Order ASCARIDIDAE (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
  – *Baylisascaris* 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 $L_3$ 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
  – Clean surfaces, 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
  - Adult cats often get patent infections by ingestion of paratenic (transport) hosts
  - **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 larva 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. **Drug resistance to avermectins** is common.
If you suspect a heavy infection, do **NOT** use a potent drug at full dosage e.g. benzimidazole

**WHY?**
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
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

Posterior of male Ascaridia

Pre-cloacal sucker
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 meleagridis*

→

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