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*

**Human Zoonosis**
- 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 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]
Emerging Issue: May be some cases of dewormer resistant strains. No study has been conducted to confirm.

“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
Control & Zoonosis

- Flea control program.

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

Diagram showing the life cycle of 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

- 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
In-class Discussion

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.
Mesocestoides corti

A

Tetrathyridium

B

Cysticercoid

Gravid Proglottid in Feces

B

C

A
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 taeniaeformis* - 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
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
Zoonosis

- Sparganosis
  (spargana [pleurocercoids] in various organs and muscles)
  - Ingestion of procercoid 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