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

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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?)
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

Be aware of recent (last 3-5 years) emerging issues in Veterinary Parasitology.

- *Dipylidium caninum* strains resistant to Praziquantel & Epsiprantel
- *Ancylostoma caninum* strains with multi-drug resistance
- Invasion of the Asian longhorned tick (*Haemaphysalis longicornis*)
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

- 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]*)
  - Prepateint 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 tetrathyrididia 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
  - Proceroid

- 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.
Notes

- **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 proceroid 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