Order ASCARIDIDA (Ascarids)

• Adult worms in small intestine are large!
  – mouth surrounded by 3 fleshy lips

• Host-specific, adult stage
  – *Toxocara canis* in dogs
  – *Toxocara cati* in cats
  – *Ascaris suum* in pigs
  – *Parascaris* in horses
  – *Baylisas carcasis* in raccoons
Impaction from massive worm burden in foal
Order ASCARIDIDA (Ascarids)

- Eggs are thick-walled (highly resistant), distinctive, contain a single cell. Can persist in soil for years!
Pot-belly typical of large worm burden in young
Toxocara canis in duodenum
Toxocara canis

• very common parasitic problem in dogs
• thick, white, large 50-180 mm adult worms
• anterior end: cervical alae are expanded i.e. ‘arrowhead’ worms
Life-cycle of *T. canis*

- Adult worms live in the small intestine
- Female worms produce a large number of eggs.....

- 1 cell develops into an infective larva within the egg shell in ~4 weeks

  ‘EGG’ is ingested
Routes of infection: ADULT Dog

1. **Direct**: Ingestion of infective egg containing larva. Ascarid L₂ are infective

2. **Indirect**: Ingestion of paratenic host which contains larva
Incoming Larva

“tracheal migration”
leads to adult development

“somatic migration”
leads to larval ARREST in tissues
Routes of infection: FETUS or Newborn

Reactivation of arrested larvae

⇒ TRANSUTERINE infection in dogs
Prepatent period:

3 - 5 weeks

..........

~5 weeks if infection starts with ‘egg’ stage
~3 weeks if *in utero* infection or if ingestion of paratenic host
Pathogenesis & Clinical Signs:

- Gastroenteritis - inflammation hypersensitivity
- Abdominal pain, pot-bellied, poor coat
- Fetid, mucoid diarrhea
- Respiratory signs are rare
• **Diagnosis:**
  – Adult worms in vomit or in feces
  – Clinical signs
  – Fecal
    – negative unless > 3-5 weeks
Treatment and control

• Adults and larvae in intestines - many drugs effective
• Arrested larvae - drugs less effective
• Deworm dam (timing of monthly prophylaxis)
• Deworm newborn puppies...start at 2-3 weeks till monthly heartworm preventative started
• Environment
  – wash hands thoroughly after handling
  – use bleach to clean, dispose of feces
Ascarids:

*Toxocara canis*
Zoonosis: Visceral larva migrans

- ingestion of 'infective egg' -- migration of larvae in tissues of aberrant host
- ocular larvae migrans: children with granulomatous reaction to larvae in eye
- 14% of people have antibodies to *Toxocara*
Toxocara cati

- small intestine of cats
- similar to *T. canis* but …
  - prominent cervical alae
  - Transmission to kittens:
    - transmammary transmission is important but queen must have been infected during pregnancy
    - no transuterine transmission
  - PPP ~ 8 weeks from ingested egg
**Toxocara cati**

- Treatment of kittens from 6-8 weeks of age
  - Pyrantel, fenbendazole, ivermectin
- **Visceral larva migrans** in humans, sand boxes and gardens
Toxascaris leonina

- <1% prevalence - dogs, cats
- eggs oval, smooth shell
- infection: ingestion of eggs or infected paratenic host only
- PPP 8-10 weeks
- mild clinical signs
- no visceral larva migrans
Baylisascaris procyonis

- Raccoons
- May infect dogs exposed to raccoon latrines
- Very aggressive visceral larval migrans, neurological signs
**Parascaris equorum**

- small intestine of young horses < 2 yrs
- adult worms are large, thick-bodied
Parascaris equorum

- only ONE route of infection i.e. ingestion of infective egg
Egg containing infective larva (takes ~10-14 days)

Larvae migrate to liver, lungs, coughed up and swallowed, returning to the small intestine 2-4 weeks after ingestion

Prepatent period ~ 80 days
Pathogenesis:

1. Respiratory problems
   - congestion due to parasite antigens/allergy
   - migration of larvae
2. Intestinal problems
   - enteritis, obstruction, perforation
Clinical signs:

- diarrhea - odorous
- potbellied appearance
- rough hair coat
- respiratory signs

*Suboptimal Growth*
Treatment & Control:

• clean environment - adult worms are very fecund, eggs are very resistant and sticky!
• mare: clean teats & udder
• deworm foal at 2 months, q 2 months till ~1 year of age
If you suspect a heavy infection, do **NOT** use a potent drug at full dosage e.g. benzimidazole or ivermectin.
LARGE worms causing impaction, anaphylaxis
So, use a lower dose or mild drug + mineral oil

Assigned reading for class discussion and exam questions: “What is your diagnosis?” in supplemental course materials at http://parasitology.cvm.ncsu.edu
Ascaris suum – PIGS

- Eggs: thick shelled, rough, brownish, oval
- 1 female → 200,000 eggs/day

Impaction of pig jejunum with Ascaris suum

Egg from fresh pig feces
Life-cycle of *A. suum*

- Only 1 route of infection:
  - INGESTION of infective egg

- Larvae migrate, coughed up and swallowed back into the small intestine in 7-8 days p.i.

- Prepatent period ~ 60 days
PATHOGENESIS

Especially with repeated infections

- **Lungs** - hemorrhage, edema, eosinophils/cells
- **Liver** - focal fibrosis ‘milk spots’, $ loss, even though edible

- **Intestine** - hypertrophy of muscle layer (poor nutrient absorption)
CLINICAL SIGNS

- coughing =‘thumps’, rapid, shallow expiration
- stunted growth
- diarrhea
Treatment & Control

– clean environment - adult worms are very fecund, eggs are very resistant and sticky!
– deworm sows 2 weeks before farrowing & wash thoroughly to get rid of those sticky eggs
– most drugs work
  • PYRANTEL kills newly hatched larvae use as feed additive
**Ascaridia** sp. small intestine ascarid of birds

- Relatively large worm, 5 – 10cm, males have distinctive pre-anal sucker, adults in the small intestine
- Only route of infection is by ingestion of egg, prepatent time = 4-8 weeks
- Pathology is in young birds (< 3 months), hemorrhagic enteritis, anemia and diarrhea, blockage with heavy burdens
Ascaridia galli

Smooth thick shell egg

Ascaridia in small intestine of a bird
Heterakis gallinarum “CECAL WORM”

• cecum of chicken, turkeys, etc.
• bird is infected either by:
  ingestion of egg containing infective larva
  OR infected transport host - earthworm
• Nematode is relatively NON-pathogenic
  but.....
*Heterakis gallinarum* eggs & larvae are carriers of a protozoa, *Histomonas meleagrisidis*

severe ‘blackhead’ disease in *turkeys only*;
(not in chickens)
inflammation/necrosis of cecum & liver

high mortality
To control ‘blackhead’ disease, must control *Heterakis* nematode infections:

* deworm
* clean up the environment
* don’t house turkeys with chicken, or use areas that previously housed chickens