Cestode Groups

**Large Animals**
- Adult Tapeworms
  - *Anoplocephala* (equine)
  - *Moniezia* (ruminants)
- Larval Tapes (condemnations)
  - *Taenia saginata* (cattle)
  - *Taenia solium* (swine)

**Small Animals**
- Adult Tapeworms
  - *Taenia pisiformis* (dogs)
  - *Taenia taeniaformis* (cats)
  - *Echinococcus granulosus* (dogs)
  - *Dipylidium caninum* (dogs, cats)
  - *Mesocestoides sp.* (dogs, cats)
  - *Spirometra sp.* (dogs, cats)

**Human Zoonosis**
- Adult Tapeworms
  - *Taenia saginata*
  - *Taenia solium*
  - *Dipylidium caninum*
- Larval Tapeworms
  - *Echinococcus sp.*
  - *Taenia solium*
  - *Spirometra sp.*
**Dipylidium caninum**

- *Most common tapeworm of dogs and cats* (Worldwide)
- Scolex with retractable armed rostellum and 4 suckers
- Strobila made of oval proglottids with bilateral genital pores.
Mature Proglottid
**Life Cycle**

- **Definitive Hosts**
  - Canids & Felids -- small intestine
- **Gravid proglottids passed in feces**
- **Ova disseminated in the environment by the motile proglottid**

- **Intermediate Host**
  - Fleas & Lice (*How do fleas get infected?*)
  - Cysticercoid larvae in hemocoel.
  - Ingested by the Definitive host

- **Young Tapes**
  - Young Tapes attach to the intestinal lining and develop into mature tapeworms.
  - Prepatent period: 21 days
Dipylidium caninum

Prepatent 21 days

Egg packet from Proglottid
Egg Packets
Cysticercoid Larvae
Pathology

- **Definitive Host (Dog & Cat)**
  - No Pathology
    (nutrient competition in mal-nourished hosts)
  - "Client Worry" (proglottid aesthetics)

- **Intermediate Host (Flea)**
  - (Who cares?)
“Pathology”
Active Segments on Poop
"Pathology"

Active Segments on Pet
Clinical Signs

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

History
- Lack of Flea Control
- Access to stray dogs / cats
Diagnosis

- Segment Squash
  - Oval segment
  - Egg Packets
Treatment

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

- Some *Dipylidium* isolates have been reported to be resistant to praziquantel & epsiprantel.

- “*Dipylidium caninum* infections that are apparently refractory to praziquantel or epsiprantel treatment have been occasionally observed; in these patients, off-label use of nitazoxanide (100 mg/kg) may prove helpful.” -- CAPC (https://capcvet.org/guidelines/dipylidium-caninum/)
How would you control?

*Dipylidium caninum*

Prepatent 21 days

Egg packet from Proglottid
Control & Zoonosis

- Flea control program.

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

A Johnston County cattle farmer brings his dog, along with a bag of feces w/ tapeworm segments and wants a treatment for the tapeworms.

What species of tapeworm is involved?
In-Class Discussion

Under which category or categories would *Dipylidium caninum* fall:

A. Companion animal concern
B. Economic concern
C. Human medical concern
Anoplocephala perfoliata

- Tapeworms of Equine (Worldwide)
- Scolex with unarmed rostellum and 4 suckers
- Strobila made of many short, wide proglottids with unilateral genital pores.
**Life Cycle**

- **Definitive Hosts**
  - Equids -- ileocecal junction
- **Gravid proglottids are released but eggs are passed in the feces**
- **Ova disseminated in the environment**
- **Intermediate Host**
  - Pasture mites
  - Cysticercoid
  - Ingested by the Definitive Host
- **Young Tapes**
  - Young Tapes attach to the intestinal lining and develop into mature tapeworms.
  - Prepatent period: 4 to 6 weeks
Anoplocephala perfoliata
Anoplocephala perfoliata
Pathology

- Definitive Host (Horse)
  - Ulceration & inflammation of mucosa
  - Possible bowel wall rupture
  - Possible Intussusception of ileum into cecum
Mucosal Ulceration
Intestinal Rupture
Intussusception
Diagnosis difficult.
- Ova not always readily found during fecal exam.

Use fecal centrifugation for detection (not McMasters)

Tests currently in Development:
- Antibody test.
- PCR test.
Ovum
Treatment

- **Pyrantel** *(Extra-label)*
  - Pyrantel pamoate *(Strongid-T)* 13.2 mg/kg (= double the nematode dose)
  - Pyrantel tartrate *(Strongid-C)* 2.6 mg/kg daily use

- **Praziquantel**
  - Ivermectin+Praziquantel
    - Zimectrin Gold & Equimax
  - Moxidectin+Praziquantel
    - Quest Plus
Control & Zoonosis

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

- Not Zoonotic
Moniezia sp.

- Tapeworms of Ruminants (Worldwide)
- Scolex with 4 suckers only
- Strobila made of many short, wide proglottids with bilateral genital pores and reproductive organs.
Life Cycle

- Definitive Hosts
  - Ruminants -- small intestine
- Gravid proglottids release in feces
- Ova disseminated in the environment
- Intermediate Host
  - Pasture mites
  - Cysticercoid
  - Ingested by the Definitive Host
- Young Tapes
  - Young Tapes attach to the intestinal lining and develop into mature tapeworms.
  - Prepatent period: 37 to 40 days
Moniezia expansa
Notes

- **Geographic distribution**
  - Worldwide

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

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

- Note Restrictions & Withdrawal Times
Control & Zoonosis

- Perform regularly scheduled treatments, spring & fall.

- Not Zoonotic
A horse presents with colic.

What clues might lead you to a diagnosis of *Anoplocephala perfoliata*?
In-class Discussion

Under which category or categories would *Anoplocephala & Moniezia* fall:

A. Companion animal concern
B. Economic concern
C. Human medical concern
Mesocestoides corti

- Tapeworms of Dogs and Cats
- Scolex with 4 suckers only
- Strobila made of small oval proglottids.
- Distinguish proglottids by single ventral genital pore and parauterine organ.
Life Cycle

- **Definitive Hosts**
  - Dogs & Cats -- small intestine
  - Wild mammals (raccoons, fox, bobcats, etc.)

- **Gravid proglottids release in feces**

- **Proglottid and/or Ova ingested by coprophagous arthropod**

- **1st Intermediate Host**
  - Coprophagous mites or beetle
  - Cysticercoid

- **2nd Intermediate Host**
  - Rodent or Reptile (Cats & Dogs)
  - Tetrathyridium (can go through asexual reproduction [longitudinal fission])

- **Ingested by the Definitive Host**

- **Young Tapes**
  - Young Tapes attach to the intestinal lining and develop into mature tapeworms.
  - Young & Adult Tapes can go through asexual reproduction [longitudinal fission].
  - Prepatent period: about 2 weeks.
Geographic Distribution

- Europe, Asia, Africa, North America
- Rare in North Carolina
Pathology

- Heavy infection of adults in intestine can cause diarrhea.
- Infection of tetrathyridia in peritoneal cavity can cause peritonitis and ascites.
Diagnosis

- Clinical signs: diarrhea
- Small Oval Segments seen in feces.
  - Segments look like sesame seeds.
  - Look for parauterine organ in segment.
Diagnosis
Treatment

- Praziquantel (Droncit)

Complete treatment is required, as asexual reproduction of surviving adults can re-populate intestine without re-infection.
Control & Zoonosis

- Prevent access to rodents, reptiles, or coprophagous arthropods.

- Zoonotic - yes can cause diarrhea in humans.
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 taeniformis* - prepatent period = 40 days
*Dipylidium caninum* - prepatent period = 21 days
*Mesocestoides sp.* - prepatent period = 14 days
**Spirometra sp.**

- Tapeworms of Dogs, Cats, and Wild Carnivores.
- Scolex with 2 bothria only
- Strobila made of square proglottids with single ventral genital pore.
Morphology
Life Cycle

Definitive Hosts
- Dogs & Cats -- small intestine
- bobcat, raccoon

Ova (not segments) released in feces
Ova in water, develop and hatch.
Free-swimming Coracidium ingested by 1st Intermediate Host

1st Intermediate Host
- Copepod
- Procercoid

2nd Intermediate Host
- Water Snake or Frog
- Pleurocercoid (spargana)

Paratenic Host
- Rodents, pigs, humans, etc.
- Pleurocercoid (spargana)

Ingested by the Definitive Host
- Young Tapes attach to the intestinal lining and develop into mature tapeworms.
- Prepatent period: 10 - 30 days
Spirometra mansonoides

pleurocercoid in paratenic host

pleurocercoid in 2nd intermediate host

coracidium

procercoid in copepod
Pleurocercoid Growth Factor in Paratenic Host
Geographic Distribution

- North America
- Feline and canine cases in North Carolina becoming common.
- NC raccoons and fox also.
Pathology
- Usually not pathogenic, but may cause enteritis.

Diagnosis
- Operculated ova in fecal sedimentation or smear.
- Clinical signs: intermittent diarrhea
- Sometimes sections of tapeworm passed in feces or vomitus

Treatment
- Praziquantel (*Droncit*)

Control
- Prevent access to snakes, frogs, rodents.
Ovum
Sparganosis

(spargana [pleurocercoids] in various organs and muscles)

Ingestion of procercoaid in copepod

Ingestion of pleurocercoid in raw paratenic host (swine)

Use of Poultice
In-class Discussion

Under which category or categories would *Mesocestoides* and *Spirometra* fall:

A. Companion animal concern
B. Economic concern
C. Human medical concern