AVIAN COCCIDIOSIS

• One of the most potentially destructive diseases in domestic poultry production.

• Most costly of all poultry diseases.

• Strictly a gut infection in chickens and turkeys.

• All avian species affected.

• Host specific.
ETIOLOGY

- Protozoa - genus *Eimeria*.

- Direct short life cycle, sexual and asexual phases with high reproductive potential.

- 1 oocyst produces 1,500,000 oocysts.

- Self limiting - severity of infection, dosage dependent.
ETIOLOGY (CONT.)

- Modern poultry production methods encourage severe infection. Mixed infections are common in chickens.
- Poultry raised on the floor are highly susceptible throughout their life.
- Pullets raised on wire away from fecal contamination have a low chance of infection but remain susceptible.
- Oocyst are resistant to adverse environmental conditions.
- Exposure related immunity develops.
SPECIES AFFECTING
CHICKENS

Eimeria necatrix
" tenella
" brunetti
" maxima
" acervulina
" mivati
" mitis
" praecox
" hagani

"bloody"
shallow
? pathogenic
INCUBATION PERIOD

- Depend on species of coccidia 7-8 days to complete life cycle.

- **Mortality** - depends on coccidia species and dosage. Usually 5 to 8 days after infection.

- **Blood appears** - 4-5 days depending on coccidia species.
COURSE OF DISEASE

- 1-3 wk. on a flock basis.
- Depends on species of coccidia.
- Immunity develops.
E. Tenella life cycle
ECONOMIC EFFECT

- Mortality - variable.
- Poor feed conversion and weight gains.
- Reduction of desired pigmentation.
- The lack of uniformity in pullets.
- Above depends on species of coccidia, dosage, condition of overall health and genetics of the chicken.
- Every ton of feed has $5/ton of coccidiostat.
METHOD OF SPREAD

• The natural behavioral traits are conducive to ingestion of sporulated oocyst.

• Starts in a few birds and dosage is built up over one or two passages and whole flock may be exposed.
SIGNS

- Typical "sick bird" - depressed and ruffled feathers.
- May or may not have bloody diarrhea depending on species of Coccidia.
- Mortality - may be first thing noticed. Species dependent.
- Loss in egg production - rare because usually exposed and immune before the start of lay.
Typical sick chicken
POSTMORTEM LESIONS

- *Eimeria tenella* - cecal coccidiosis.
- Erosions of cecal wall with free blood and bloody cores in ceca.
- Caseous cores (old cases).
- **Micro** - presence of ovoid oocyst in cecal scraping from sub-epithelium.
- Oocysts are double walled.
E. tenella vs. normal
E. tenella
E. tenella
E. tenella
E. tenella
E. Tenella oocysts
POSTMORTEM LESIONS

- *Eimeria necatrix* - mid gut.
- Ballooning in mid gut. Parasite in sub-epithelium.
- **Serosa** - white spots and petechial hemorrhages
- **Open gut** - mucoid blood-filled exudate.
- **Micro** - gut has large schizonts (single wall with little definition) but no oocyst. Life stages moves to ceca where oocysts are found.
- Ceca-oblong ovoid oocyst with no wall erosion.
- Less likely to be a mixed infection.
E. necatrix
E. necatrix
E. necatrix
E. necatrix
E. necatrix
E. necatrix scraping
E. necatrix schizonts
POSTMORTEM LESIONS

- *Eimeria brunetti* - mainly in lower SI and rectum. Some infection in mid SI and ceca.
- **Serosa** - ecchymotic white areas with thickening of lower SI and rectal walls.
- **Open gut** - *coagulative* necrosis, mucoid bloody enteritis in lower gut.
- **Micro** - large ovoid oocyst in coagulative material. Infection in sub-epithelium.
E. brunetti
E. brunetti
E. brunetti
POSTMORTEM LESIONS

- *Eimeria maxima* - midgut - “salt and pepper” lesions.

- **Serosa** - faint hemorrhages and wall ballooning.

- **Open gut** - blood-tinged mucus sometimes orange exudate.

- **Micro** - large golden color oocyst in gut is diagnostic.  
  30 x 20 microns.
E. maxima
E. maxima
E. maxima

E. maxima +2
Day 7
E. maxima
E. maxima schizots
POSTMORTEM LESIONS

- *Eimeria acervulina* - usually in duodenal area.
- **Serosa** - white plaques that may be elongated and have a tendency to be "Ladder like" (horizontally) or in severe infections coalesced plaques and wall thickening. The ladder lesions are becoming less common.
- **Open gut** - only the epithelium is affected. May be whitish petechiae to coalesced lesions with a milky appearance (oocyst) in severe infection. Pathology depends on dosage.
- **Micro** - small (18 x 14 microns) ovoid oocyst from gut epithelium.
E. acervulina
E. acervulina

E. acervulina
5th day
E. acervulina
E. acervulina
**POSTMORTEM LESIONS**

- *Eimeria mivati* - some disagreement over the actual authenticity of this being a separate species from *E. acervulina*.
- Occurs in the epithelium of the upper gut.
- **Serosa** - similar to *E. acervulina* but round lesions and more gut thickening.
- **Open gut** - depending on dosage from individual plaques to coalesced large infected areas that appear milky.
- **Micro** - similar to *E. acervulina* with more macrogametocytes present mixed with oocyst.
E. mivati
E. mivati

Score 2

E. mivati
E. mivati
E. mivati oocyst
POSTMORTEM LESIONS

- *Eimeria mitis* - low in pathogenicity lower third of the SI.
- **Serosa** - difficult to see any lesions.
- **Open gut** - slight mucoid appearance, look for oocyst with microscope.
- **Micro** - very small (15 x 14 microns) subspherical oocyst.
- *E. praecox* - slightly pathologic causing diarrhea.
- *E. hagani* - needs research.
DIAGNOSIS

- The presence of lesions and some stage of the life cycle of coccidia (usually oocyst).
- Need to look at live and dead birds.
- Select birds typical of the flock, not culls. Culls may be off feed and not ingesting coccidiostat so are very likely to have cocci even if it is not a flock problem.
- Must use light microscope to confirm.
- Can speciate by location of lesions and type and size of oocyst.
DIAGNOSIS (CONT.)

• The serosal surface is examined for white plaques and hemorrhagic petechiae. The area of the gut affected is considered.
• The gut is opened and the mucosa of the affected area is scraped off with a spatula and placed on a microscopic slide.
• A cover-slip is applied to the scraping and mashed to produce a thin smear.
• The slide is then examined with a light microscope. Low power (100x) is used for scanning and high dry power (430x) for detail examination and measurements.
Many times coccidiosis will be caused by a mixture of species. Usually if birds are dying, there is a predominance of one deep invading species.

Coccidiasis-presence of stage of life cycle (usually oocyst) without lesions in the gut or effect on production.

Disease has a tendency to be over-diagnosed by servicemen.
COMMENT

Other enteritis problems may appear similar to coccidiosis. However, a microscopic examination should clarify the diagnosis. Don’t treat for coccidiosis unless you know for sure.
Nonspecific enteritis
Nonspecific enteritis
TREATMENT

- Follow directions closely.
- Treatment - usually in water.
- Overtreatment can cause drug toxicity (Sulfas).
- Take into consideration the season of the year. Sulfa drugs can be toxic if birds change their drinking habits based on temperature.
- Some drugs can be used for both treatment and control.
- Treatment - really prevention.
## TREATMENT CHICKENS

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<thead>
<tr>
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<th>Water</th>
<th>Feed</th>
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<tbody>
<tr>
<td>Sulfaquinoxaline</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Amprol®*</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Sulfadimethoxine</td>
<td>+</td>
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*Approved for laying hens
PREVENTION

- Genetics - not developed.
- Nutritionally - certain vitamins help but not reliable.
- Quarantine & depopulation - not practical - can make things worse.
- Sanitation - not practical - may produce more susceptible birds. Very resistant to chemicals.
PREVENTION (CONT.)

- Reduced exposure - shift from floor to cage rearing but bird must remain in cages or on wire for life.
- Immunization - requires exposure (natural or planned) to live coccidia. This is used in broiler breeders or leghorns. Vaccine available.
- Chemotherapy - coccidiostats - presently most practical and most used.
## COCCIDIOSTATS

### Trade names

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<thead>
<tr>
<th>Ionophores</th>
<th>Withdrawal (days)</th>
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<tbody>
<tr>
<td>Coban® (Summer)</td>
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<td>Avatec®</td>
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<td>Bio-Cox® (Summer)</td>
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<td>Amprol®, Amprol +®, Amprol Hi-E® (A thiamine analog)</td>
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<td>Coyden® at 0.125% (25% premix)</td>
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<td>Rofenaid®</td>
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<td>Stenoral®</td>
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SHUTTLE AND ROTATION PROGRAMS

- These programs have been used to stop strain resistance to specific drugs.
- Rotation involves complete change of drugs for several months or years hoping resistance will disappear.
- Shuttle programs involve the change of Coccidiostats within a grow-out period of a single flock.
TYPICAL SHUTTLE PROGRAM

Summer
Coban 3-4 weeks
Avatec 5th week until withdrawal

Winter
Nicarb 3 weeks
Coban 5th week
IMMUNITY

• 2-3 cycles of infection to develop sufficient immunity (depending on species of coccidia).
• Coccivac® - must give in first 7-10-days and proper management of coccidia shed - need 20% moisture in litter.
• 4-6 species used in the vaccine depending on geography.
• Coccivac - mainly used in breeders, layer pullets, and roasters.
• Coccivac - now given as an eyedrop in the hatchery or sprayed on the feed at 3 days
IMMUNITY (CONT.)

- Important to develop immunity in breeders and floor layers.
- Amprol - step down program.
- Research being done on new immunizing agents.
TURKEY COCCIDIOSIS

• Etiology - same genus; *Eimeria*
• Incubation period - same as chicken
• Course of disease - usually about (4-5 days)
• Mortality - low 5% except *E. adenoides*
• Method of spread - same as chicken
• Symptoms - Not as severe, more like "Shallow" invaders, weight loss. No bloody diarrhea like in chickens.
IMPORTANT SPECIES AFFECTING TURKEYS

- *Eimeria meleagrimitis*
  - " adenoides" pathogenic
  - " gallopavonis"
- 4 other species - non-pathogenic
- *Eimeria dispersa* – affects quail also
  This one is not host specific.
POSTMORTEM LESIONS

- *E. meleagrimitis* - upper two-thirds white or green cheesy mucous casts
- Blood rare
- Micro-oocyst in small intestine
E. meleagrimitis
E. meleagrimitis
E. meleagrimitis
POSTMORTEM LESIONS

- *E. adenoides* - lower third small intestine, ceca, and large intestine
- Dilation, edema and caseous exudate "cottage cheese"
- Mortality may reach 100% in young
- This doesn’t occur often and is not seen in Georgia.
E. adenoides
E. adenoides
POSTMORTEM LESIONS

- *E. gallopavonis* - lower third & ceca.
- Same as *E. meleagrimitis*, but in lower intestines and ceca, in between the cecal pouches.
E. gallopavonis
E. gallopavonis
TURKEY TREATMENT

- Sulfaquinoxaline (SQ) - toxic
- Amprol
- Sulfadimethoxine (Agribon®) in water
CONTROL

Try to develop some immunity in the poult’s. Feed coccidiostats during brooding

- Sulfaquinoxaline (SQ)
- Amprol
- Zoalene
- Coban - need to start birds on this or can get toxicity characterized by a “knockdown” where birds are recumbent with feet stretched out behind
- Stenoral
- Avatec