Coccidiosis or Coccidiasis?

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2015 Poultry Institute Meeting
November 19 – Puyallup, WA

Coccidia Are Present In Every Poultry House Anywhere In The World

Reproductive Potential

1 oocyst can produce
• E. acervulina 400,000
• E. maxima 12,000
• E. tenella 72,000

• Day 20 ~ 30,000 oocyst/gram litter
• 1 sq. ft. built up litter weighs ~ 1.5 kg

40 x 400 ft = 16,000 sq. ft. ~ total oocysts in house 720,000,000, 000

Slide courtesy: G.F. Mathis, Southern Poultry Research
COCCIDIOSIS - DEFINITION

Coccidiosis is a common parasitic disease of the intestinal tract or ceca of chickens and turkeys caused by single-celled protozoan parasites of the genus *Eimeria* which are commonly referred to as coccidia.

OTHER GENERA OF APICOMPLEXAN PARASITES

» *Isospora*
» *Haemoproteus*
» *Leucocytozoon*
» *Plasmodium*
» *Toxoplasma*
» *Sarcocystis*
» *Wenyonella*
» *Tyzzeria*
» *Cryptosporidium*

COCCIDIOSIS VS. COCCIDIASIS

There are 2 types of coccidiosis:

Clinical coccidiosis where the affected birds show typical symptoms of disease, such as bloody droppings and increased mortality and

Subclinical coccidiosis where the affected birds do not show visible symptoms of the disease but the gross lesions and the coccidia are present.

COCCIDIOSIS VS. COCCIDIASIS

Because in most cases the feed chickens and turkeys consume is supplemented with anticoccidial drugs, cases of clinical coccidiosis are not nearly as common as those of subclinical coccidiosis.

For this reason, subclinical cases of coccidiosis are much more prevalent and harder to diagnose and treat and the performance of these flocks is substandard.

COCCIDIOSIS VS. COCCIDIASIS

The prevalence of subclinical coccidiosis is most frequently monitored by conducting "cocci checks".

Extremely good performance responses to diclazuril observed by many companies following its introduction clearly illustrated the significant adverse effects of subclinical coccidiosis on flock performance.

Incidence of Subclinical Diseases

U.S. Broilers - Overall Ranking (%)
Occasionally Outbreaks of Coccidiosis Occur in Caged Layers

Most Common Coccidia in Broilers

» Eimeria acervulina
» Eimeria maxima
» Eimeria tenella

Other Coccidia

» Eimeria brunetti
» Eimeria necatrix
» Eimeria mitis
» Eimeria praecox

Signs of Coccidiosis

• Typical sick bird attitude.
• Inadequate pigmentation (pale shanks).
• Anorexia (loss of appetite).
• Huddling under brooders.
• Ruffled feathers, soiled vent.
• Enteritis/flushing and wet litter.
• Impaired nutrient absorption/feed passage.
ADVERSE EFFECTS ON BROILER PERFORMANCE

- weight gain: ↑ feed conversion.
- mortality.
- Secondary infections.
- ↑ medication cost.
- Bloody droppings.
- Anemia.
- Sudden death.

DISEASES OR CONDITIONS THAT MAY LOOK LIKE COCCI

- Pale bird/malabsorption syndrome/RSS.
- Mycotoxicosis.
- Clinical and subclinical NE.
- Enteric salmonellosis.
- Enteric colibacillosis.
- Classical IBD.

DISEASES OR CONDITIONS THAT MAY LOOK LIKE COCCI

- Consumption of poor quality feed (i.e., rancid fat, soybean meal with high levels of tripsin inhibitors).
- Excess salt in feed.
- Enteric viruses.
- Other internal parasites.
- Non-specific enteritis.

ASSESSING THE CHALLENGE AND THE EFFICACY OF ANTICOCCIDIAL PROGRAMS

- Always follow the same procedure.
- Examine 5 birds per house (avoid culls).
- Check 2 or more farms per age group.
- Check 2, 3, 4, 5, 6, 7 & 8 week-old birds.
- Carefully inspect the outside and inside of the gut for gross lesions of coccidiosis.
- Always scrape the mid-gut to look for *E. maxima* oocysts with a microscope.

ASSESSING THE CHALLENGE AND THE EFFICACY OF ANTICOCCIDIAL PROGRAMS

- Look for typical gross lesions.
- Always score from 0 (no lesions) to +4 (most severe lesions).
- Always scrape the gut and look for oocysts under the microscope to confirm *E. maxima*.
- If anticoccidial failure is suspected, always collect and assay a feed sample for drug content.
ASSESSING THE CHALLENGE

• Keep in mind that onset of lesions may shift to a later period when a strong chemical drug is used in the starter feed.

PEAK OOCYST PRODUCTION
OOCYST NUMBERS

ASSESSING THE CHALLENGE

• Oocyst counts:
  Litter vs. droppings

• Sensitivity limit:
  100 oocysts/gram

Oocyst Counts (OPGs)

• Impending risk:
  E. acervulina 100,000
  E. maxima 10,000
  E. tenella 70,000

Antimicrobial Drugs: Lesion Scoring Techniques in Battery and Floor-Pen Experiments with Chickens

James J. Hahn and W. Mahone Reid

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E. acervulina, E. maxima, and E. tenella were found to be the most difficult species to score since the gross pathologic picture has been difficult to correlate with weight gain or other indicators of pathogenicity. Birds from floor pen trials infected with one or more of these species were also graded on a 0 to 4 scale. The sections of the intestine, appendicitis, liver, and mesenteric lymph nodes were scored separately. No attempt was made to determine species, but microscopic examination of organs was used to confirm the presence of coccidiosis.
LESION SCORING REGIONS

- Upper region = Duodenum and upper jejunum.
- Middle region = Jejunum (mid and lower jejunum).
- Lower region = Ileum and rectum.
- Cecal region = Ceca.

J. Johnson & W.M. Reid, 1970.

COCCIDIOSIS COMPARISON

CLINICAL COCCIDIOSIS

SUBCLINICAL COCCIDIOSIS
COCCIDIOSIS COMPARISON

CLINICAL COCCIDIOSIS

SUBCLINICAL COCCIDIOSIS

COCCIDIASIS?
COCCIDIOSIS CONTROL

OBJECTIVES

• Broilers:
  Control infection to maximize performance, immunity development is secondary.

• Breeder pullets and table-egg layers:
  Controlled exposure to ensure protective immunity in all pullets by 12 weeks of age.

COCCIDIOSIS PREVENTION PROGRAMS

• Chemoprophylaxis:
  Chemical anticoccidials. Ionophore anticoccidials. Chemical + Ionophore anticoccidials.

• Vaccination:
  Live attenuated and non-attenuated vaccines.
CHEMOPROPHYLAXIS

- **Step-down** programs
  The concentration of the anticoccidial is lowered in the latter feed(s).
- **Rotational** programs
  The anticoccidial drug is changed every 3, 4 or 6 months resulting in 4, 3 or 2 rotations per year.

IONOPHORE ANTICOCCIDIALS

**CHARACTERISTICS**
- They allow some coccidiosis to occur.
- The level of coccidiosis allowed has a minimal adverse effect on flock performance.
- The low-grade cycling of coccidia is commonly referred to as a “leakage” and it allows a gradual development of immunity.
- The coccidia are not under selection pressure and are not as likely to mutate and develop resistance.

- This prolongs the anticoccidial’s useful life.
- Ionophores are versatile, they can be used in straight, shuttle, step-up, step-down and rotational programs.
- Some are cleared for use in breeder and layer pullets.
- Most of them benefit from the addition of 3-nitro to the feed.

CHEMICAL ANTICOCCIDIALS

**CHARACTERISTICS**
- Typically this type of anticoccidial do not allow coccidiosis to occur (except a few like Nicarb).
- Birds do not develop immunity.
- The coccidia are under selection pressure and are more likely to mutate and develop resistance to the drug.
- The resistance problem reduces the drug’s efficacy and its useful life.

- Drug resistance may develop completely and suddenly, the consequences can be devastating.
- They are best used in shuttle programs (usually in the starter feed) and rotational programs.
- They are usually not used for more than one or two cycles.
- Most of them benefit from the addition of 3-nitro to the feed.

ASSESSING THE NEED FOR TREATMENT

- Use incidence of coccidiosis and severity of gross lesion scores to determine when to treat.
- Always use a drug that is effective against the *Eimeria* species that you are dealing with.
- Always read the medication label.
- Always comply with drug withdrawal requirements.
WHEN TO TREAT FOR COCCI:
A GENERAL RULE OF THUMB

Birds should be treated for coccidiosis when:

*Eimeria acervulina* or *E. maxima*
Lesion scores are +2 or higher in 80% of the birds.

*Eimeria tenella* lesion scores are +2 or higher in 20% of the birds.

COCCIDIOSIS TREATMENT

Each species and/or strain of coccidia reacts differently to every drug.

Therefore, one drug may be more effective than another one in controlling a particular field challenge.

In general, *Eimeria tenella* is more sensitive to amprolium water medications than to sulfas.

COCCIDIOSIS TREATMENT

In general, *E. acervulina*, *E. maxima* and *E. necatrix* are more sensitive to sulfas than to amprolium water medications.

Full details of drugs available and treatment regimens are available in the paper hand-out.

COCCIDIOSIS PREVENTION PROGRAMS

VACCINES

<table>
<thead>
<tr>
<th>TRADE NAME</th>
<th>TARGET BIRD</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coccivac – B</td>
<td>Broilers &amp; roasters</td>
<td>MERCK</td>
</tr>
<tr>
<td>Coccivac – D</td>
<td>Layers &amp; breeders</td>
<td>MERCK</td>
</tr>
<tr>
<td>Coccivac – T</td>
<td>Turkeys</td>
<td>MERCK</td>
</tr>
<tr>
<td>Immucovex Chickens I</td>
<td>Broilers &amp; Roasters</td>
<td>CEVA</td>
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<tr>
<td>Immucovex Chickens II</td>
<td>Breeders &amp; Egg Layers</td>
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<tr>
<td>Immucovex for Turkeys</td>
<td>Turkeys</td>
<td>CEVA</td>
</tr>
<tr>
<td>Advent</td>
<td>Broiler chickens only</td>
<td>Viridus (NOVUS)</td>
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<tr>
<td>Inovox</td>
<td>Broiler chickens only</td>
<td>Embrex</td>
</tr>
<tr>
<td>Hatchpack Cocci-III</td>
<td>Broiler chickens only</td>
<td>MERIAL</td>
</tr>
</tbody>
</table>

VACCINE ADMINISTRATION METHOD

- Coccivac – B: Spray cabinet, Eye spray, Feed or Water
- Coccivac – D: Spray cabinet, Eye spray, Feed or Water
- Coccivac – T: Spray cabinet, Eye spray, Feed or Water
- Immucovex Chickens I: Gel
- Immucovex Chickens II: Gel
- Immucovex for Turkeys: Gel
- Advent: Spray cabinet or Feed
- Inovox: In-oae injection
- Hatchpack Cocci-III: Spray cabinet
Coccidiosis Prevention Programs

Vaccines

- Primarily used during summer time in heavy broilers or in "organic" or drug-free chickens
- None of the vaccine manufacturers are recommending routine use of amprolium post-vaccination
- Vaccines appear to produce more consistent results when used on built-up litter
- Performance (feed conversion) may suffer, possibly due to lesions and lack of antibiotic effect from the removal of the ionophore anticoccidial (sometimes used in conjunction with an anticoccidial)

- Typically not used to improve performance (controlled infection), vaccine-induced lesions may predispose birds to NE
- Addition of an antibiotic with good antclostridial activity like virginiamycin (Stafac®) in the feed is recommended to prevent NE and maintain good performance
- Viable rotational alternative (summer time)
- May restore sensitivity to ionophore anticoccidials
- Good responses to ionophore anticoccidials following vaccine use have been reported

Vaccine storage, mixing and administration is critical
- Uniformity of vaccine administration is critical
- Uniform administration ensures the delivery of a protective dose to each bird
- Uniform administration prevents "post-vaccination reactions" and the need for half-dose treatments with amprolium that may interfere with the development of immunity

Newest spray vaccination method for the hatchery is by gel-spray
- Newest injection vaccination method is "in-ovo" into 18 day-old chicken embryos at the hatchery during transfer

Daily Oocyst Shedding Pattern
Following Coccidiosis Vaccination

- Day of Age

Necrotic Enteritis

E. maxima
**VACCINATION**

**KEY POINTS**

- Vaccine for broilers and breeder pullets should preferably contain only the species endemic in the area.
- Following early vaccination _E. acervulina, E. maxima_ and _E. tenella_ gross lesions may be found from 6 days postvaccination until day 35.
- To limit the damage induced by the vaccine, the administration of amprolium 10 days p.v. at a half level was often recommended. Sometimes a 2nd treatment was needed during the 4th or 5th week.

**COCCIDIOSIS PREVENTION**

**MANAGING THE ENVIRONMENT**

- Under suitable environmental conditions, oocysts sporulate and become infectious within 24-48 hours.
- Keeping the proper balance between ventilation and heat will help reduce sporulation by maintaining drier litter.
- Management factors like the periodic raking and removal of caked litter, proper height, pressure and maintenance of nipple drinkers will aid to keep drier litter.

- If stocking density is high and oocyst sporulation fast the challenge may overwhelm any product, especially if the birds are immunosuppressed by IBDV, CIAV, MDV, aflatoxins, etc.
- Inevitably, wet litter leads to faster and higher rates of oocyst sporulation and higher challenge.
- This is one reason for which coccidiosis is still usually a bigger problem during the cold or rainy months of the year.
MANAGING COCCIDIOSIS

SUMMARY

• Coccidiosis remains today the most frequently diagnosed subclinical disease of broiler chickens.
• The estimated global cost to broiler producers for prevention and control programs is $300 M.
• The estimated global economic losses on broiler performance are at least $3 billion.
• Therefore, it is of critical importance to monitor on a routine basis the prevalence of this disease through routine “cocci checks”.
• Changes to anticoccidial programs should be based on necropsy findings and flock performance results.

MANAGING COCCIDIOSIS

SUMMARY

• There are no new anticoccidial drugs in development due to the expense involved and the uncertainties of the current regulatory environment.
• Therefore, the current anticoccidial drugs must be used in the most rational programs to maintain and extend their effective useful life.

THE END

Thank you for your attention

Questions?

Phibro

Animal Health Corporation