Nematodes 2

BVM&S Parasitology

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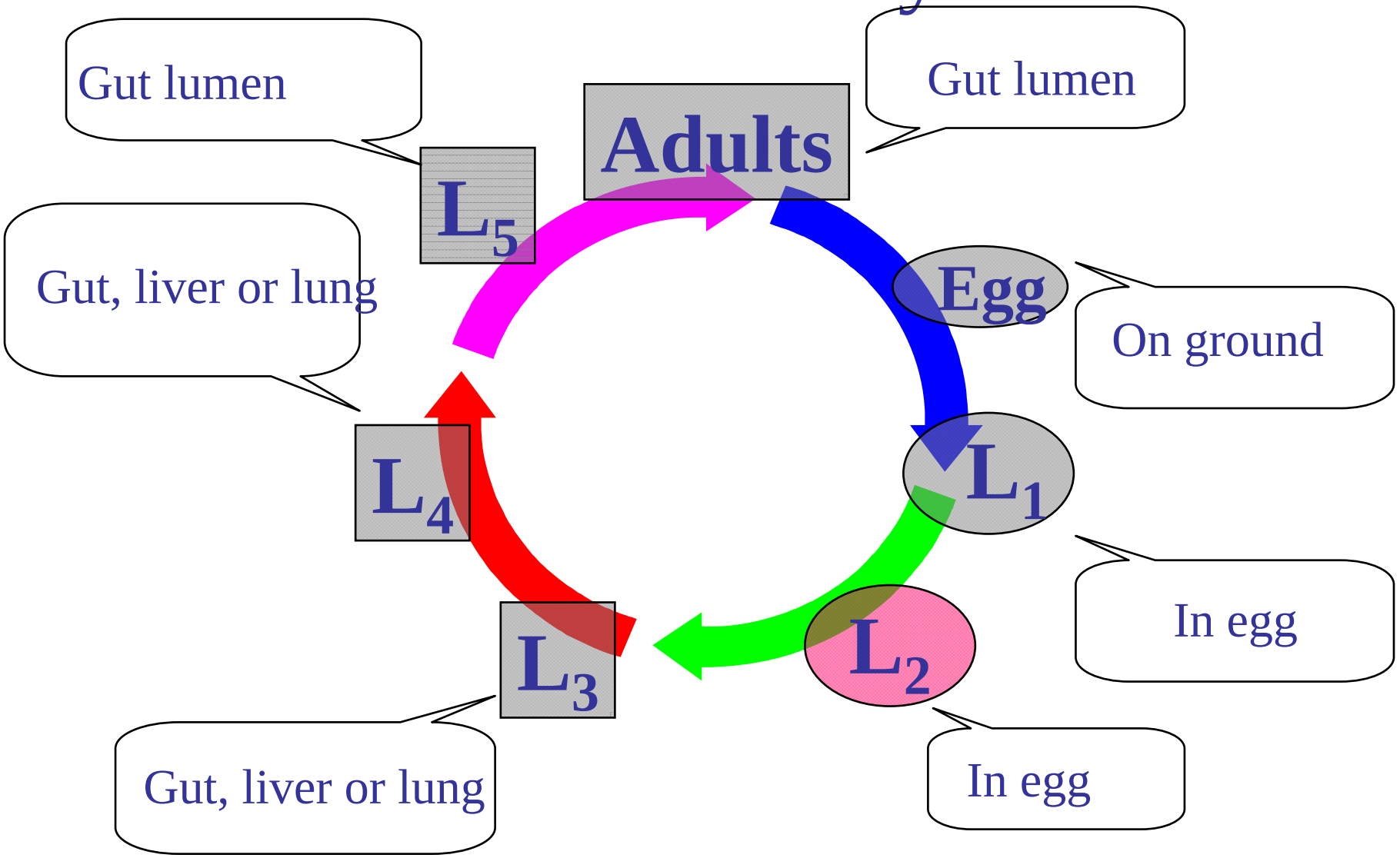
Lecture topics

- The Ascarids
  - Migratory & non-migratory species
  - Hypobiosis
  - Paratenic hosts
- The Strongyles
  - Tissue feeders
  - Migratory & non-migratory species
- The Hookworms
  - Blood feeders
  - Skin penetration

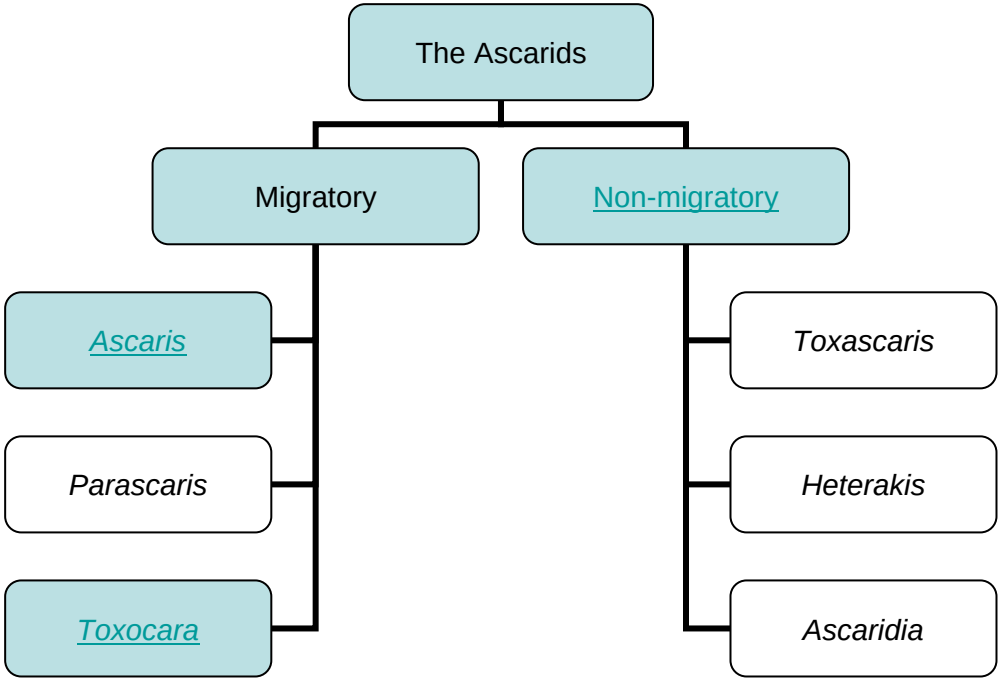
Main features of the Ascarids

- Nematodes with a **simple mouth** enclosed by three lips.
- Males lack a bursa
- The infective stage is the **L_2 larva** enclosed in the **thick-shelled egg** .
- Often have **paratenic hosts**.
- Important parasites of Pigs, horses, poultry, cats, dogs and humans.

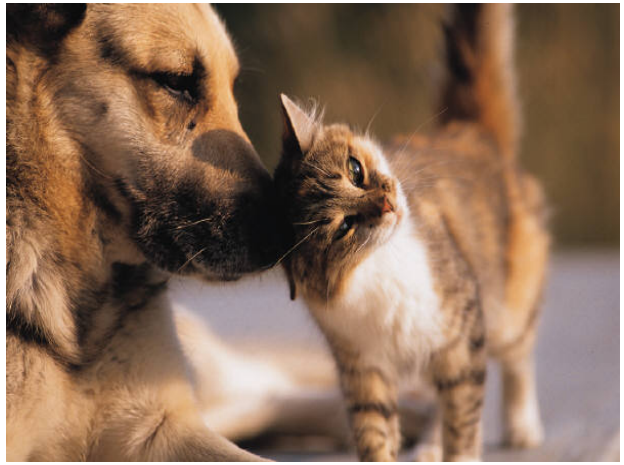
Ascarid life cycle



Groups that you need to know about



Important examples of non-migratory ascarids

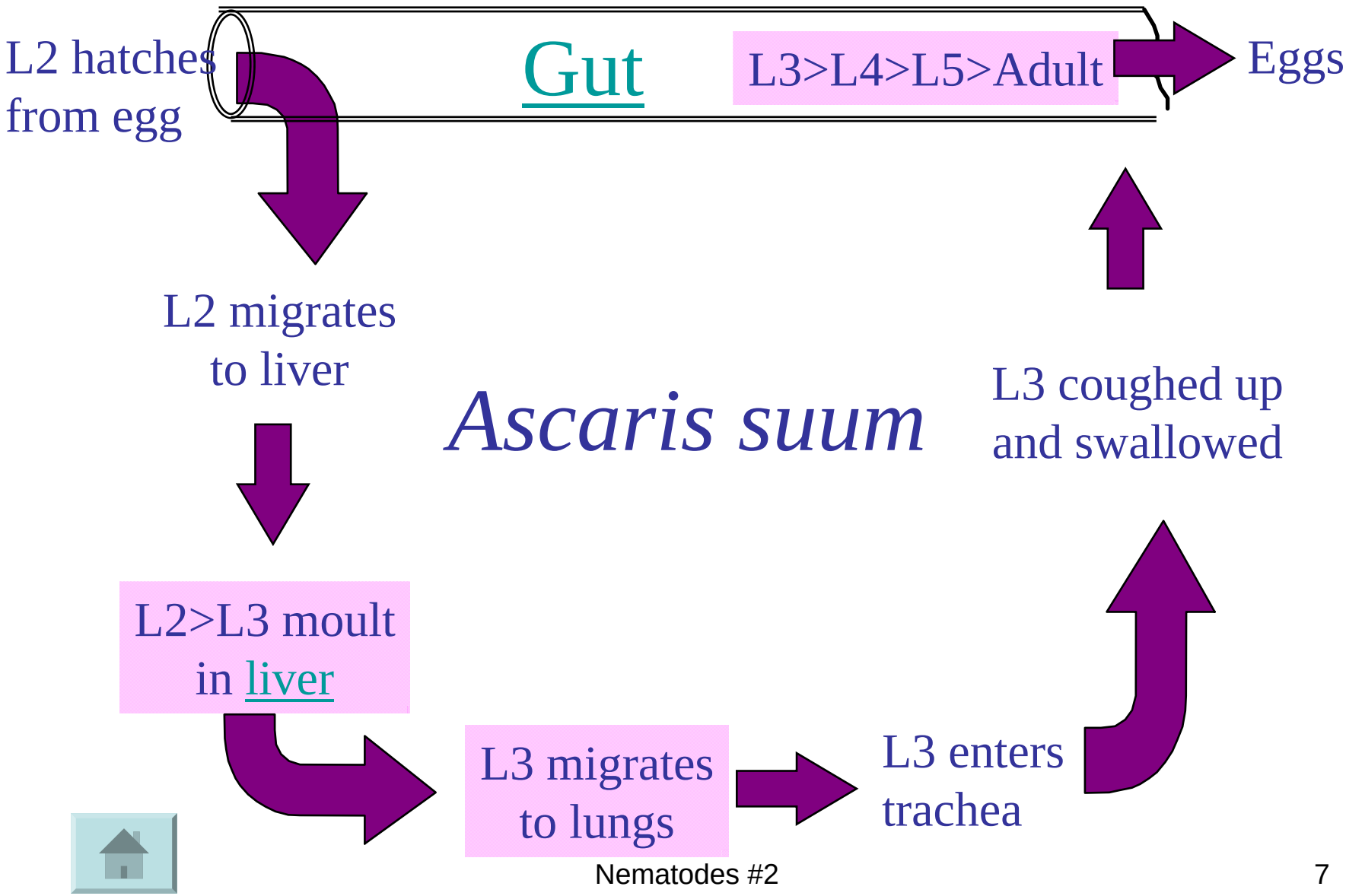


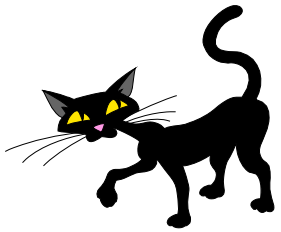
Dogs & cats

- *Toxascaris*

Poultry

- *Ascaridia*
- *Heterakis*


L2 hatches from egg
Gut
L3>L4>L5>Adult
Eggs
L2 migrates to liver
Ascaris suum
L3 coughed up and swallowed
L2>L3 moult in liver
L3 migrates to lungs
L3 enters trachea



Toxocara sp

- Large white worm (~10cm) found in the small intestine of **dogs and cats**.
  - *T.canis* - dogs.
  - *T.cati* (*T.mystax*)- cats.
- Hepato-tracheal ***and*** somatic migration
- Hypobiotic larvae
- Endogenous transplacental infection

Toxocara canis

Gut

L2 hatches in gut

L3>L4>L5>Adults

Eggs

Trachea

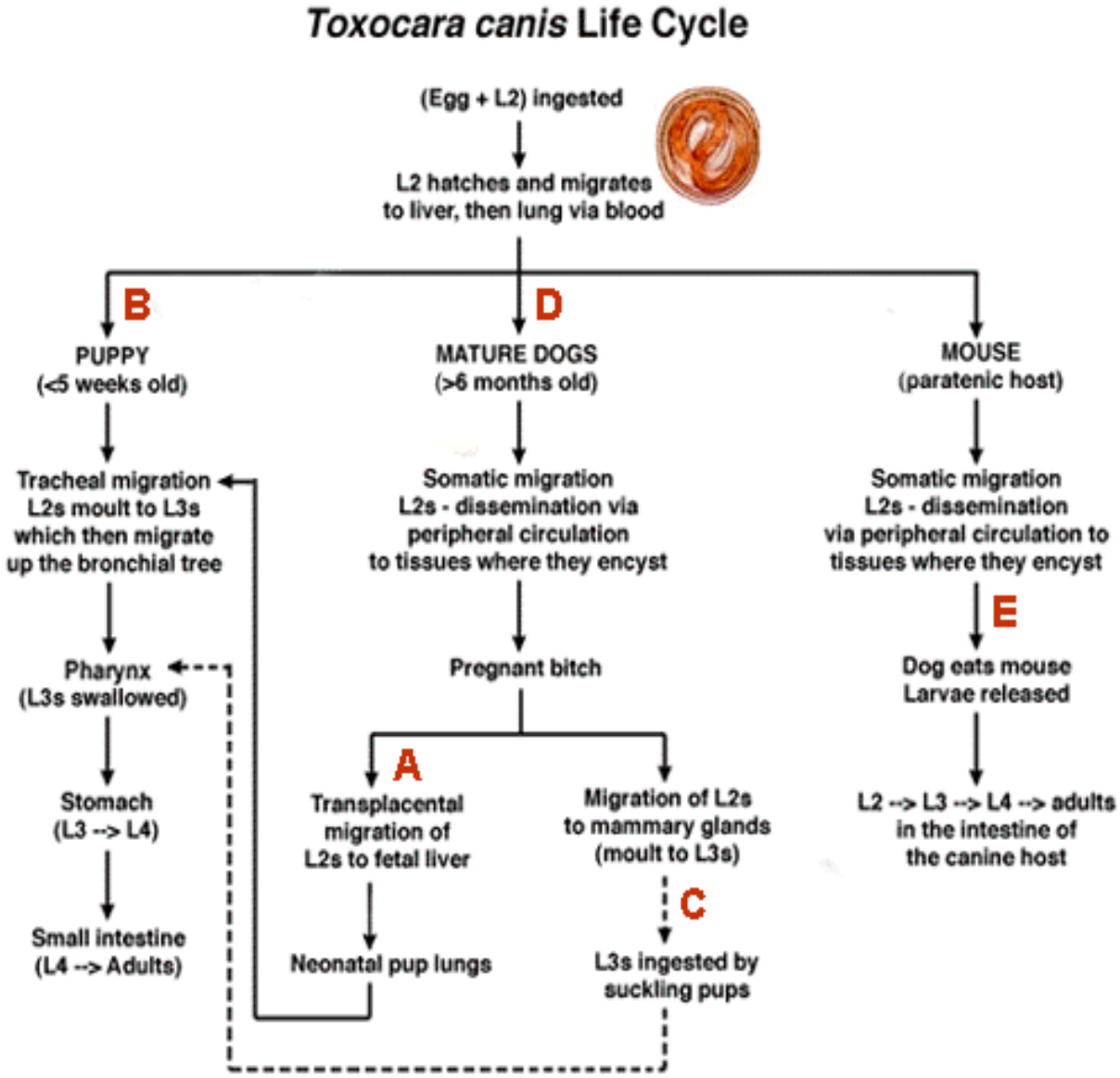
Liver

L2 inhibited in somatic tissues

L2>L3 moults in lungs

After 3 months of age

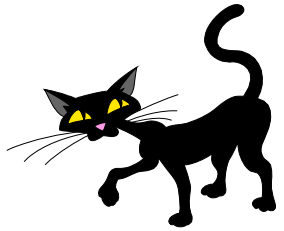
Up to 3 months of age


Toxocara canis Life Cycle
(Egg + L2) ingested
L2 hatches and migrates to liver, then lung via blood
B
D
PUPPY (<5 weeks old)
MATURE DOGS (>6 months old)
MOUSE (paratenic host)
Tracheal migration L2s moult to L3s which then migrate up the bronchial tree
Somatic migration L2s - dissemination via peripheral circulation to tissues where they encyst
Somatic migration L2s - dissemination via peripheral circulation to tissues where they encyst
E
Pharynx (L3s swallowed)
Pregnant bitch
Dog eats mouse Larvae released
A
Stomach (L3 --> L4)
Transplacental migration of L2s to fetal liver
Migration of L2s to mammary glands (moult to L3s)
L2 --> L3 --> L4 --> adults in the intestine of the canine host
C
Small intestine (L4 --> Adults)
Neonatal pup lungs
L3s ingested by suckling pups

T.canis – an *important zoonosis*

- Causes **visceral larva migrans**.
- Effects usually limited to the liver but can affect other organs such as the eye.
- Infection by **ingestion of infective eggs** from dog faeces leading to larval migration.
- **Children at particular risk** from close contact with dogs or areas that are contaminated with dog faeces.

Toxocara cati (mystax)



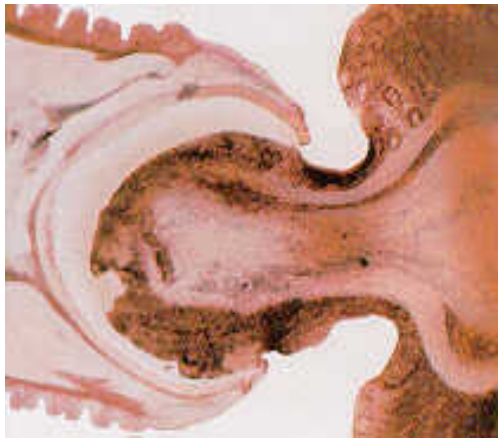
- Life cycle similar *T.canis*
- Transmission
  - principally **transmammary**
  - Ingestion of a paratenic host containing L_2
- **Prenatal** infection does not take place - compare with *T.canis*

The Strongyles

- Tissue feeders with large buccal capsule
- Bursate
- Infective form = ensheathed L_3 on pasture
- Migratory and non-migratory species
- Important parasites of
  - Ruminants
  - Equines

Adaptations for tissue feeding

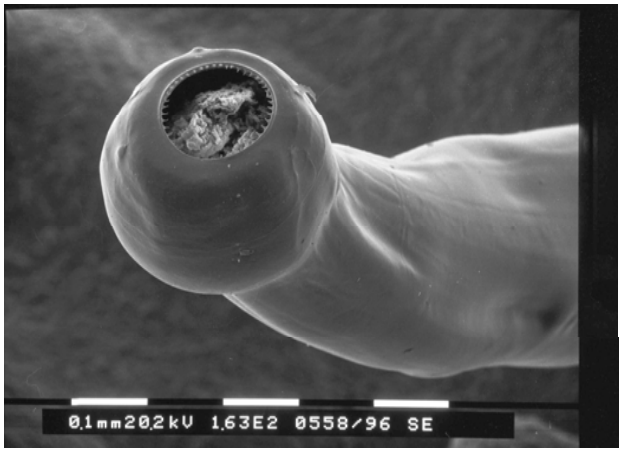
- Large buccal capsule
  - Cutting plates
  - “Teeth”
- Sometimes called “plug-feeders”



Important examples of strongyles of ruminants

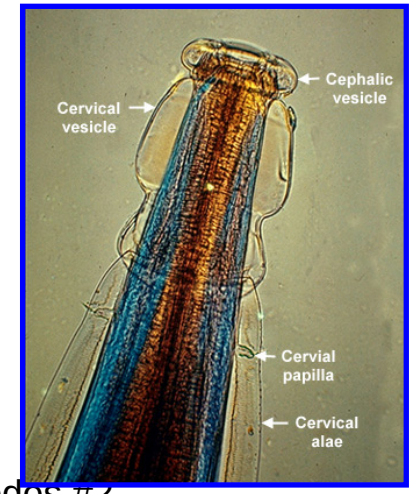
Chabertia -

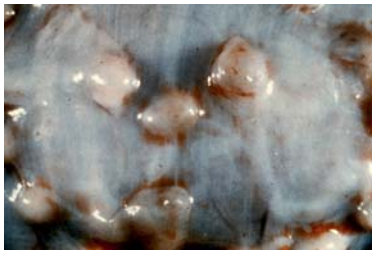
Intestinal worm of sheep & cattle



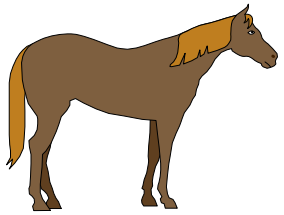
Oesophagostomum -

Intestinal worm of sheep & goats



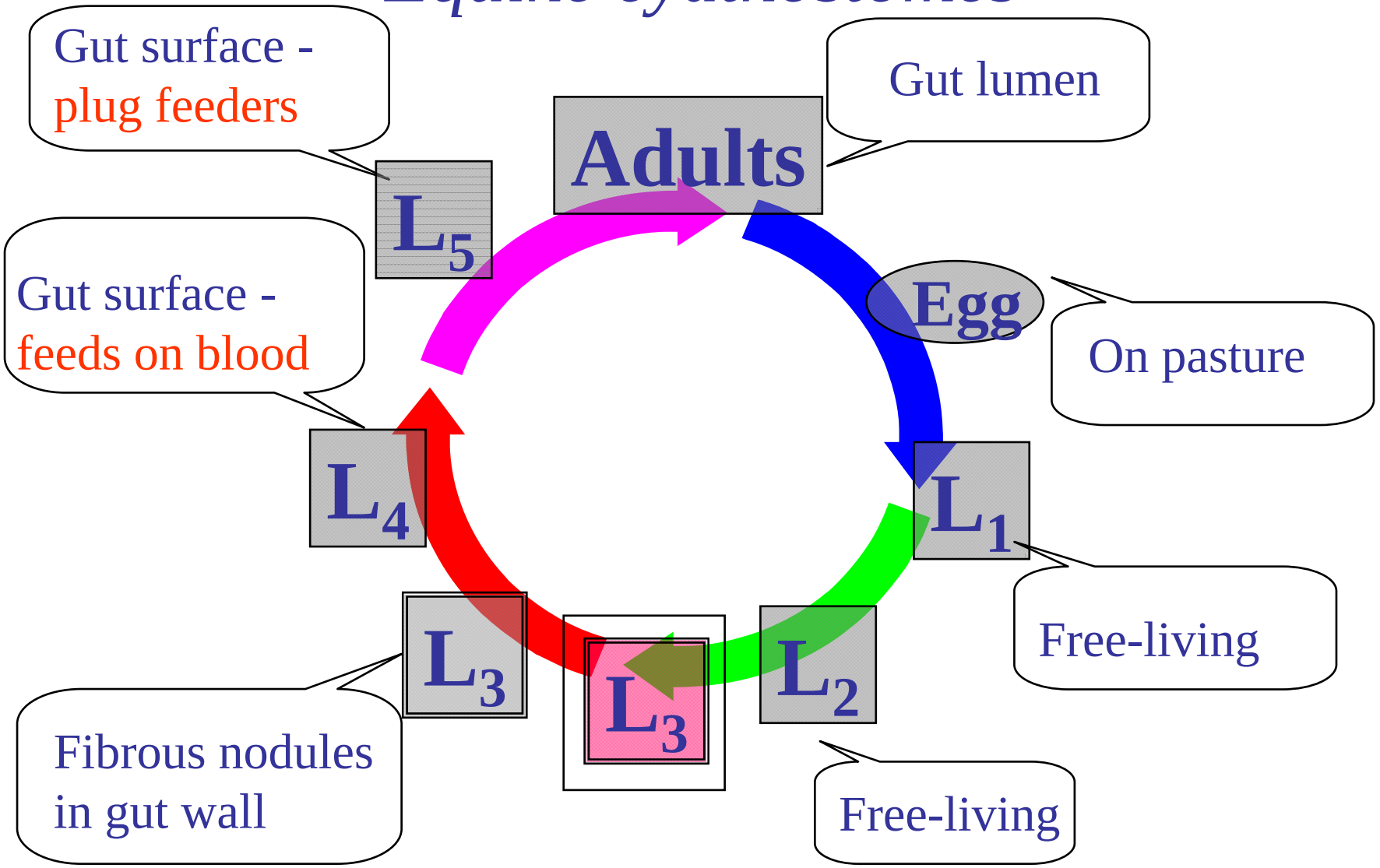


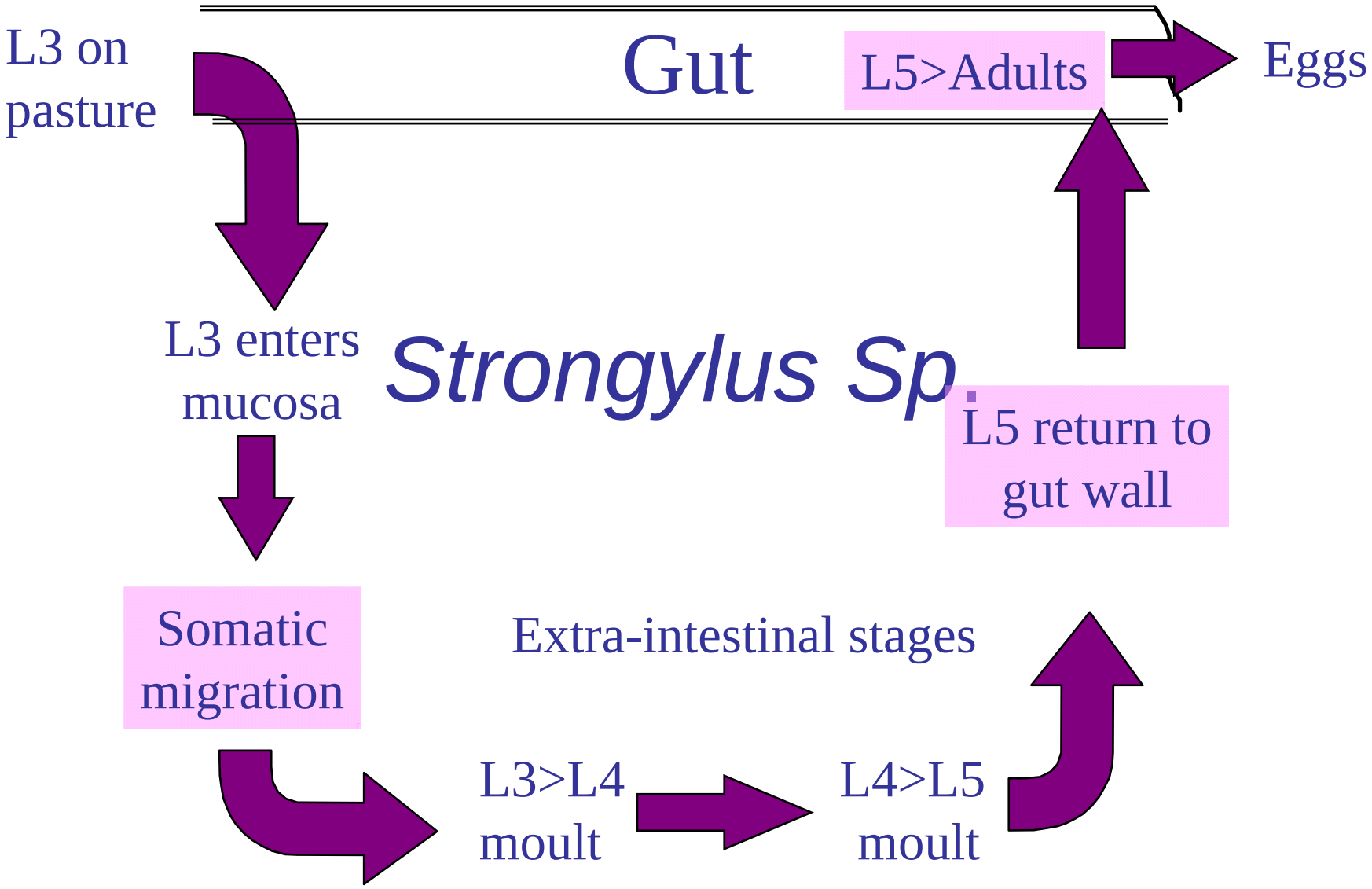
Strongyles of equines



	Small strongyles aka cyathostomes	*Large strongyles*
Adults	Large intestine	Large intestine
Infective form	Ensheathed L_3	Ensheathed L_3
Larval behaviour	**Develop in nodules in the intestinal wall**	**Somatic migration**
Number of species	15	3 - *Strongylus*

Equine cyathostomes




L3 on pasture
Gut
L5>Adults
Eggs
L3 enters mucosa
Strongylus Sp.
L5 return to gut wall
Somatic migration
Extra-intestinal stages
L3>L4 moult
L4>L5 moult

Strongylus sp - migratory patterns

Species	**Location of first moult**	**Location of second moult**
Strongylus vulgaris	Submucosa	Cranial mesenteric artery
Strongylus edentatus	Liver	Flanks & hepatic ligaments
Strongylus equinus	Gut musculature	Gut parenchyma

Controlling equine strongyles

- Anthelmintics
  - Timing
  - Active ingredient
    - Adults
    - Larvae – *especially migratory species*
    - Rotate active ingredients to combat drug resistance
- Pasture management
  - Removal of faeces
  - Harrowing of paddocks
  - Rotational grazing
    - Pasture “resting” for 6 months
    - Alternative species grazing e.g. sheep

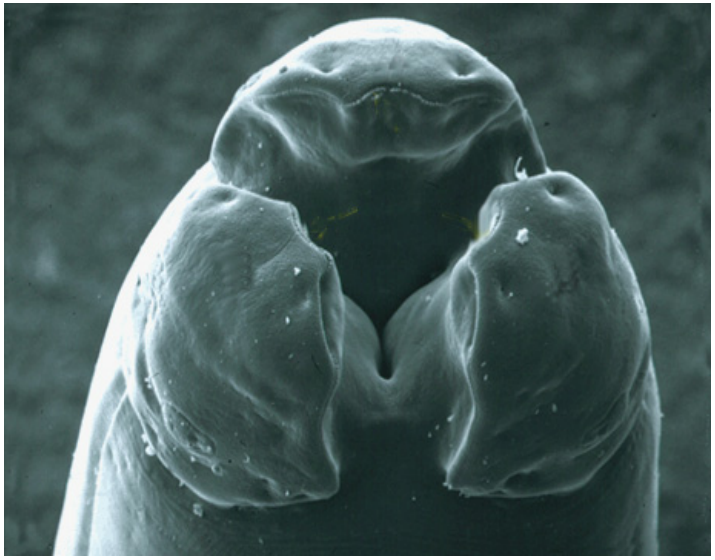
Main features of the the hookworms

- Parasites of the intestine of most higher mammals other than horses.
- Prominent dorsal bending of the head - "hook".
- Buccal capsule armed with broad cutting plates or teeth.
- Blood feeders.
- The L_3 enters either orally or in some cases percutaneously.

Important examples of hookworms in UK

- *Bunostomum* - found in the small intestine of ruminants.
- *Uncinaria* “northern” hookworm of dog, cat & fox.
- *Ancylostoma* – “tropical” canine hookworm – *coming soon to a practice near you?*

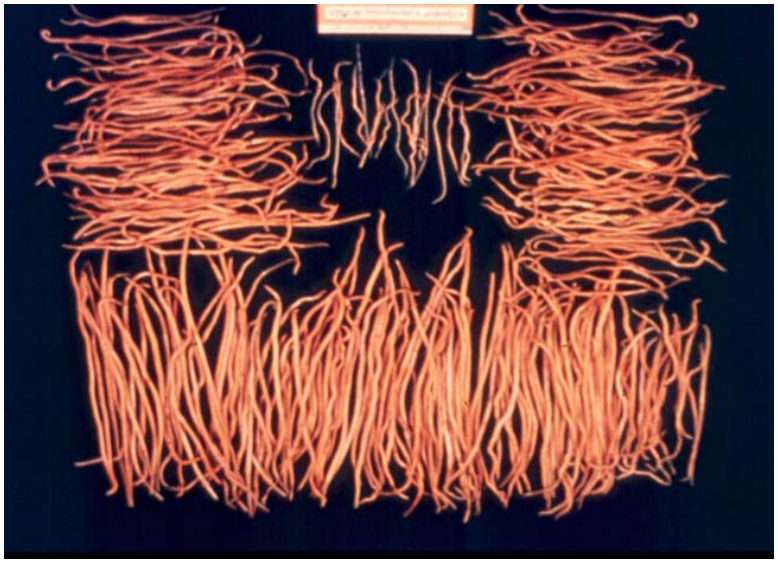
Ascarids



Mouth surrounded by three lips

Thick walled egg

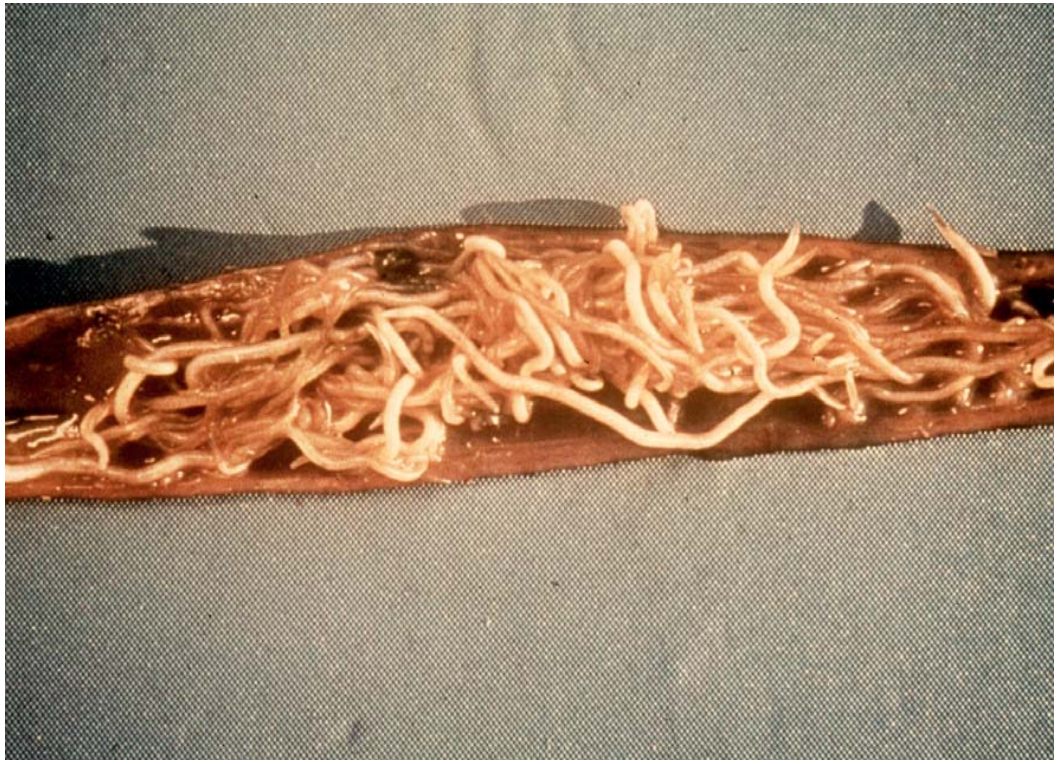
Ascaris infection from pig



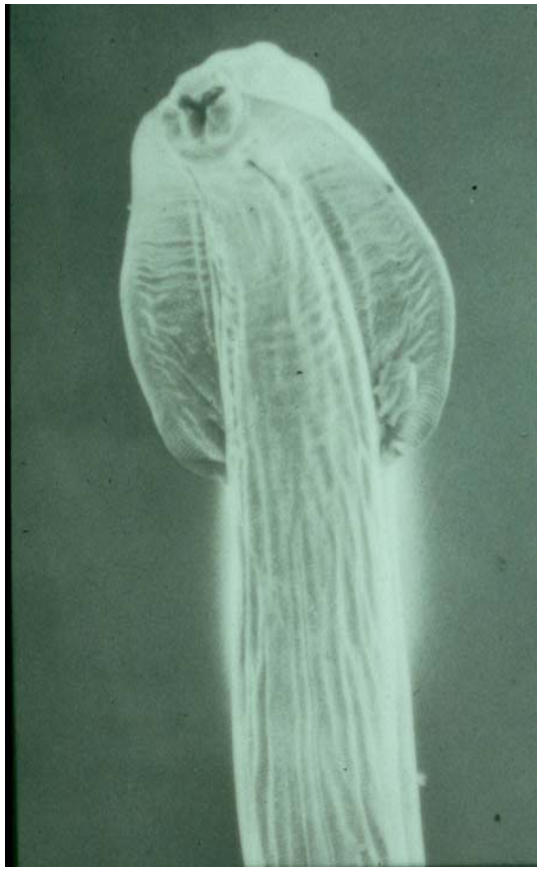
White spot liver

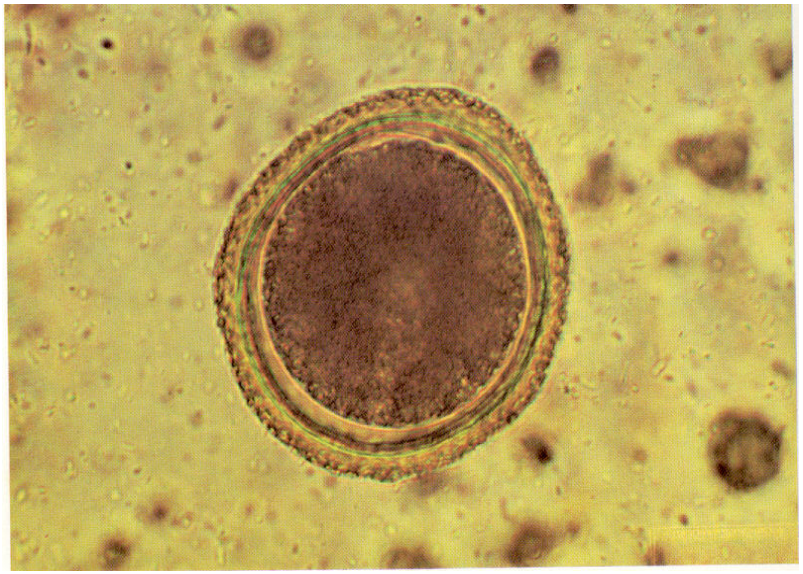
Toxascaris

Ascaridia

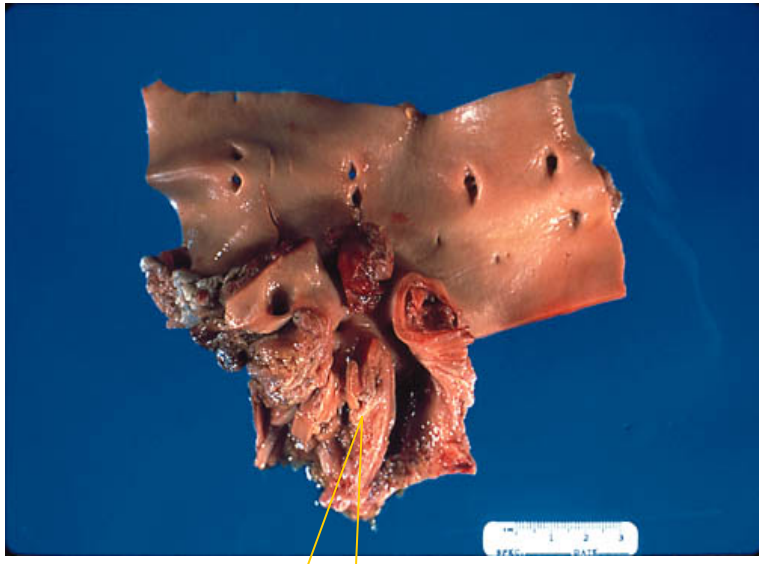


Toxocara

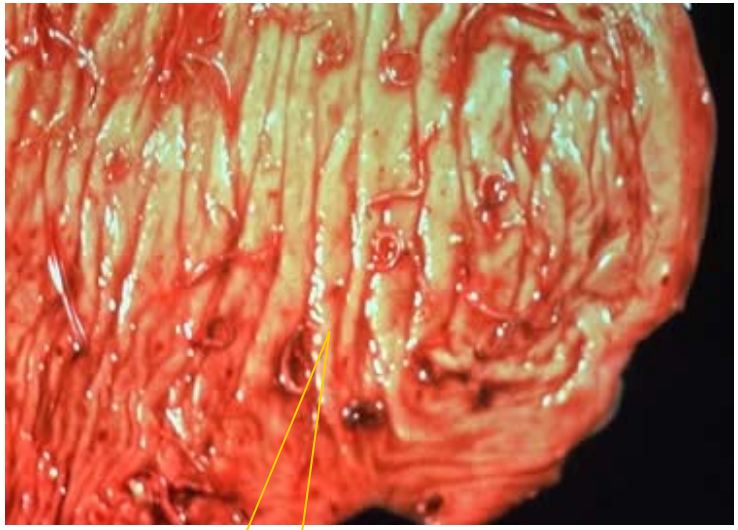




Strongylus

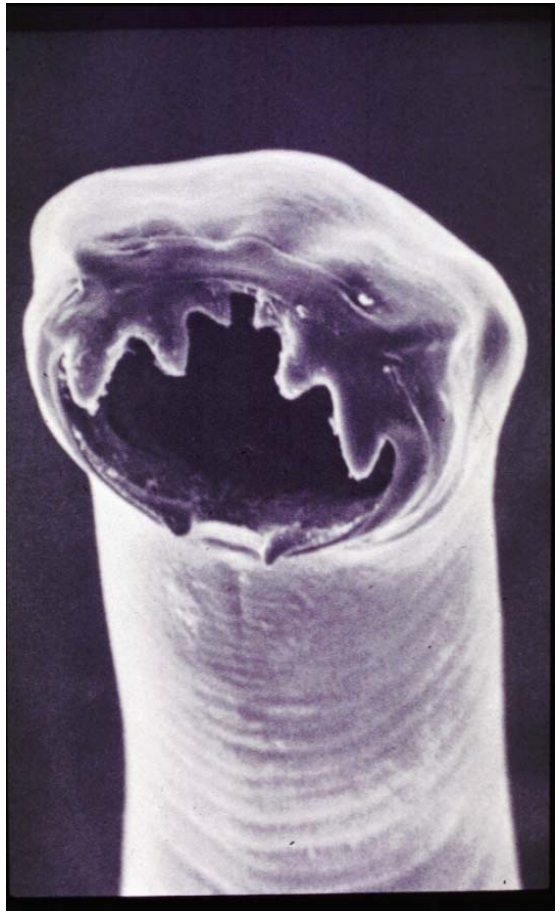


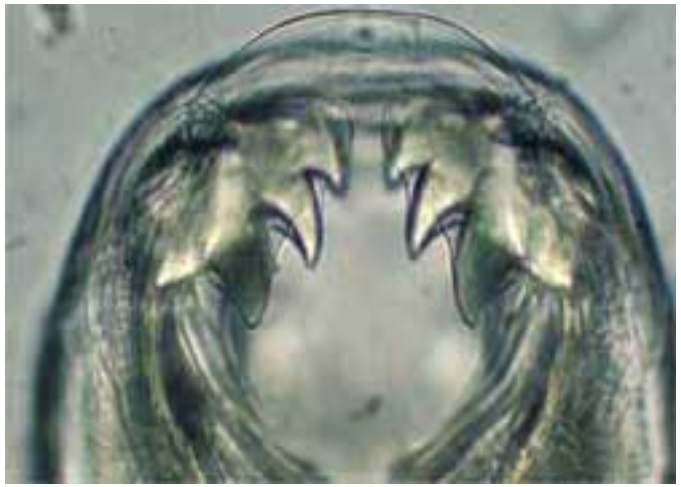
Damage to arterial wall by *S.vulgaris* larvae



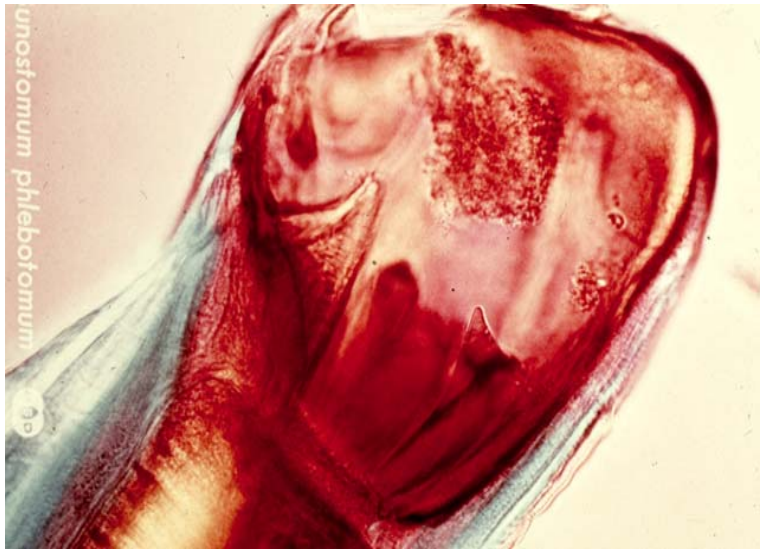
Damage to intestinal wall by *S.equinus* larvae

Hookworms

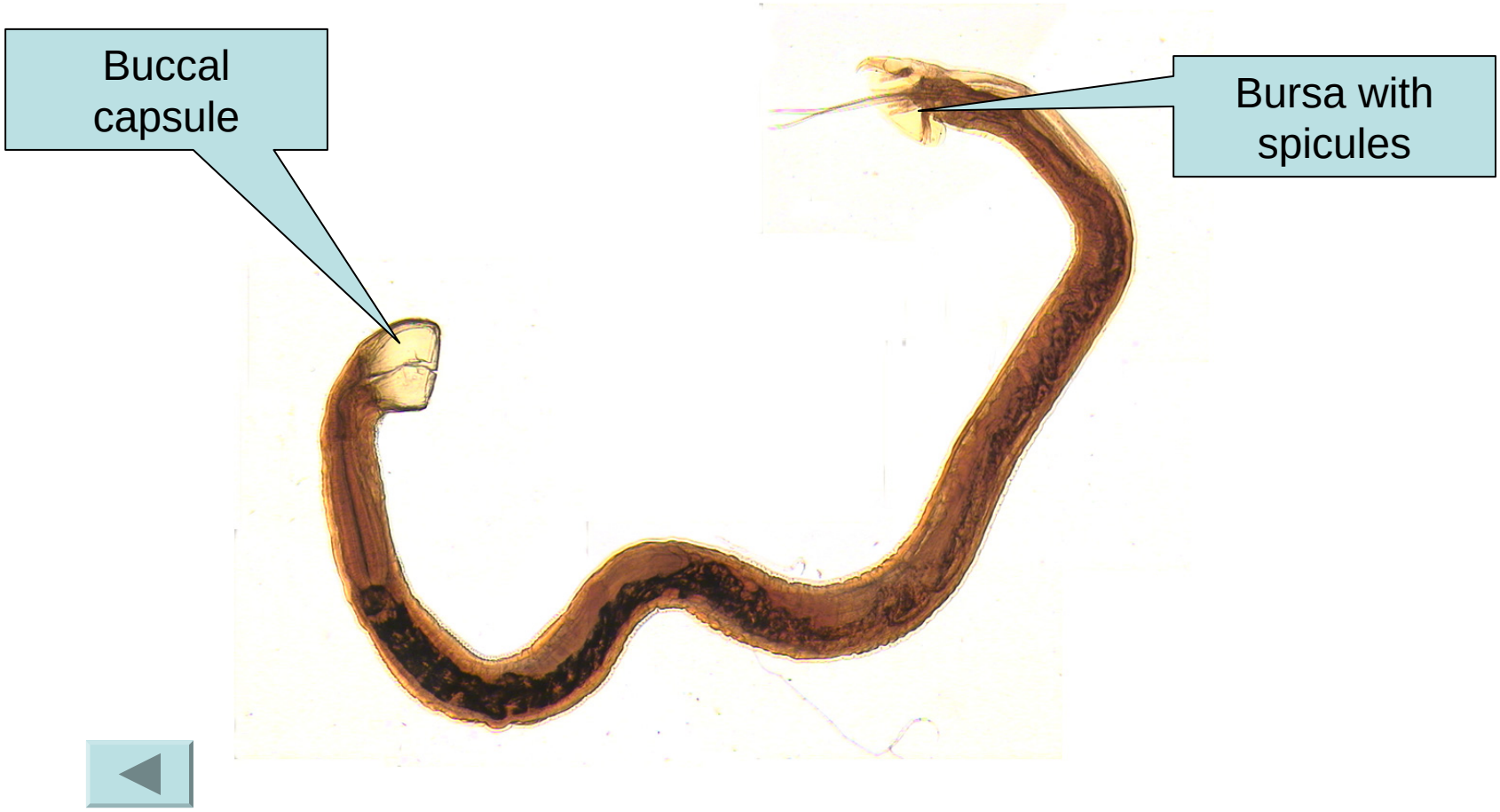




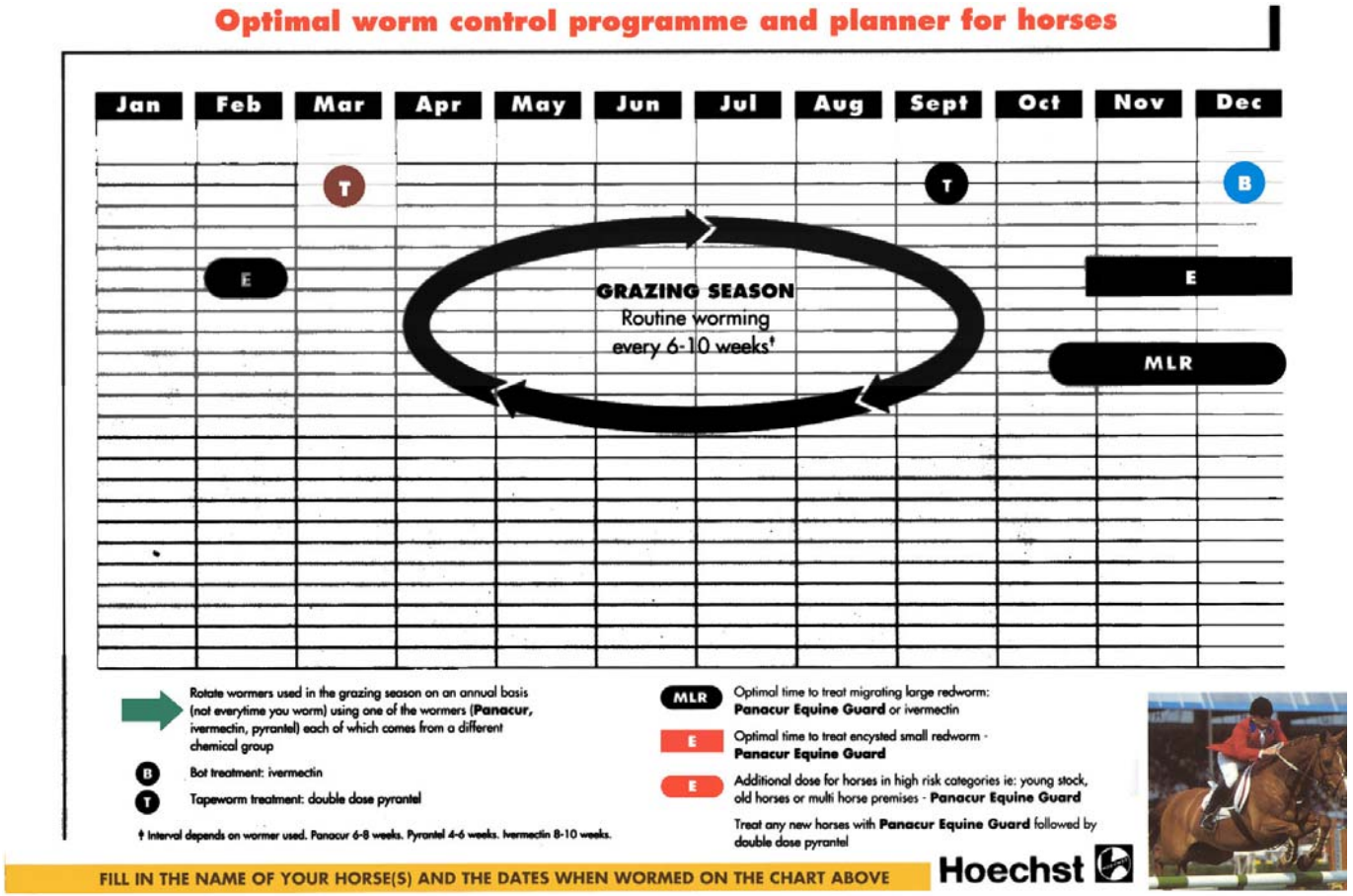
Bunostomum



Male of *Chabertia*



Treatment regimes for equine nematodes



Pasture cleaning the easy way

Claimed to be able suck nematode larvae from the pasture!

Each horse can produce up to nine tons of waste per year!