INTERNAL PARASITES
(MOST IMPORTANT HELMINTHS)

- Large roundworms - *Ascaridia sp.* - Most important in chickens and turkeys
- Cecal worms - *Heterakis gallinarum*
- Hair worms - *Capillaria obsignata* - quail
- Crop worms - *Capillaria contorta* and *C. annulata* - quail
- Tape worms - *Raillietina cesticillus* + 6 others
- Gapeworms - *Syngamus trachea* - in pheasants
LARGE ROUNDWORMS

Ascaridia galli (chickens)
A. dissimilis (turkey)
A. columbae (pigeons, doves)

Mature worms - A. galli size
   Males - 1 1/2-2 1/2 in. long.
   Females - 2-4 in. long.
Size affected by crowding.
**LIFE CYCLE**
**(Ascaridia galli)**

**DIRECT**

*Embryonated egg $\leftarrow$ Mature adults

↓

Infective

↓

Larvae (9 days)

↓

Penetrate S.I. at 17 day. Young adult in lumen

Mature adults $\rightarrow$

Produce eggs

28-30 days

Post infection $\uparrow$

*Embryonation takes 10-12 days. Eggs infective 161 weeks on ground.
COURSE OF DISEASE

Worms remain until "self cure" or treatment.

MORTALITY

Usually negligible
Mainly caused by gut blockage.
METHOD OF SPREAD

Ingestion of sporulated eggs from contaminated environment.
CLINICAL SIGNS

Clinical signs usually seen only in backyard flocks.

- Depression, loss of weight, diarrhea
- Retarded growth
- Lowered egg production in heavy infection (can occur in caged layers exposed to contaminated flies)
POSTMORTEM LESIONS

- Presence of worms in small intestine
- Inflamed intestines
- Emaciation (culling)
Ascaridia galli
Ascaridia galli
Ascaridia galli
Ascaridia galli
• Greatest damage - birds under 3 mo. of age - due to larval migration in the small intestinal wall.

• Light breeds more susceptible

• Malcolm Reid research
  10-14 worms = 5-7% loss egg production
  1 lb wt loss in broilers per 325 worms
DIAGNOSIS

- Presence of worms on postmortem

- Diagnosis - without sacrifice if worms suspected, can place several birds on wire bottom cage and treat with worming drug. Observe feces.

- Flotation of fecal matter.
A. galli eggs
TREATMENT

- Piperazine (various salts) nontoxic. Works by paralyzing worms long enough to be evacuated from the intestinal tract.
- Piperazine dihydrochloride
  Most common - powder form for feed or water use.
- Piperazine sulfate (wazine\textsuperscript{tm}).
  Liquid for water use.
- Base dose on Piperazine content.
- Follow directions on label. This doesn’t work as well as it used to. Resistance has developed to the drug.
TREATMENT (CONT.)

Piperazine
- in water most practical.
- water starve; want high level quickly.
- Dosage:
  Chicken & turkey - feed 0.2-0.4%
  water 0.1-0.2%
  Single dose
  chicken 50-100 mg/bird
  turkey < 12 wks 100 mg/bird
  > 12 wks 100-400 mg/bird
Severe infestation - repeat in 21 days.
Worm in egg
TREATMENT (CONT.)

- Coumaphos - Meldane 2® (Hess & Clark) - feed treatment. May suppress feed intake in heavy breeders.
- Approval - chickens only > 8 wks.
- Pullets - worm 2-3 times with piperazine. Then treat with meldane.
  - Before laying house.
    - 40 ppm - 4 lbs/ton - 10-14 days
- Hens - 30 ppm - 3 lbs/ton - 14 days
- Retreat pullets on contaminated floor in 3 wks.
- Effective on roundworms, cecal worms, & Capillaria.
- Levamisole - 8 mg/lb of broiler for Roundworms.
  - Effective but not approved for use without a prescription.
TREATMENT (CONT.)

- Hygromycin B - chickens only. Stops worm egg production
- Usually in pullets, may be used in broilers. Not allowed in commercial layers; ok in breeders.
- 8-12 gm/ton continuously (12 gm/ton - Capillaria) (8 gm/ton - rounds & cecal)
- 3 day withdrawal period.
PREVENTION AND CONTROL

• Confinement rearing and caging has reduced problems with most internal parasites.

• Deep litter (4-6" wood shavings) has reduced exposure to worm eggs.

• Worst problems in winter - poor litter conditions are ideal for worm egg maturation.
PREVENTION

• Proper clean up between flocks.

• Hygromix continuously. This drug is not longer being produced.

• Meldane at 3 week intervals.

• Examine all flocks routinely at 4-5 weeks, 10 weeks and 15 weeks.

• Routinely worm before moving to the laying house.
CECAL WORMS

- *Heterakis gallinarum*

- Primary importance - transmitting Blackhead in turkeys and chickens

- Mature worms - 3/8 to 3/4 inch long
LIFE CYCLE

• **DIRECT** - similar to ascarids. About 65 days to complete. (Not seen in broilers)

• Eggs infective up to 230 weeks on the ground.

• May be transmitted by earthworms.

• *H. gallinarum* eggs pick up Histomonas (Protozoa) in gut of infected birds. (Usually chickens)
LIFE CYCLE OF POULTRY CECAL WORM
Heterakis gallinae

Adult parasites in ceca

Eggs hatch and larvae develop into mature parasites

Lay eggs in digestive tract

Embryonated eggs ingested by chickens

Deposited and develop in soil and feces

Eggs in feces
COURSE OF DISEASE

Worms remain until "self cure" (IgE) or treatment

MORTALITY

Usually negligible
METHOD OF SPREAD

Ingestion of sporulated eggs from contaminated environment

CLINICAL SIGNS

Usually inapparent
POSTMORTEM LESIONS

- Presence of worms in ceca.
- Slight thickening of cecal mucosa in heavy infections.
- Mild cases - no pathology.
Heterakis gallinarum
Heterakis gallinarum
Heterakis gallinarum
Heterakis gallinarum
Heterakis gallinarum
DIAGNOSIS

– Presence of worms in ceca.

– Cut off the tip of the ceca and heat with a match.
TREATMENT

- Phenothiazine in feed - 0.5gm/1 chicken or 1 gm/1 turkey.
- Hygromix - 8-12 gm/ton - 8 weeks
- Meldane - 30 ppm - 10 days to 2 weeks
- Levamisol - effective but not approved. 16 mg/lb of broiler for Heterakis - put in water after water starving birds
- Piperazine does not work on cecal worms
PREVENTION

• Same as ascarids.

• Very important to use deep litter (4-6") over floors when changing from chicken production (pullets or layers) to turkeys.

• Blackhead transmission.
CAPILLARIA WORMS

- Crop & esophagus invaders - *C. contorta* and *C. annulata* burrow in the mucosa

- Important intestinal form - *C. obsignata* intertwine in intestinal villus

** Capillaria are not a problem in broilers.**
Capillaria obsignata

- 1/2 - 3/4 in. Long - hair-like
- Life cycle - direct
- Eggs infective up to 102 weeks
- Found in small intestine
Life Cycle of Poultry Nematode
Capillaria obsignata

1. Adult parasite in small intestine
2. Eggs hatch and develop in the intestinal mucosa
3. Embryonated eggs ingested by chickens
4. Deposited and develop in soil and feces
5. Eggs passed in feces
6. Lay eggs in digestive tract
MORTALITY

• Negligible
METHOD OF SPREAD

EMBRYONATED EGGS

• May be a problem in heavy breeders in the winter due to increased moisture in the house. Slats in houses decrease the incidence.
CLINICAL SIGNS

• Infected birds are unthrifty, have diarrhea and loss of weight.
• Birds are pale.
• Egg production may decline 15-20% or never peak properly.
• Produces enzymes to prevent their own digestion which may interfere with Vit. A absorption and may cause white yolks.
POSTMORTEM LESIONS

- Moderate to severe inflammation of duodenum and upper small intestine.

- In severe infections, the intestinal wall may be quite thickened as well as inflamed, resulting in a heavy catarrhal enteritis.
Capillaria obsignata
Capillaria obsignata
Capillaria obsignata
Intestinal scrapings washed through 100 mesh screen will reveal the worms. In severe infections, simple scraping with microscopic examination will reveal infection.
Screening
Screening
Viewing screenings
Microscopic view
Microscopic
Capillaria eggs
TREATMENT

• Meldane - 2-4 lbs. 10% premix/ton - two weeks at two month intervals.

• Hygromycin - hygromix - 12 gm/ton for 8 weeks. May be necessary to maintain flock on 8 gm/ton continuously. This product is not longer being manufactured.

• Levamisol - effective but not approved. 16 mg/lb of broiler for capillaria - in water after water starving birds. It can be used under a prescription.

• Vitamin A - increase 6000 additional units for 2 weeks.
PREVENTION

- Good sanitation.

- Worm layer pullets with meldane just before you put them in the laying house.

- Hygromycin - as in treatment.

- Meldane - as in treatment.
COMMENT

- Problem usually in young adults.
- "Self cure" develops as infection continues.
C. annulata and C. contorta

- C. annulata - requires earthworms in life cycle. Occasionally seen in turkeys and game birds.

- C. contorta - more important. Most frequent species found in crop infections. Has direct life cycle.

- Adults are from 1 1/2 to 2" long.
COMMENT

- Seen quite frequently in pen raised (on ground) game birds, particularly quail.

- Occasionally seen in turkeys on the range.
MORTALITY

• May be 100% in untreated quail. Seldom high in turkeys, but depresses growth.

• Usually die of starvation.
CLINICAL SIGNS

• **In turkeys** - "penguin" stance due to pendulous crop.

• **Quail** - "typical sick" appearance, birds quite hungry but refuse to eat, just stand and look at feed.

• Birds make "swallowing" motions.
Typical sick quail
POSTMORTEM LESIONS

- Thickened and inflamed crop and esophagus walls.

- Heavy exudate covering lining of the crop and esophagus and sloughing of the membranes.

- Pulling crop walls apart reveals worms.
Thickened crop
Worms in crop
Thickened crop
Thickened crop
Thickened crop

CAPILLARIA WORM INFESTATION IN CROP OF TURKEY
Tearing crop
DIAGNOSIS

• Typical lesions in the esophagus, mouth and crop with burrowing worms present.

• Requires parasitologist for species identification.
TREATMENT

- Meldane - 2-4 lbs. 10% premix/ton - 2 weeks - about 50% effective. May be hard to find.

- Levamisol - effective but not approved.
  - 1 gm/gal of water for 24 hour consumption.
PREVENTION

- Use new ground.
- Raise on wire.
- Probably continuous use of meldane.
- Method of treating old pens with methyl bromide under plastic tenting is being used with success.
- Need a licensed applicator.
GAPEWORMS
(Syngamus trachea)

- Not important in commercial poultry operations.
- Occasionally seen in backyard flocks and pet birds.
- Seen commonly in pheasants grown on straw-type litter in Pennsylvania.
- Transmitted by earthworms mainly.
- Usually in immature birds.
ETIOLOGY

• Male and female worms are generally found attached to each other continuously (y shaped). Worms are attached to the trachea and are red and vary in size depending on the crowding effect.

• Birds gape (mouth breathe) depending on number of worms and amount of blockage.

• A single pair of worms can choke a bird.
DIAGNOSIS

- Worms are found on postmortem in the trachea and bronchi.

- No drugs are approved for commercial use against Syngamids.
Worms in trachea
TREATMENT AND PREVENTION

• *Thiabendazole 0.05-0.1% in feed for 2 wks.
  – * Not approved by FDA.

• Levamisole 16 mg/lb of bird for 3 days in water.

• Prevention - stop access of wild birds and stop earthworm exposure.
CESTODES

TAPEWORMS

• Seven species affect chickens

• All require intermediate hosts

• *Raillietina cesticillus* most commonly found - darkling beetle - intermediate host
COMMENT

• Present husbandry excludes the most important pathogenic species.

• *Davainea proglottina* requires slug as intermediate host.

• Other species probably non-pathogenic except in large numbers.

• *Hymenolepis sp.* are so small they may be completely overlooked and found in Coccidia scraping.
Life cycle

1. Adult tapeworms in intestines of poultry

2. Ripe segments containing numerous eggs are expelled with the droppings

3. Beetles become infested by swallowing the segments or eggs liberated from the segments

4. The infective stage or cysticercoid develops in the body cavity of the beetle in 2 to 3 weeks

5. Poultry acquire tapeworms by eating infested beetles

Figure 24.—Life history of a poultry tapeworm, Raillietina cesticillus.
DIAGNOSIS

Presence of tapeworms

TREATMENT

No legal treatment available.
Tapeworms
Tapeworms
PREVENTION

• Control intermediate hosts such as flies, ants and beetles.

• Sevin dust or spray is commonly used for this.