NC STATE UNIVERSITY

AHD2: VET 921
Parasitology Section

Cestodes 2
More Tapeworms

Common Pet Tapeworm

Take Homes

- *Dipylidium caninum*. (most common pet tapeworm)
  - DH: Dog & Cat small intestine. Segments passed in feces. IH: Fleas.
  - Pathology: Aesthetics for owner – proglottids on dog/cat poop or butt. Diagnosis: segment squash
  - Control: Flea control.
  - Zoonosis: Yes, Children ingest infected flea gets adult tapeworm in SI & segments in poop / diaper.

Dipylidium caninum
Flea Tapeworm of Pets

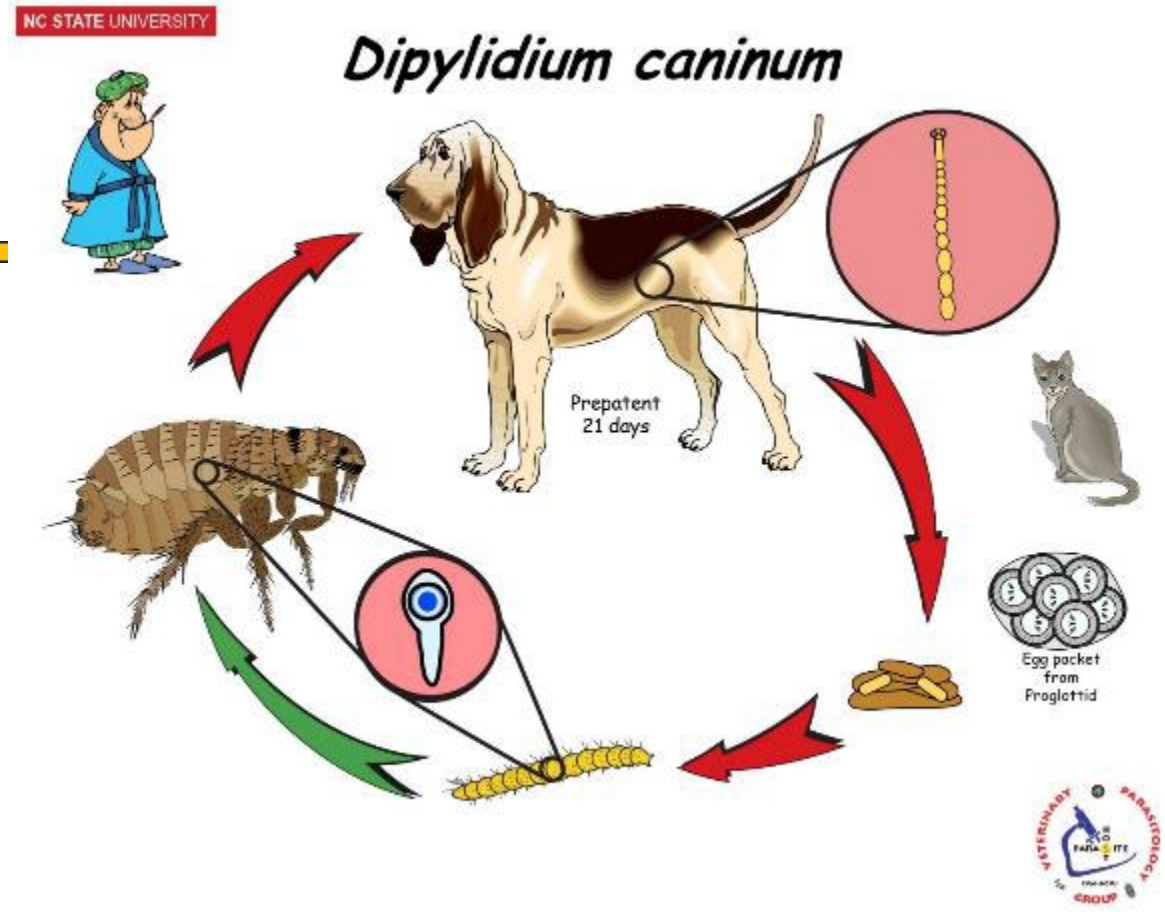
Dipylidium caninum

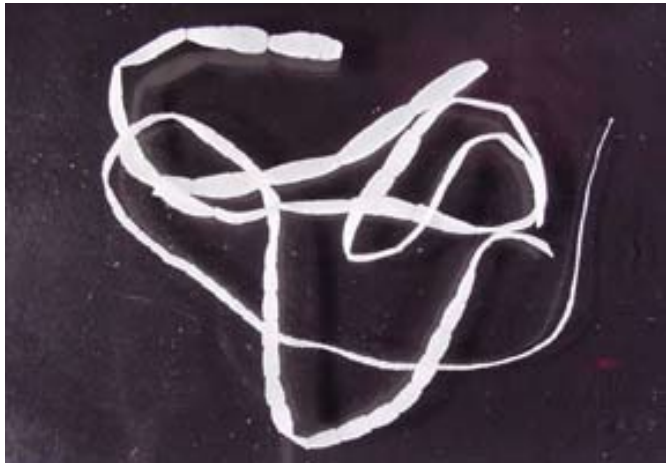
Flea tapeworm of dogs & cats

- Most common tapeworm of dogs and cats
- Scolex with retractable armed rostellum and 4 suckers
- Strobila made of oval proglottids with bilateral genital pores.

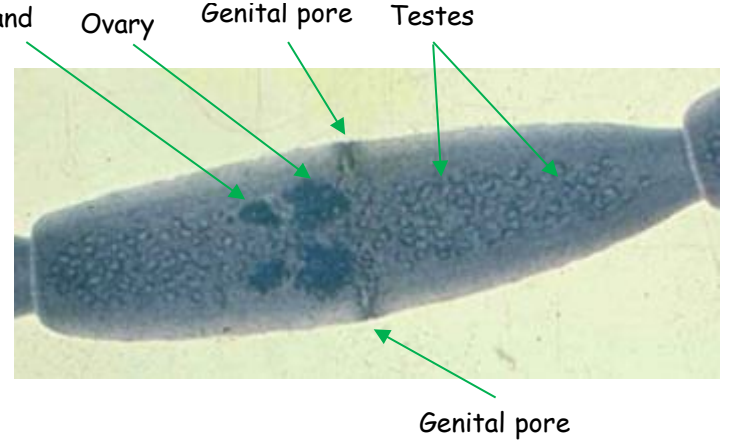
Life Cycle

- DH: Canids & Felids (small intestine)
- Gravid proglottids passed in feces
- Ova disseminated in the environment
- IH: Fleas & Lice *(How do fleas get infected?)*
  - Cysticercoid larvae in hemocoel.
  - Ingested by the Definitive host





- Worldwide
- Zoonotic - Yes
  - Children have been infected with adult worms. **(How?)**



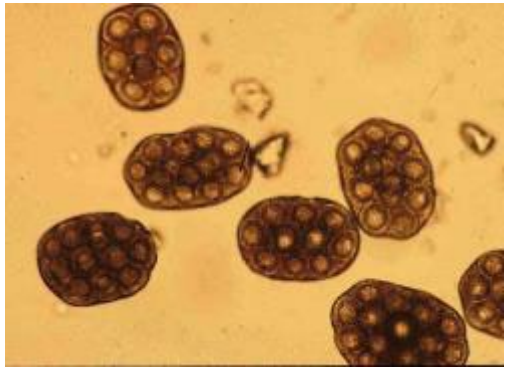
Dipylidium caninum

Pathology, Diagnosis

- No Pathology
  (nutrient competition in mal-nourished hosts)
- "Client Worry" (proglottid aesthetics)

Clinical Signs

- Segments presented by Client
- Pet usually shows no signs
  - Occasionally pet drags tail
- Observation of fleas
- History
  - Lack of Flea Control



Diagnosis

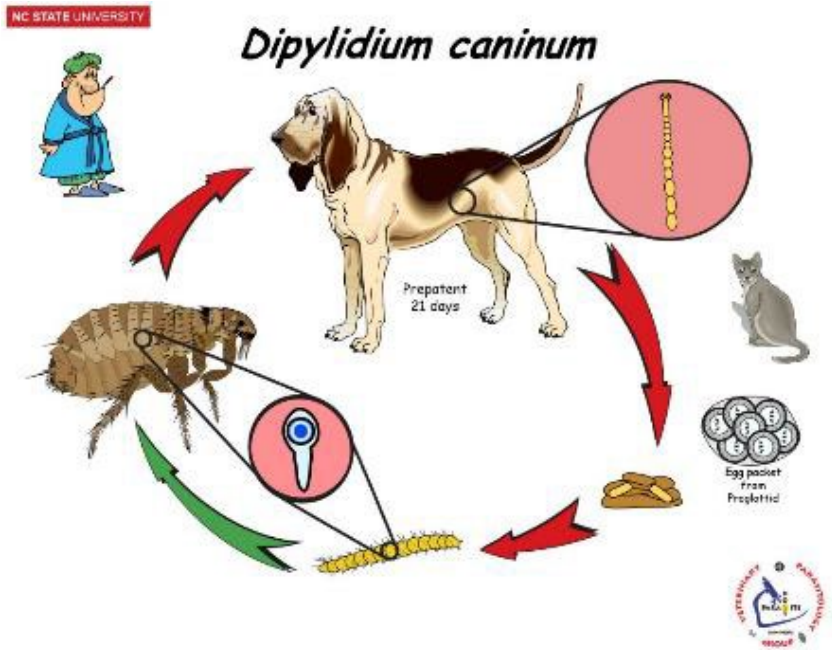
- Segment Squash
  - Oval Segment
  - Eggs in packets.

Dipylidium caninum

Treatment, Control

- Praziquantel (*Droncit*) (5mg/kg) [dog & cat]
- Pyrantel+Praziquantel+Febantel (*Drontal Plus Tablets*) [dog]
- Pyrantel+Praziquantel (*Virbantel Flavored Chewables*) [dog]
- Ivermectin+Pyrantel+Praziquantel (*Iverhart Max Chewable Tablets*) [dog]
- Pyrantel+Praziquantel (*Drontal Tablets*) [cat]
- Emodepside+Praziquantel (*Profender*) [cat]
- Epsiprantel (*Cestex*) [dog & cat]

How would you prevent re-infection?



Resistance – emerging issue

- **Some *Dipylidium* isolates have been reported to be resistant to praziquantel & epsiprantel.**
  - Treatments with nitroscanate or compounded pyrantel/praziquantel/oxantel were successful against the resistant isolates. (2018. Chelladurai et al. Am. J. Trop Med Hyg 99: 1201-1205)
  - "in these patients, off-label use of nitazoxanide (100 mg/kg) may prove helpful."
    -- CAPC (https://capcvet.org/guidelines/dipylidium-caninum/)
  - Note from one practicing veterinarian:
    - used nitazoxanide at the 100 mg/kg dose once orally → cleared tapeworm infection.
    - side effects: vomiting about 5-6 hours post-treatment + loose stool, lethargic. Lasted 1 day.
    - The dose for a ~40 lb dog was about $230 after using a GoodRX coupon.

In-Class Discussion

For tapeworms, some clinics use a 21-day automatic re-treatment schedule.

Would you?

Taenia pisiformis - prepatent period = 56 days
Taenia taeniaformis – prepatent period = 40 days
Dipylidium caninum - prepatent period = 21 days

In-class Discussion

- An irate client storms into your office and complains that you are a quack because about 2 months ago you charged him an "excessive amount of money" to treat tapeworms and yet his dog still has tapeworms. Are you a quack? Why or why not?

Taenia pisiformis - prepatent period = 56 days
Taenia taeniaeformis - prepatent period = 40 days
Dipylidium caninum - prepatent period = 21 days

Tapeworms of Livestock

Tapeworms of Livestock

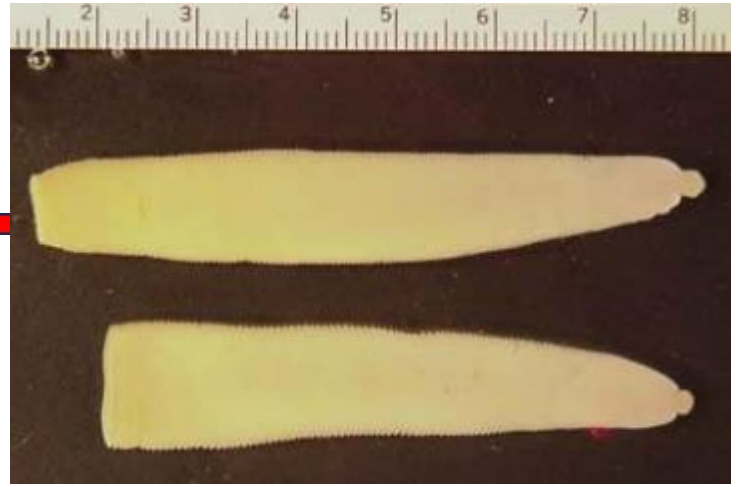
Take Homes

- *Anoplocephala perfoliata.*
  - DH: Horse ileocecal junction. IH: Pasture Mite.
  - Pathology: Potentially intussusception, bowel rupture. Diagnosis: fecal centrifuge, ELISA (serum & saliva)
  - Control: Assume infection, treat with praziquantel at end of grazing season.
  - Zoonosis: No

- *Moniezia sp.*
  - DH: Ruminant small intestine. IH: Pasture Mite.
  - Pathology: Non-pathogenic, aesthetics = economic loss.
  - Diagnosis: worms expelled, eggs on fecal float or McMasters
  - Control: regularly scheduled deworming with praziquantel
  - Zoonosis: No

Anoplocephala perfoliata

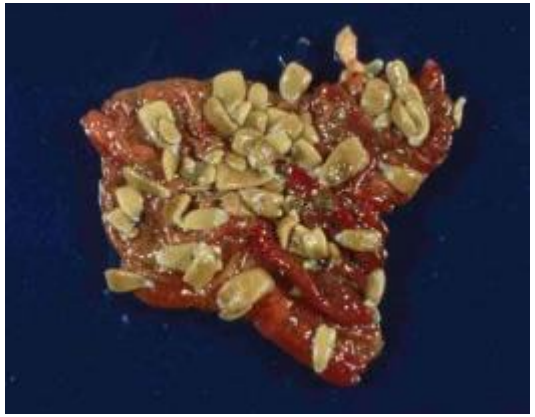
Tapeworm of Equine

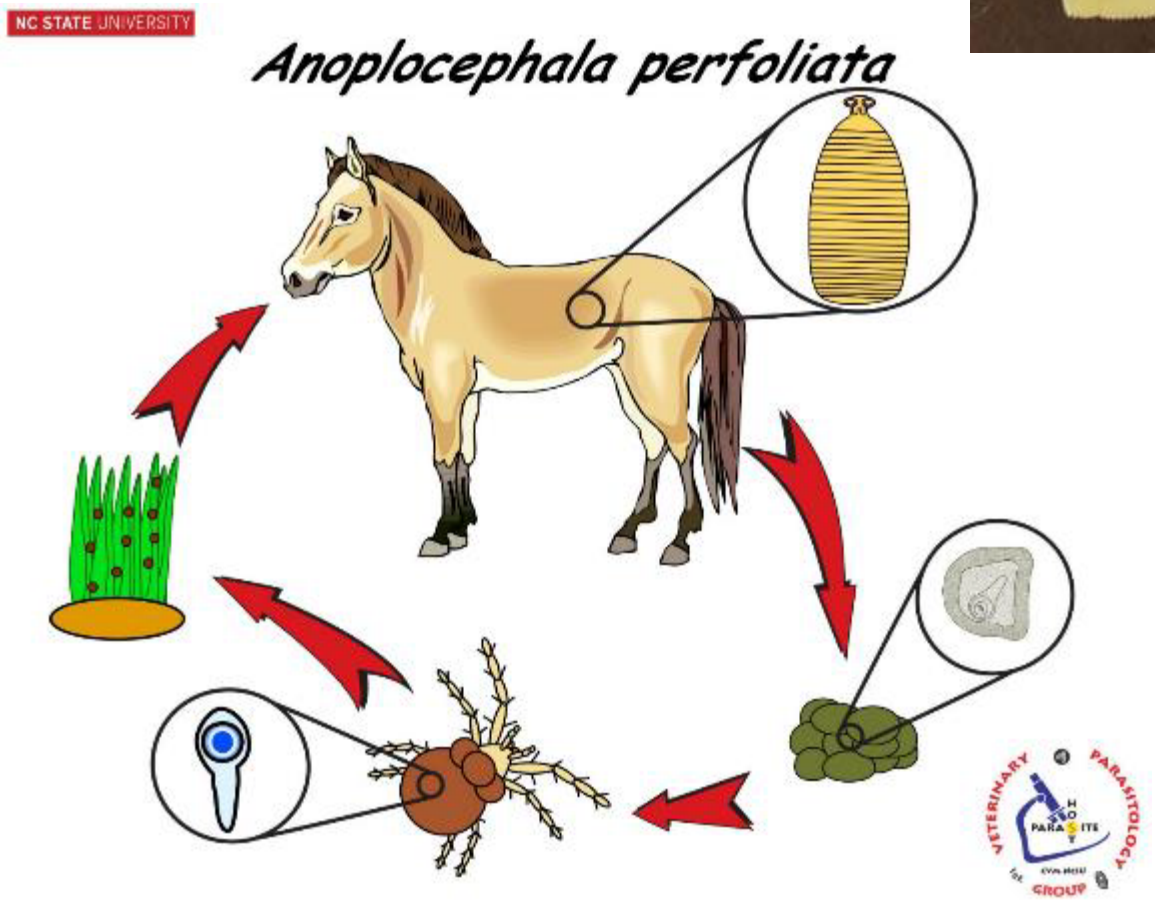


- Scolex with unarmed rostellum and 4 suckers
- Strobila made of many short, wide proglottids with unilateral genital pores.

Life Cycle

- DH: Equids (ileocecal junction)
- Eggs are passed in the feces
- IH: Pasture mites
  - Cysticercoid
  - Ingested by the Definitive Host





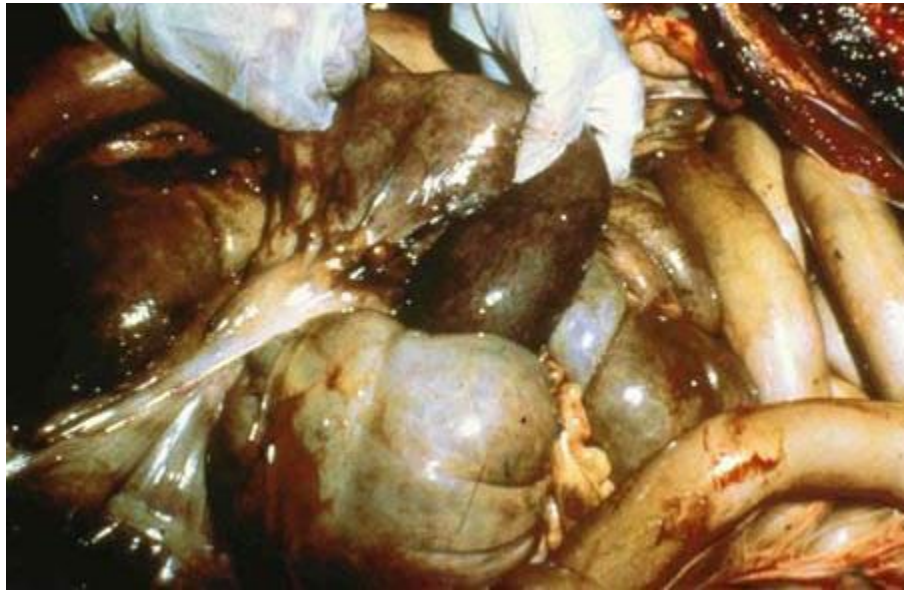
- Worldwide
- Not Zoonotic

Anoplocephala perfoliata

Pathology

- Ulceration & inflammation of mucosa
- Possible bowel wall rupture
- Possible Intussusception of ileum into cecum

Mucosal Ulceration



Intussusception

Intestinal Rupture

Anoplocephala perfoliata

Diagnosis, Treatment, Control

Diagnosis

- Diagnosis difficult
  - Ova not always readily found during fecal exam.
- Use fecal centrifugation (<10%) for detection (not McMasters)
  - <10% sensitivity
- Antibody tests
  - Horse Serum Tapeworm ELISA (52%)
    - Serum Antibodies
    - Wait 4 months post-treatment
  - EquiSal® Tapeworm Saliva Test
    - Mucosal antibodies
    - Wait 3 months post-treatment

Treatment

- Pyrantel (Extra-label)
  - Pyrantel pamoate (Strongid-T)
    - (double the nematode dose)
- Praziquantel
  - Ivermectin + Praziquantel
    - Zimectrin Gold & Equimax
  - Moxidectin + Praziquantel
    - Quest Plus

Control

- Perform regularly scheduled treatments, as detection of ova is not reliable.

Moniezia sp.

Tapeworm of Ruminants

- Scolex with 4 suckers only (no hooks)
- Strobila made of many short, wide proglottids with bilateral genital pores and reproductive organs.

Life Cycle

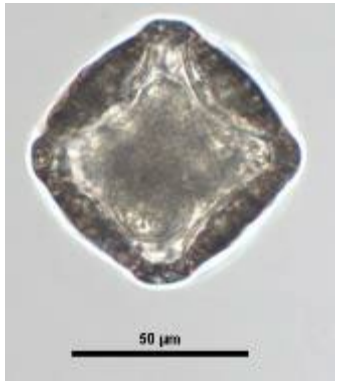
- DH: Ruminants (small intestine)
- Gravid proglottids & eggs released in feces
- Ova disseminated in the environment
- IH: Pasture mites
  - Cysticercoid
  - Ingested by the Definitive Host

- Worldwide
- Not Zoonotic

Moniezia sp.

Pathology, Diagnosis

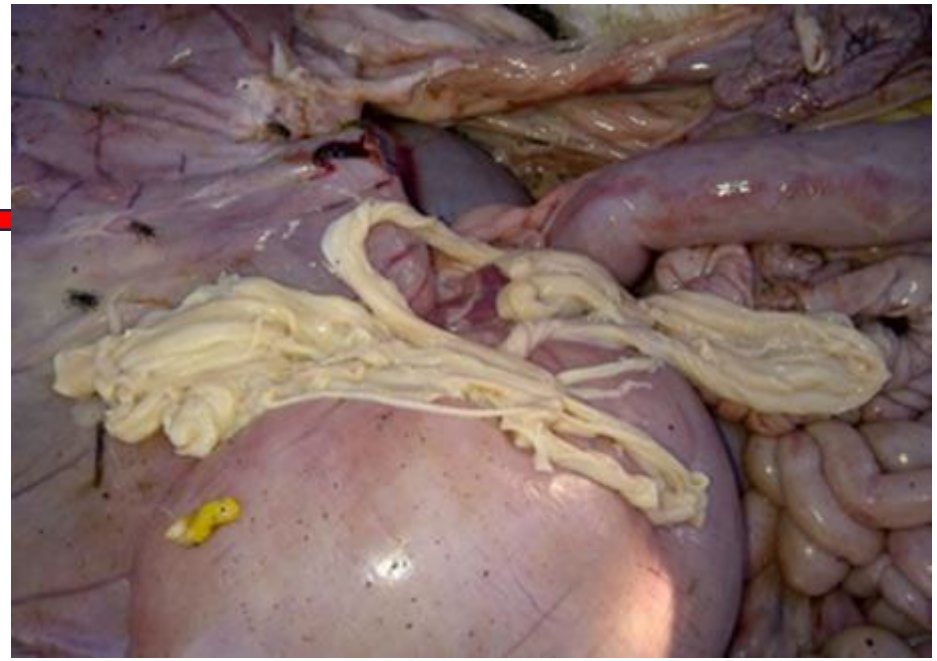
- **Pathology**
  - Considered non-pathogenic.
  - "Client Worry" (decreased marketability)



- **Diagnosis**
  - Segments (individual or in groups) seen in feces.
  - Ova found on fecal float or McMasters.

Moniezia sp.

Treatment, Control



Treatment

- Fenbendazole (*Panacur or Safe-Guard*) [cattle]
- Albendazole (*Valbazen Suspension PI*) [cattle, sheep, goats]
- Oxfendazole (*Synanthic Bovine Dewormer Suspension*) [cattle]

- Praziquantel (*Droncit*) [sheep & goats] (extra-label)

- **Always check Restrictions & Withdrawal Times**

Control

- Perform regularly scheduled treatments, spring & fall.

Spirometra sp.
Wildlife Tapeworm

Wildlife Tapeworm

Take Homes

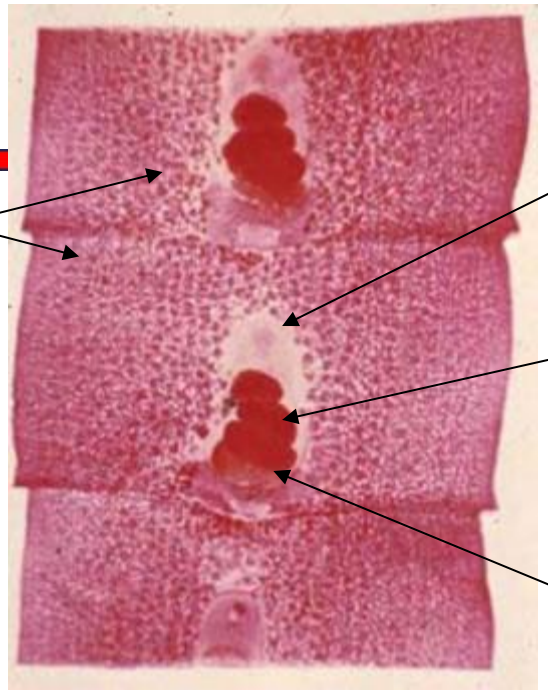
- *Spirometra spp.*
  - DH: Wildlife, Dogs, Cats. Small Intestine
  - 1st IH: Aquatic copepod.
  - 2nd IH Tadpole / frog.
  - PH: pig, rodent snake.
  - DH Pathology: Enteritis, Intermittent diarrhea. Diagnosis: Fecal Sedimentation
  - DH that ingests 1st IH (aquatic copepod) → DH Pathology: Proliferative sparganosis often fatal due to asexual repro of larval tapeworm.
  - Control: Prevent access raw frog, pork, snake, rodent. Sparganosis control prevent access to copepods.
  - Zoonosis: Serious Zoonosis: Sparganosis in various organs. Drink creek water, eat raw frog/snake/ pork.

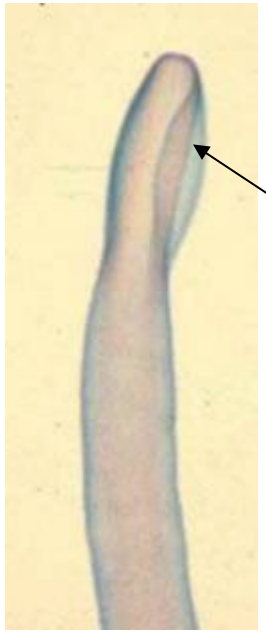
Spirometra sp.

Wildlife Tapeworm

- Scolex with 2 bothria (grooves) only
- Strobila made of square proglottids with single ventral genital pore.

aka "Zipper tapeworm"



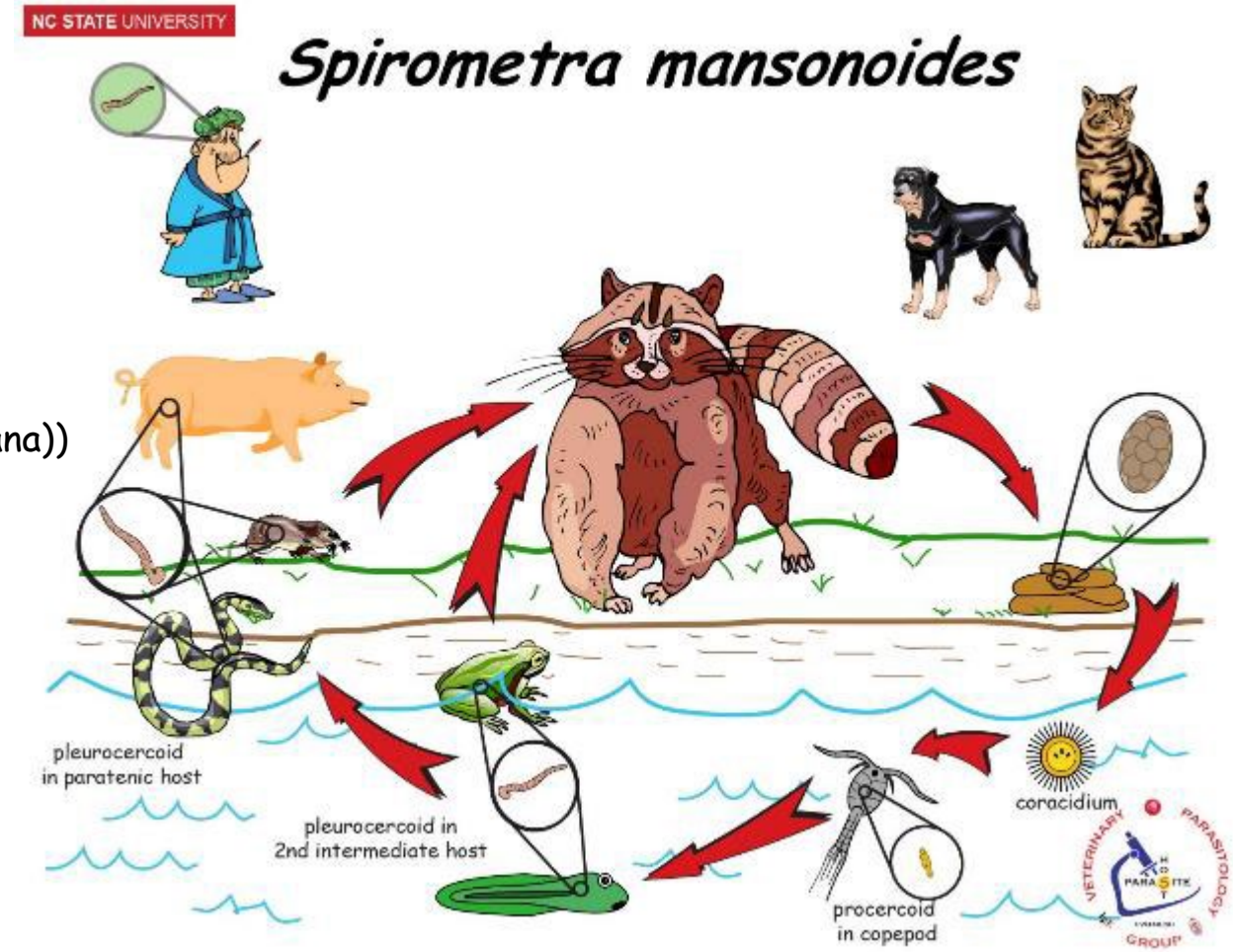


scolex

Spirometra sp.

Life Cycle

- Definitive Hosts
  - Dogs & Cats (small intestine)
  - Raccoon, bobcat, fox, etc.
- Ova (not segments) released in feces
- Ova in water, develop, and hatch.
- Free-swimming Coracidium ingested by 1st IH
- 1st IH: Copepod (Procercoid)
- 2nd IH: Tadpole or Frog (Pleurocercoid (spargana))
- PH: Snake, rodents, pigs, humans, etc. (Pleurocercoid (spargana))
- Ingested by the Definitive Host



Geographic Distribution

- North America
- Feline and canine cases in North Carolina rather common.
- NC raccoons and fox also.

Spirometra sp.

Pathology

- Adults in small intestine
  - Usually not pathogenic but may cause enteritis, with intermittent diarrhea
- Proliferative sparganosis
  - Extremely rare
  - Larval stages proliferate throughout the body
    - Extremely poor prognosis

FYI Canine Case of Proliferative Sparganosis FYI

- **Case Description** -- A 21-month-old spayed female Border Collie. Fenced yard in Tampa, Fla, that contained a small area of marshy terrain.
- **Complaint** -- Progressive right forelimb lameness, signs of pain, & subcutaneous edema.
- **Clinical Finding**
  - The subcutis and intermuscular fascia contained multiple cystic cavities filled with larval cestodes (plerocercoids or spargana) and cloudy red fluid.
  - The dog developed a progressively worsening fever, dyspnea, mature neutrophilia, and hypoproteinemia. Septic pleuritis and peritonitis complicated the later stages of the disease.
- **Treatment** -- Treatment with praziquantel, fenbendazole, and nitazoxanide failed to control the proliferation and dissemination of larval cestodes.
- **Outcome** -- The dog was euthanatized after 133 days of treatment.
- **Necropsy**
  - Numerous parasitic tissue cysts were present in the subcutis and intermuscular fascia; these cysts were most abundant in the soft tissues of the forelimbs and cervical musculature.
  - The pleural and peritoneal cavities contained multiple larval cestodes and were characterized by neutrophilic inflammation and secondary bacterial infection.

(*J Am Vet Med Assoc* 2008; 233:1756-1760)

Spirometra sp.

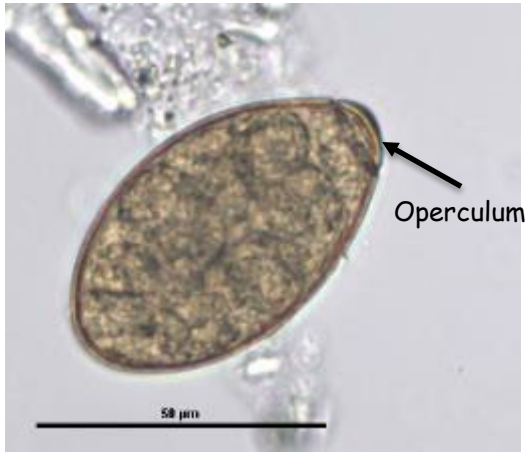
Diagnosis, Treatment, Control

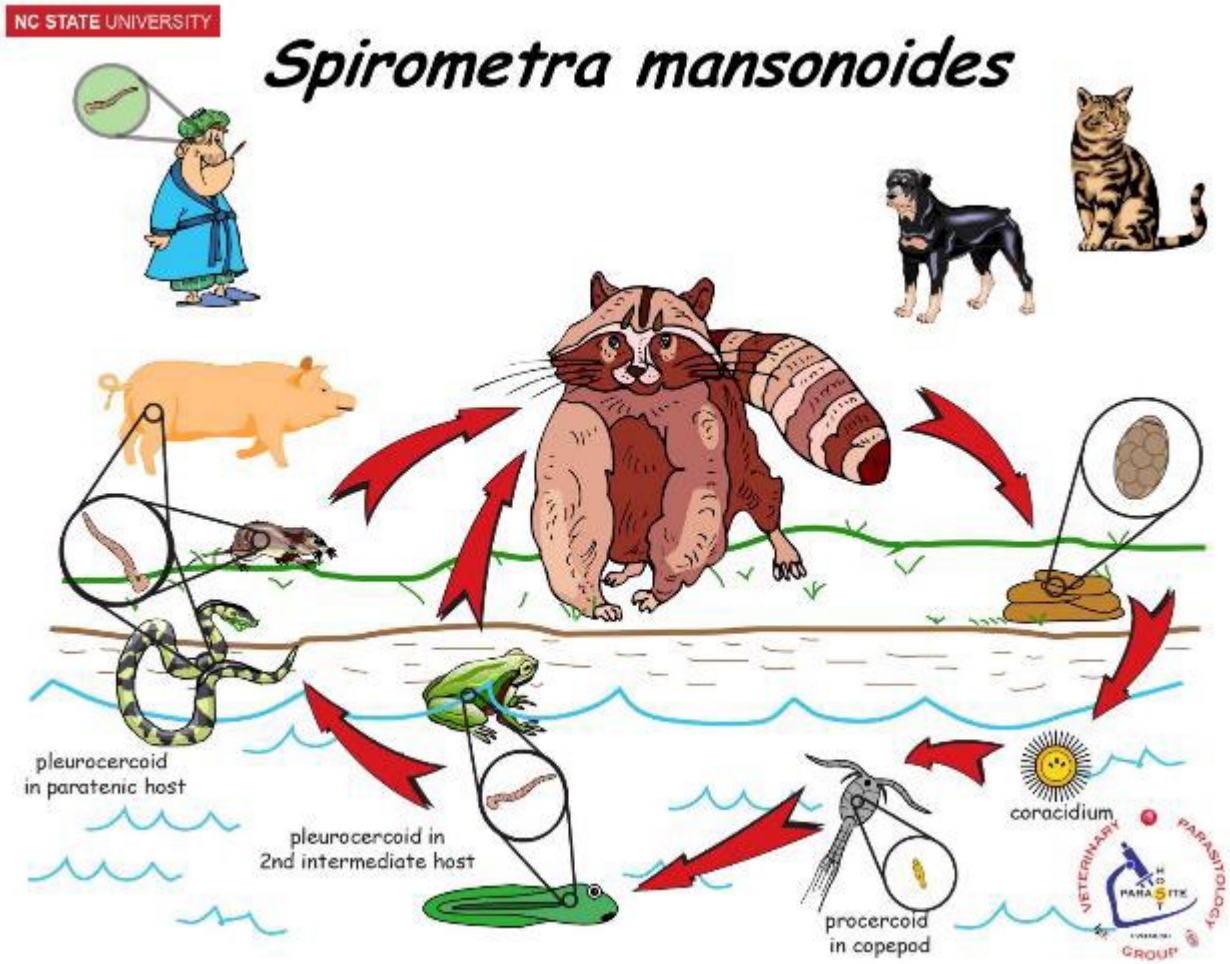
Diagnosis (for adults in intestine)

- Operculate ova in fecal sedimentation or smear.
- Clinical signs: intermittent diarrhea
- Sections of tapeworm passed in feces or vomitus are often presented by owner.

Treatment

- Praziquantel *(Droncit)*
  - High doses, multiple treatments



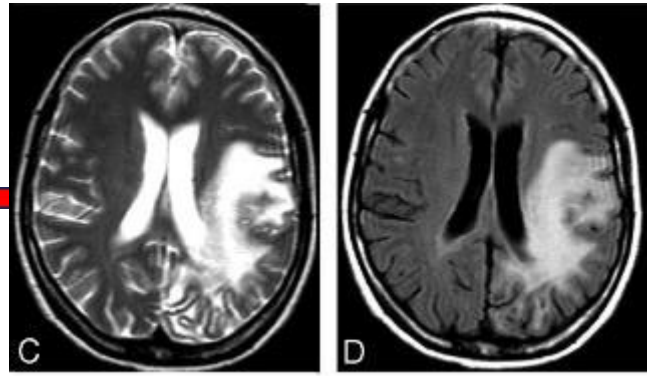


Control

- Adult tapeworm: Prevent access to snakes, frogs, rodents.
- Sparganosis: Prevent access to copepods

Spirometra sp.

Zoonosis

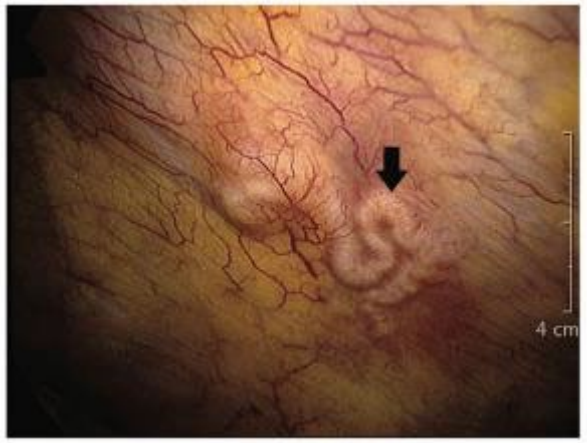


Cerebral sparganosis

Sparganosis (in humans)

- When spargana [pleurocercoids] invade various organs and muscles)
  - Ingestion of procercoid in copepod
  - Ingestion of pleurocercoid in raw paratenic host (swine, snake, frog)
  - Use of Poultice

Ocular sparganosis



Pleural sparganosis

Extracted spargana

Cutaneous sparganosis

FYI

Pleurocercoid Growth Factor in Paratenic Host

Cestode Table 2

Parasite	Definitive Host	Intermediate Host	Pathology	Diagnostics	Control	Zoonotic ?
Dipylidium caninum	Dog & Cat Small intestine	Flea	DH: aesthetics	Segment squash	Dx fleas	Minor: Aesthetics (children mainly)
Anoplocephala perfoliata	Horse Ileo-cecal junction	Pasture Mite	DH: Minor to Intussusception, bowel rupture	Fecal Centrifugation ELISA: serum or saliva tests	Assume infection, treat w/ praziquantel at end of grazing season	No
Moniezia sp.	Ruminant Small Intestine	Pasture Mite	DH: aesthetics	Fecal centrifugation Segments in feces	Treat when seen	No
Spirometra spp.	Dog, Cat, wildlife Small intestine	1st IH: FW copepod 2nd IH: tadpole/ frog PH: pig, rodent, snake	Adult worm: enteritis, intermittent diarrhea ---------- Larval worms: Proliferative sparganosis (Asexual reproduction of larval stage)	Sedimentation	Dx access to frogs, raw pork, rodent, snake ---------- DX access to FW with copepods	MAJOR: Sparganosis (visceral larval migrans) Various organs

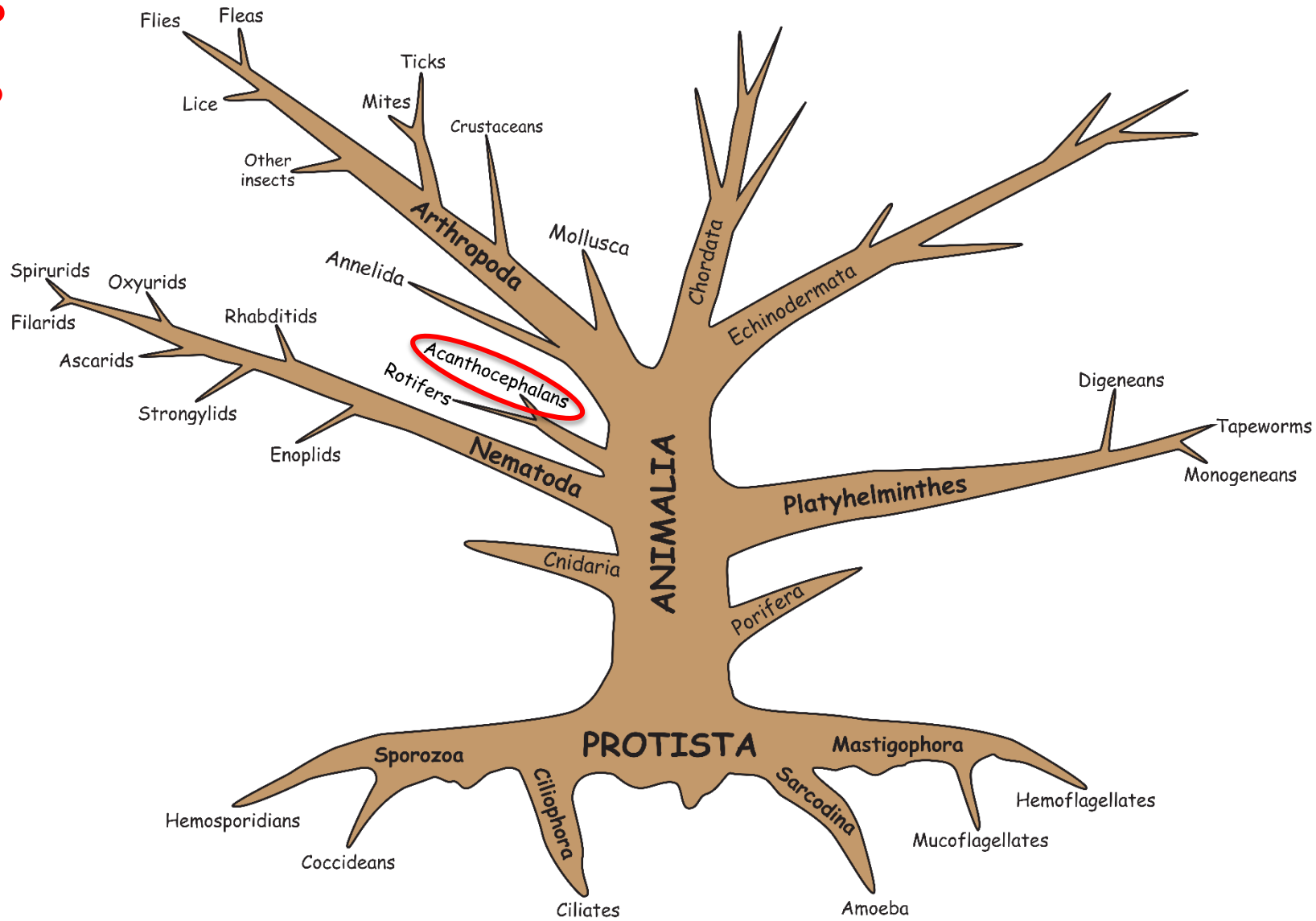
FYI

VMP 930
Veterinary Parasitology

Acanthocephlans
(thorny-headed worms)

A Phylogenetic Tree of Parasite Groups

FYI

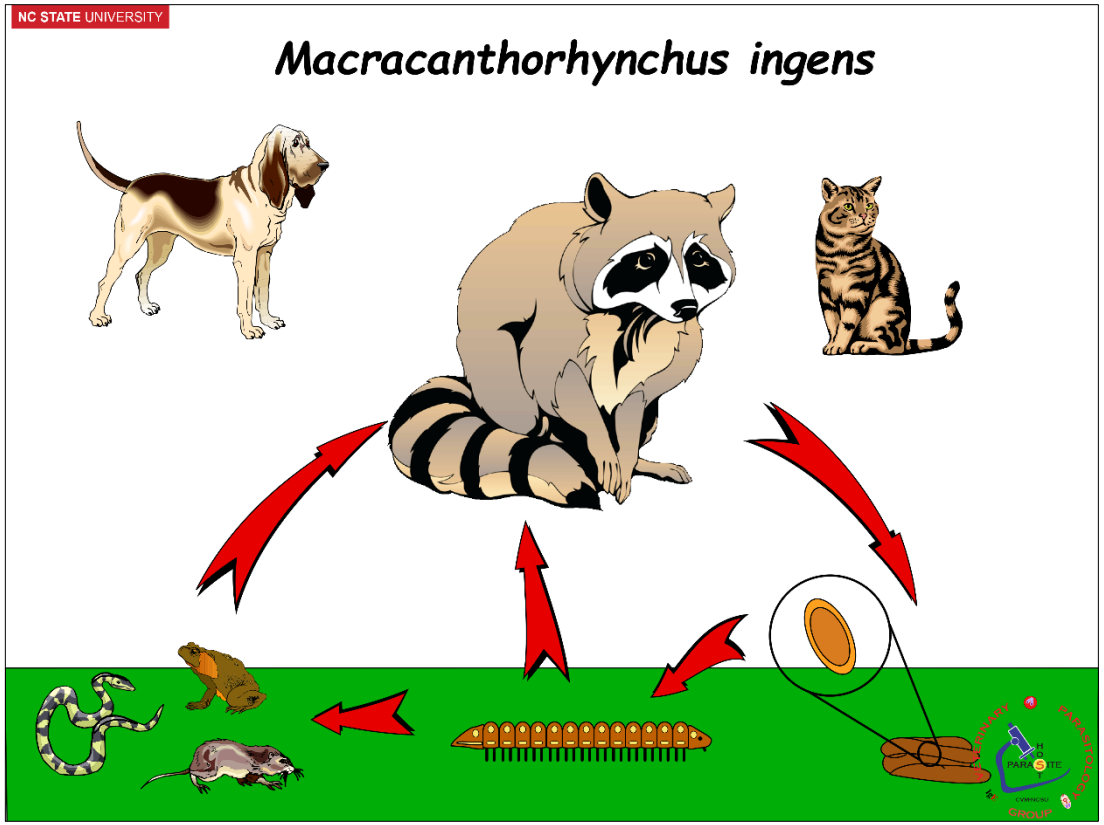


Macracanthorhynchus ingens

Thorny headed worm of pets & wildlife

FYI

- Life Cycle -- Terrestrial
  - Dogs, Cats, Wildlife
  - Millipedes
  - Paratenic: Lizards or toads
- No pathology to mild enteritis
- Found in feces or vomitus

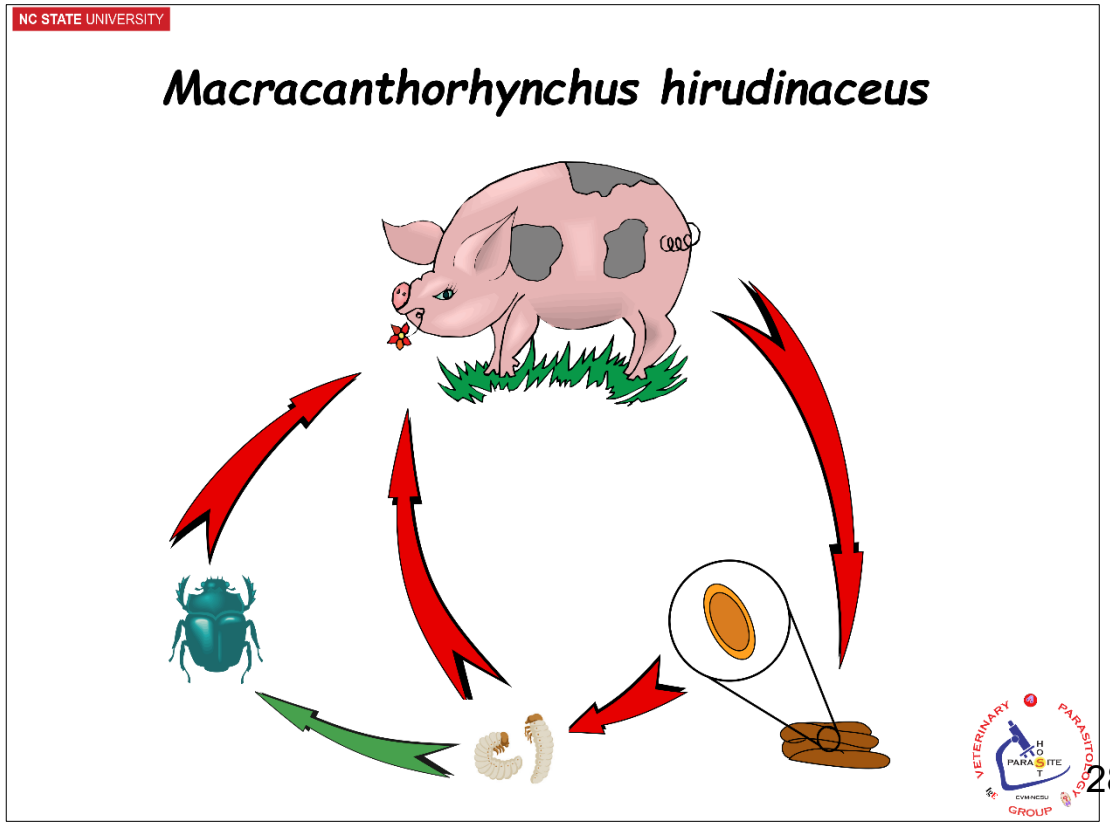


Macracanthorhynchus hirudinaceus

Thorny headed worm of swine

FYI

- Life Cycle -- Terrestrial
  - Swine
  - Beetle Grubs & Beetles
- No pathology to mild enteritis
- Found on necropsy



Macracanthorhynchus spp.

FYI


VETERINARY
PARASITOLOGY
HOST
PARASITE
IgE
CVM-NCSU
GROUP