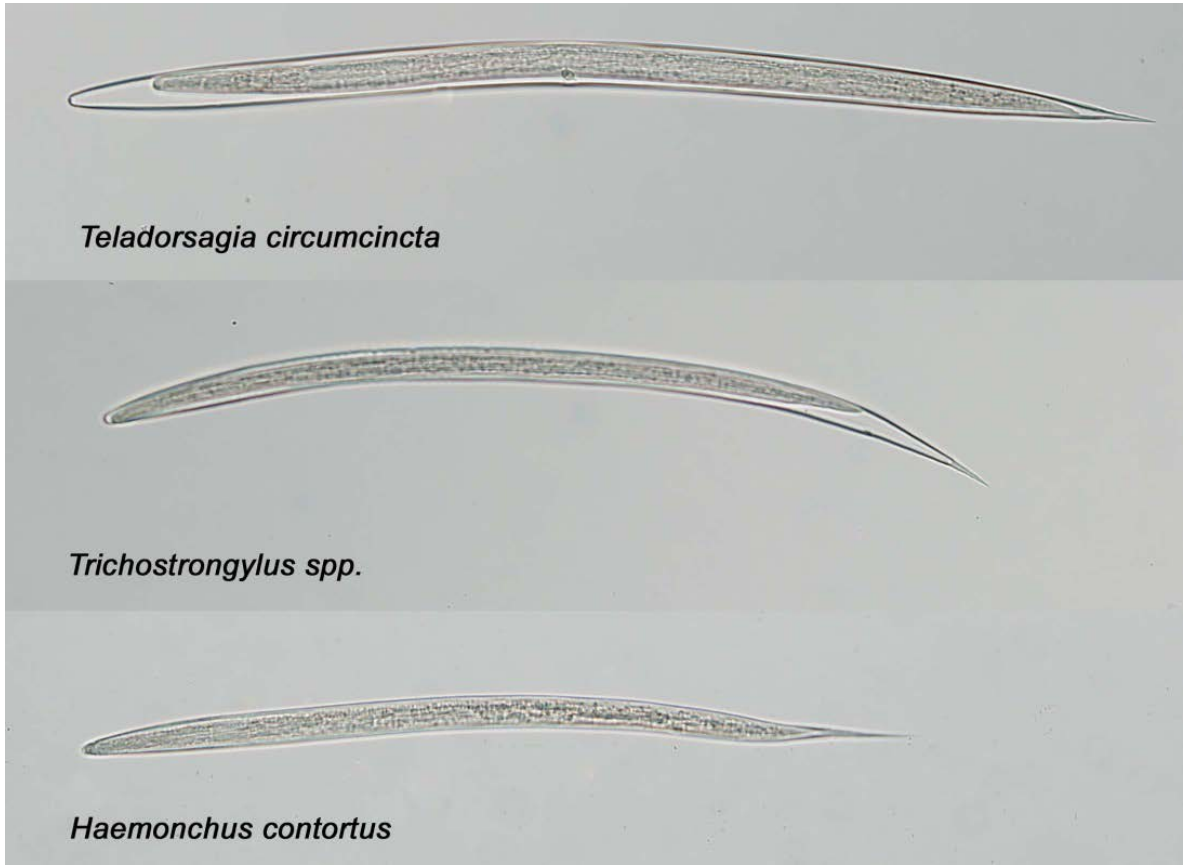
Identification of L3s of trichostrongylid nematodes



a - total length; b - tip of larval tail; c - sheath ; d - filament

Identification of L3s of trichostrongylid nematodes





Identification of L3s of trichostrongylid nematodes

- Larval morphology is used to identify various genera of trichostrongylid nematodes
- The image on right shows various morphological features which are used to identify common nematodes of sheep.
- Four important morphological features of larvae, including total length, tip of larval tail, sheath and filament are important in identifying the third larval stage of nematodes

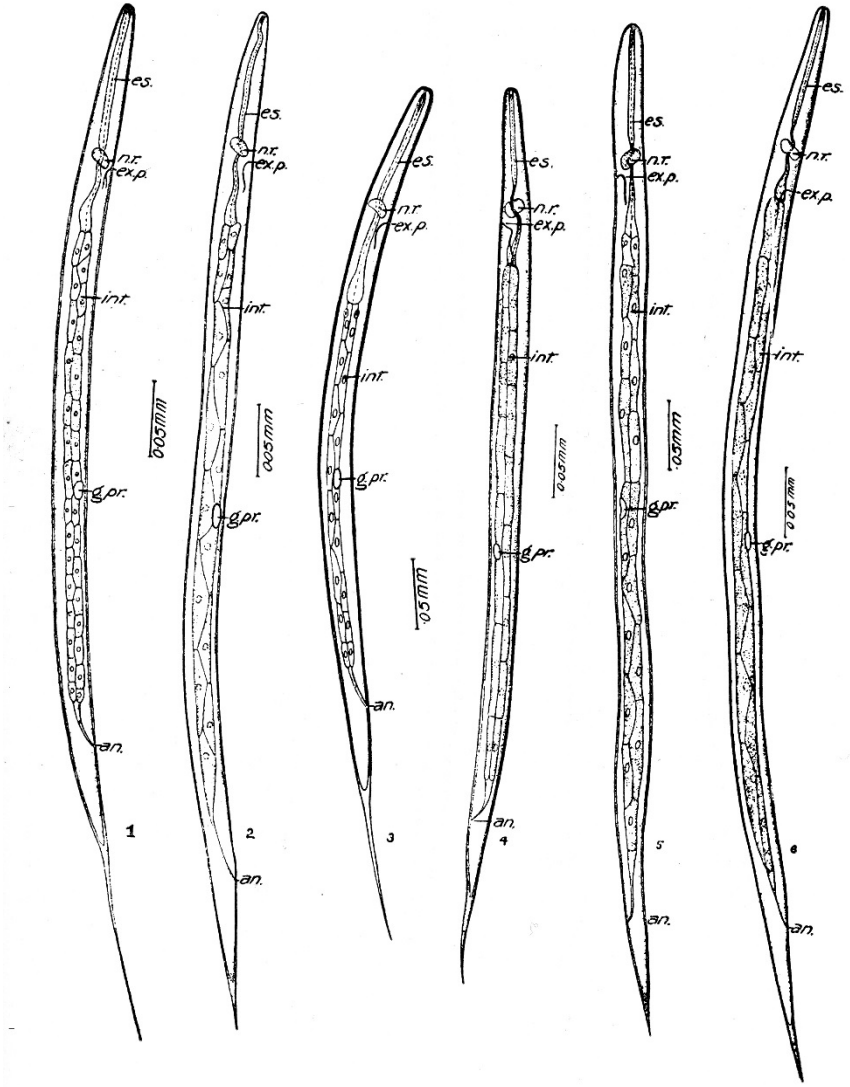


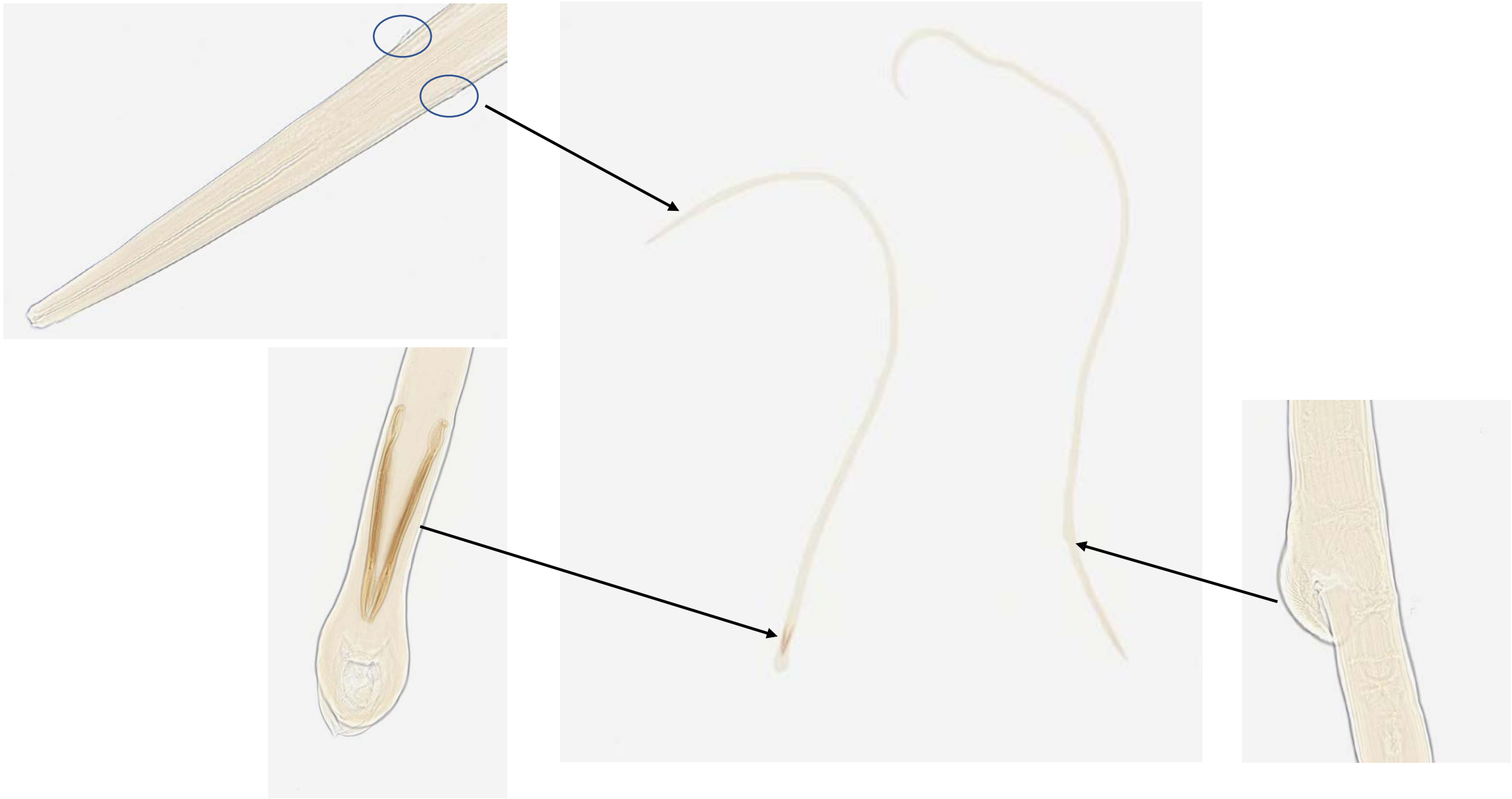
FIG. 74. Infective larvae of:
1. *Chabertia ovina*
2. *Trichostrongylus colubriformis*
3. *Bunostomum trigonocephalum*
4. *Haemonchus contortus*
5. *Trichostrongylus vitrinus*
6. *Ostertagia circumcincta*

(Key to abbreviations: an.—anus; b. c.—buccal cavity; es.—oesophagus; ex. p.—excretory pore; g. pr. genital primordium; int.—intestine; n. r.—nerve ring.)
(Reproduced with kind permission from Dr G. Dikmans and Dr John S. Andrews. Ref. *Trans. Amer. Microscop. Soc.* (1933) **52**, 1.)

Part E – Mystery/unknown specimens

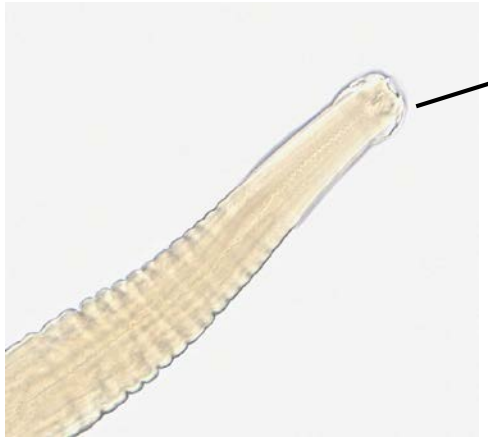
Unknown Specimen 1: worm from the *small intestine* of a sheep

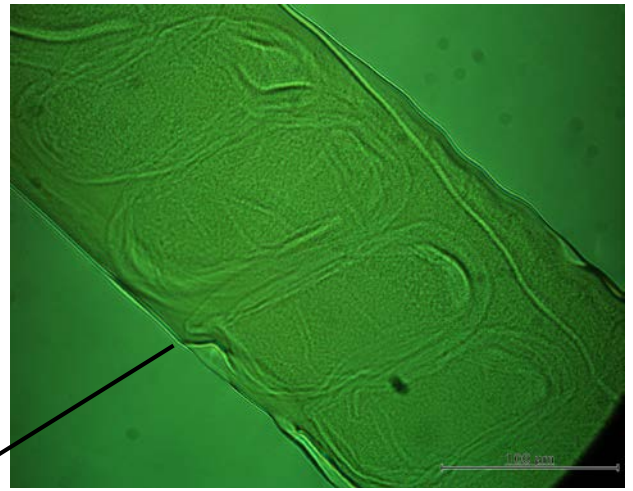
Unknown Specimen 2: worms from the *abomasum* of a sheep

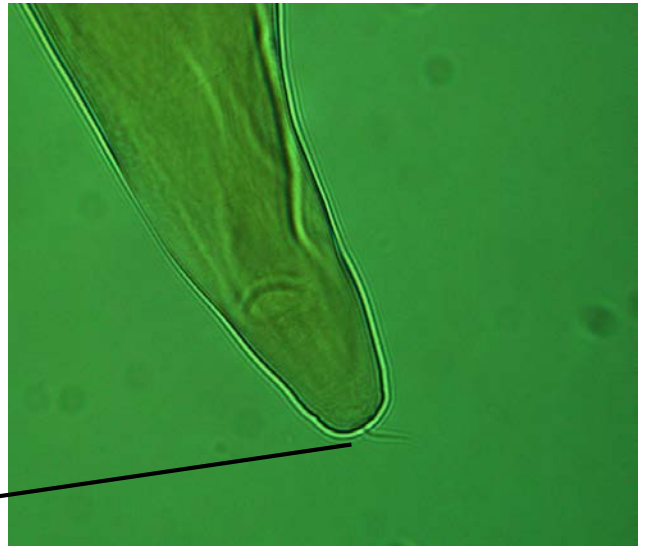


Unknown Specimen 3: worm from the *small intestine* of a sheep

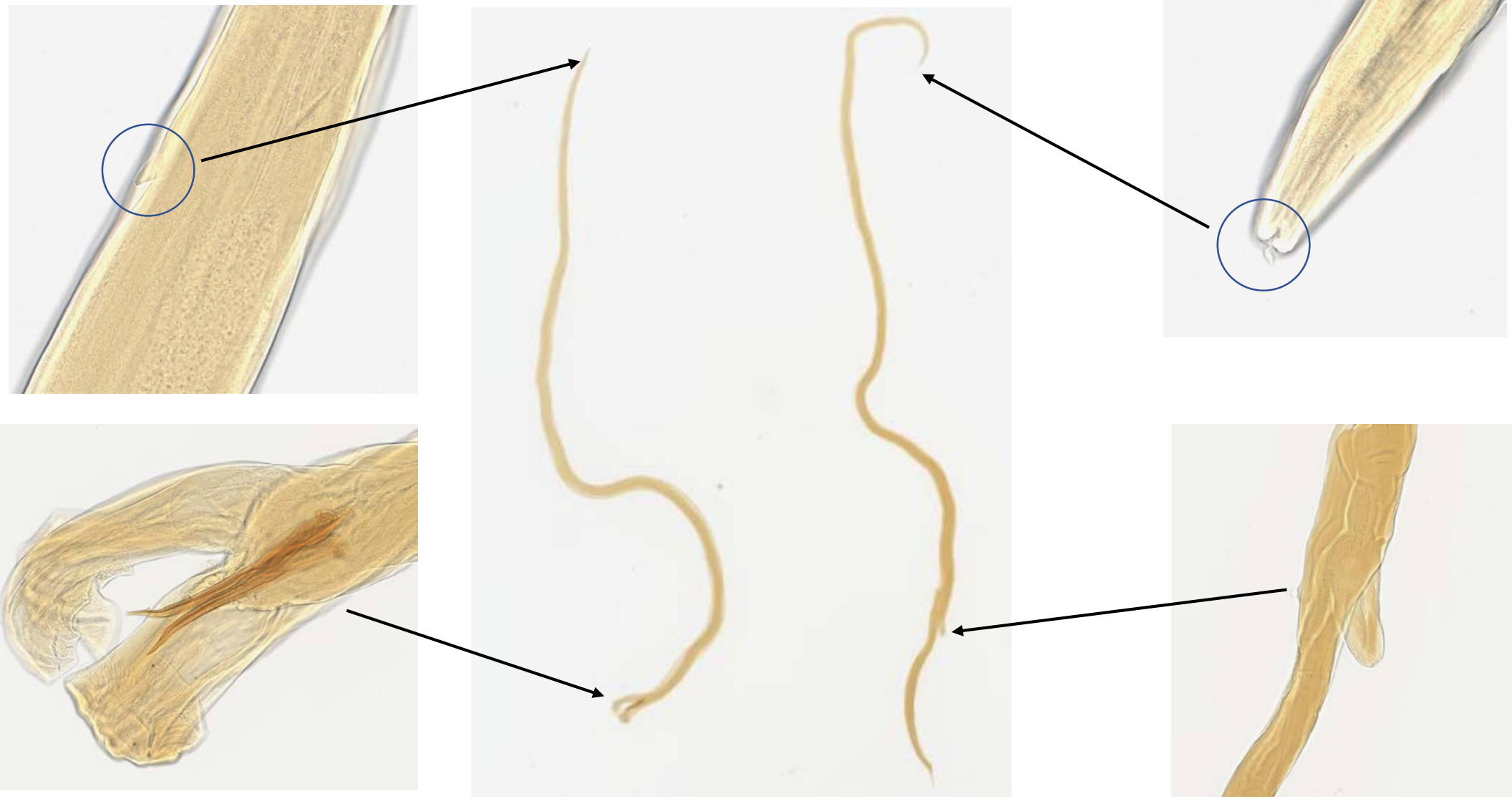
Unknown Specimen 4: worms from the *small intestine* of a sheep



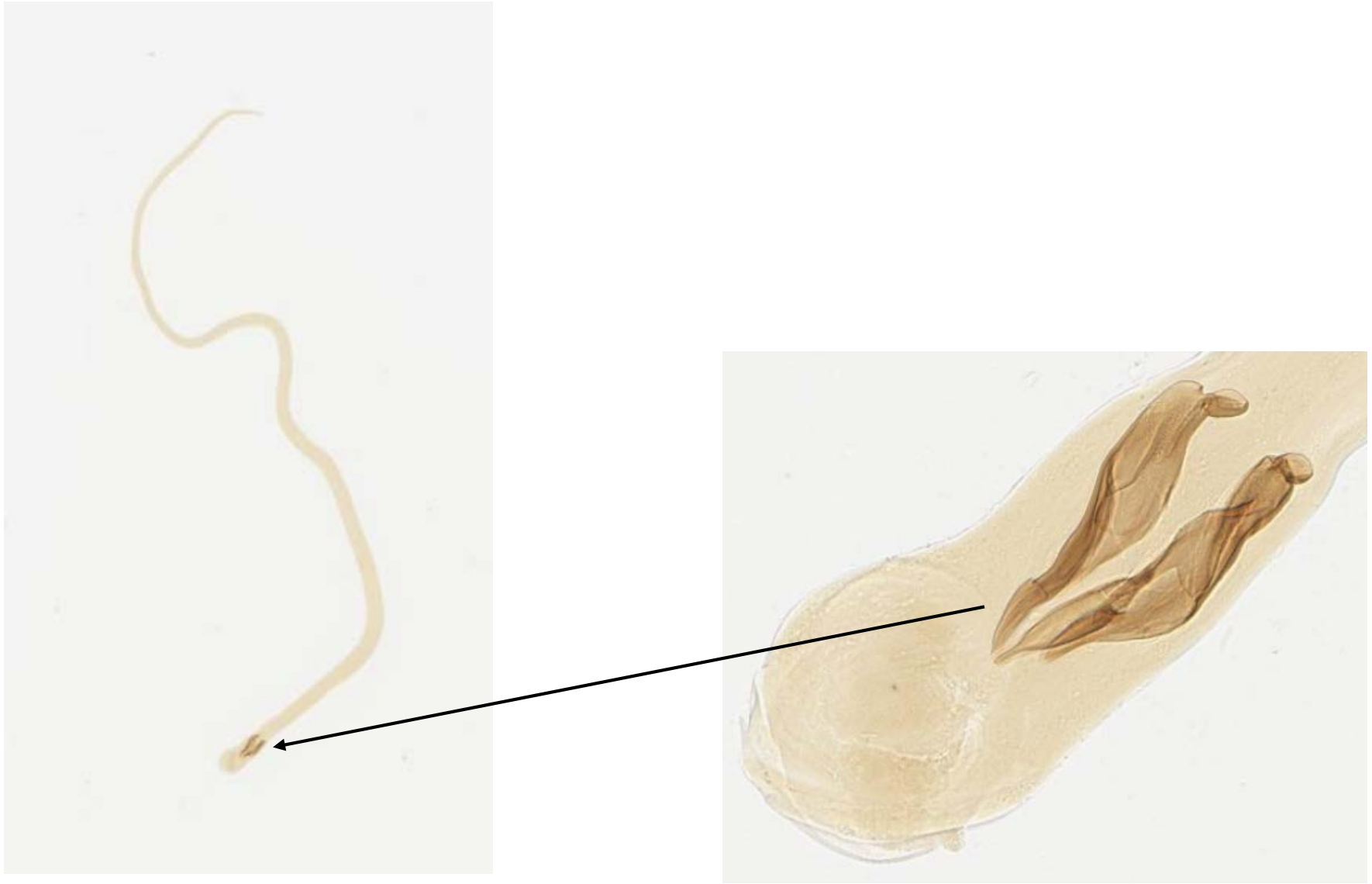




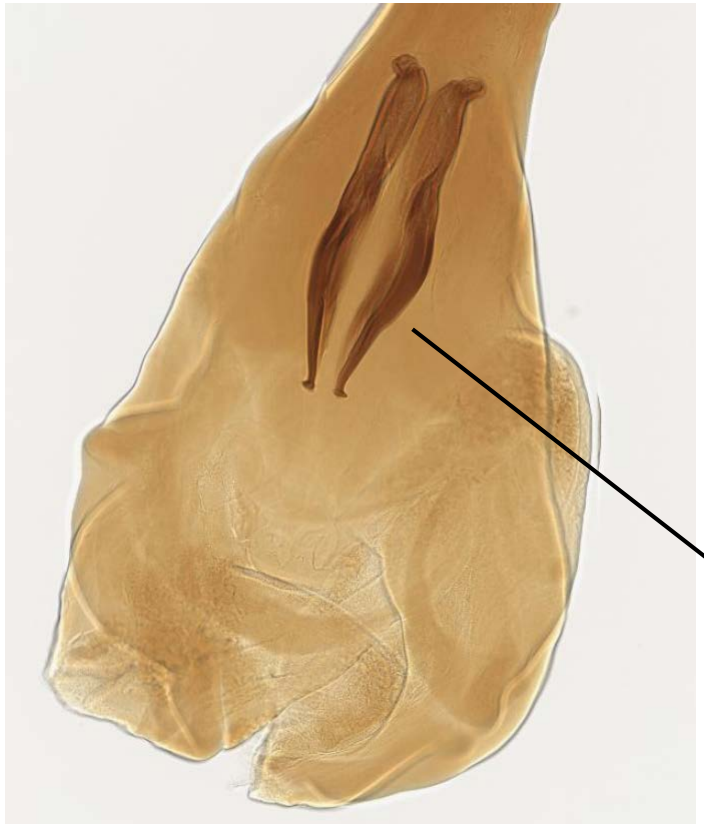
Unknown Specimen 5: worms from the *abomasum* of a sheep

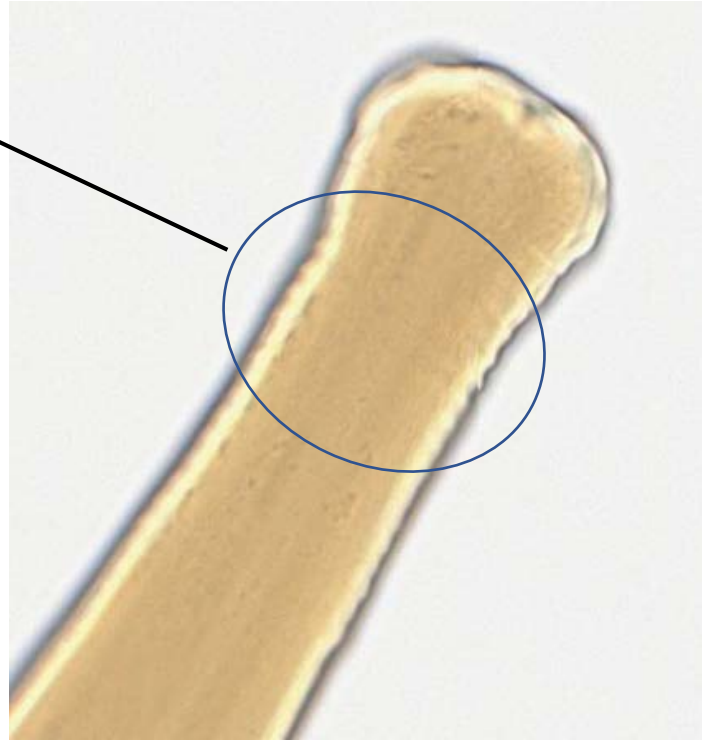


Unknown Specimen 6: worm from the *small intestine* of a sheep

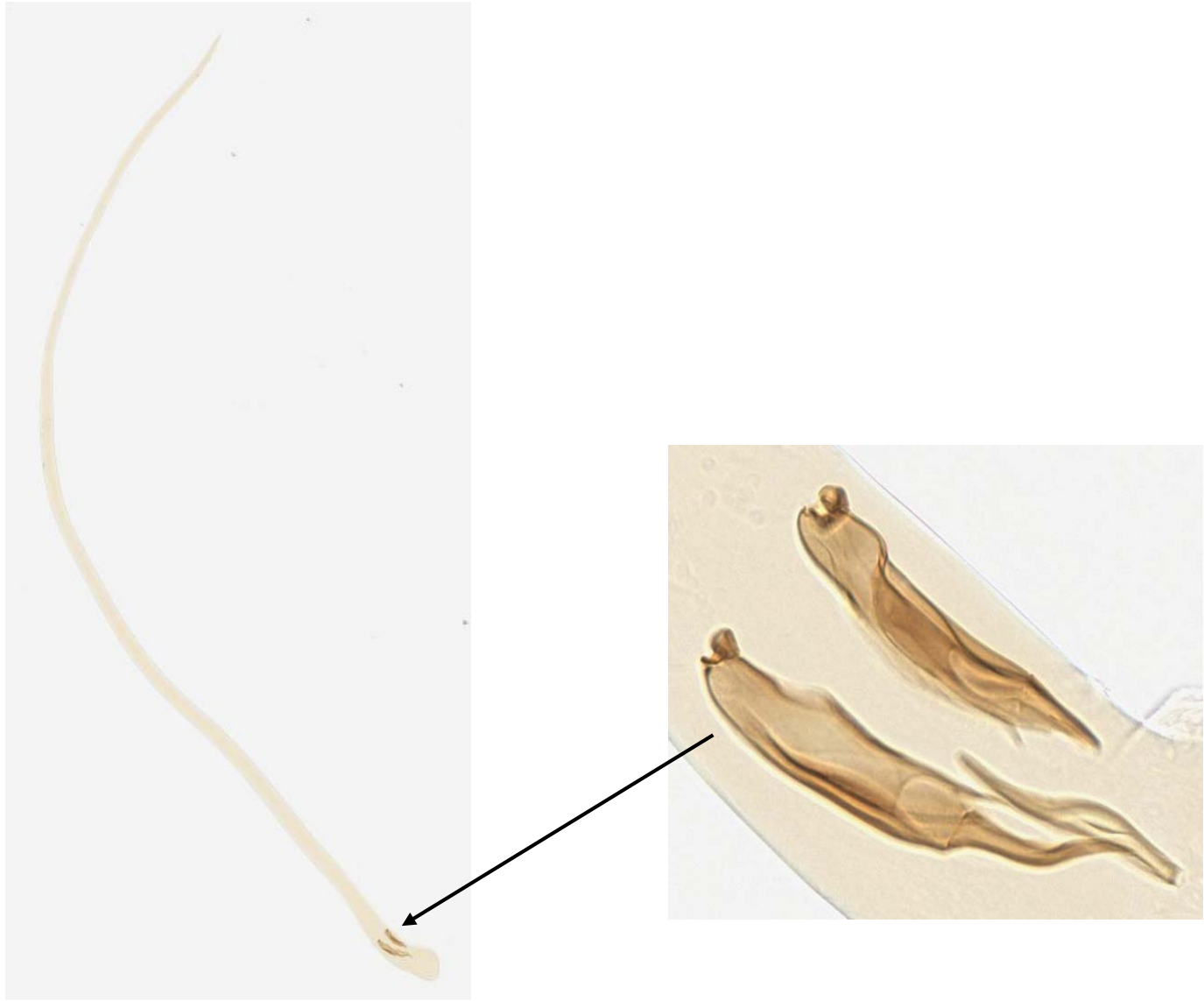


Unknown Specimen 7: worm from the *small intestine* of a sheep



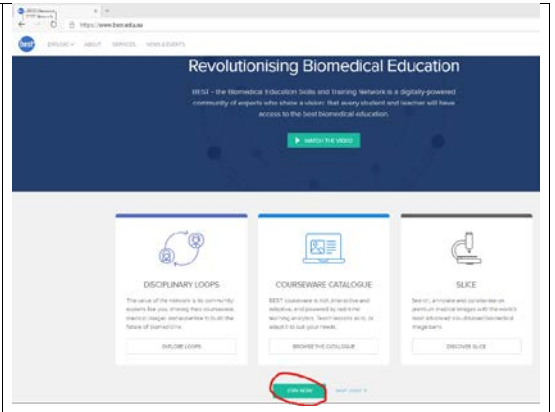
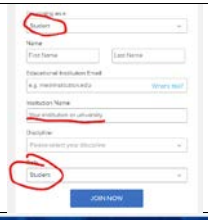
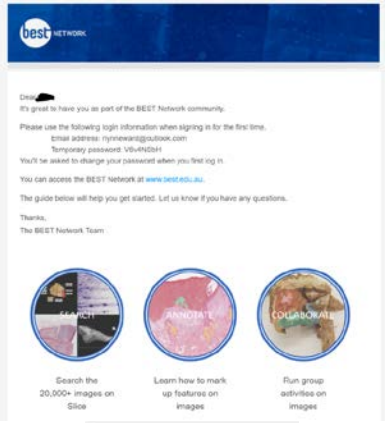
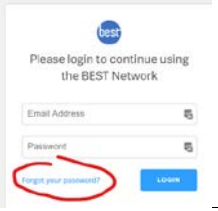


Unknown Specimen 8: worm from the *abomasum* of a sheep



To access specimen images, go to Best Network: https://www.best.edu.au/
Register to use Slice according to instructions ➞

How to register for online access to Slice (and the BEST Network)

1. Go to www.best.edu.au and click the green “Join Now” button.	
2. Fill in the form. You must say you are joining as a student to get an automatic logon. Please add your official university email here too (and be able to access it to respond!)	
3. You should get an email within a few minutes from BEST. Open the email you are sent and follow the link to get your temporary password for your account. The email will have tips on how to use Slice.	
4. If you have registered but have forgotten your password, you can just go to the BEST site and click on the “Forgot your password?” link – then follow the instructions in the email sent to you to create a new one	

Poll Everywhere Questions

CASE STUDY:

A 10-week-old Yorkshire terrier puppy was submitted to autopsy after three weeks of intermittent diarrhoea, vomiting and pain at defecation followed by sudden death. The clinical symptoms were first noted by the owner on the second day of arrival to the new home at the age of seven weeks. The nutritional condition was normal at necropsy. There was moderate oedema around the anus. In the duodenum and at the beginning of jejunum the mucosa was oedematous with moderate hyperaemia. The caudal small intestine and large intestine were moderately dilated with liquid contents. The colonic mucosa was dark red. Numerous small nematodes, larvae and ova were found in intestinal scrapings of the duodenum and also lesser amounts in other parts of the small intestine. Figure 1 shows various features of nematodes found in the small intestine of the puppy while Figure 2 shows histopathological changes in sections of small intestine.

What parasite(s) can cause such clinical presentation in young puppies?

Nematodirus spathiger

Haemonchus contortus

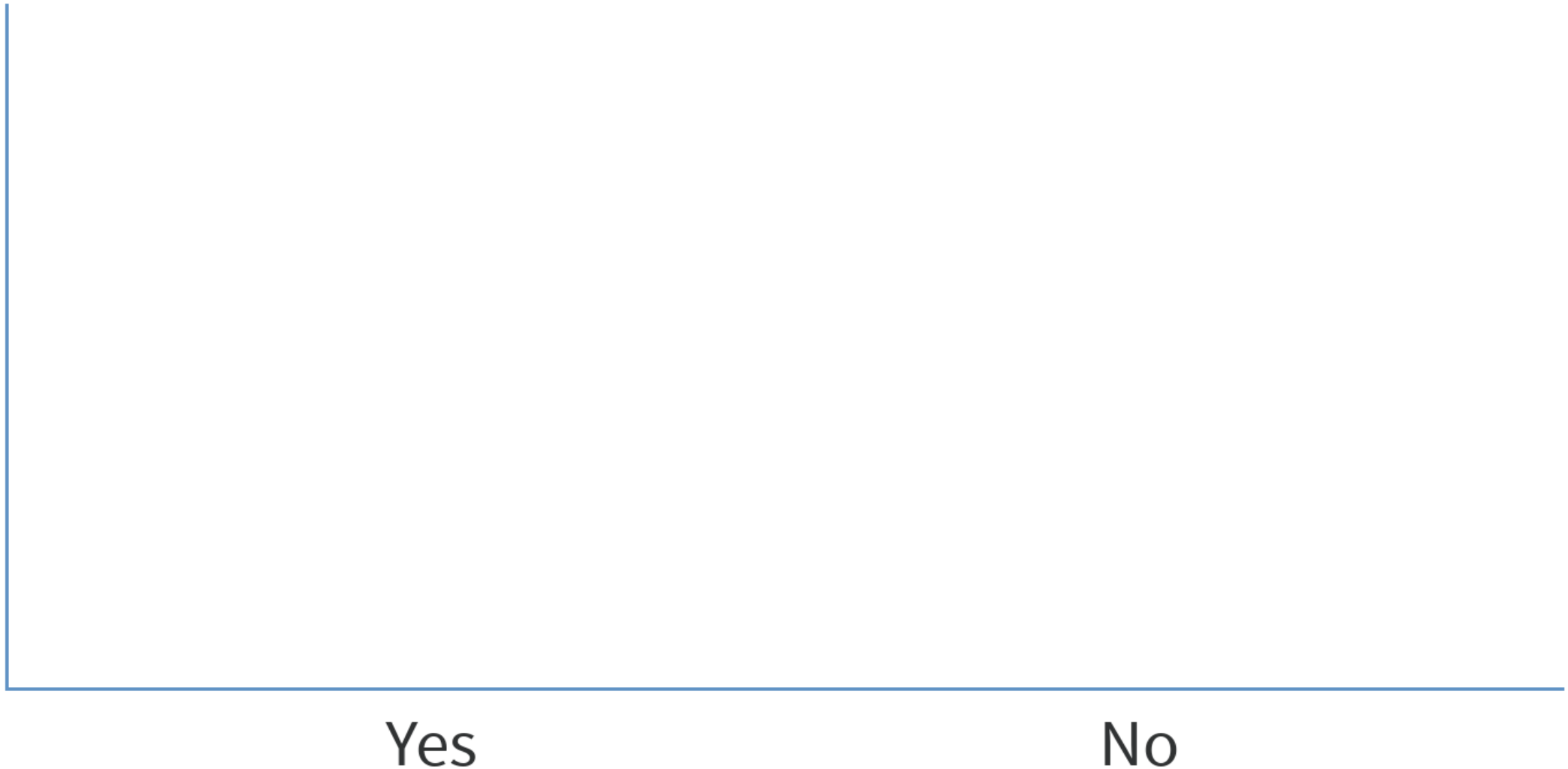
Strongyloides westeri

Hyostrongylus rubidus

Strongyloides stercoralis

What are the possible route(s) of transmission for this parasite?

Can the owner of the puppy acquire this parasite?



What implication(s) this parasite can have in the owner as he is suffering from an autoimmune disease?