Intensive Animal Industries
Poultry Diseases – Enteric

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| Causal Agent | Eimeria species (intracellular protozoan parasites)  
9 species in chickens with 5 of significance  
- *E. acervulina*  
- *E. necatrix*  
- *E. tenella*  
- *E. maxima*  
- *E. brunetti* |
|---|---|
| Major Clinical Signs | • bloody droppings (not all), diarrhoea, wet litter  
• depression  
• reduced wt gain, increased FCR |
| Characteristics | • incubation period is 4-6 days  
• these species are host specific (chickens only) |
| Route of Infection | • ingestion (oral) of oocysts in infected faeces |
# Coccidiosis

| Major Post Mortem Findings | • dependant on species (location in gut)  
|                           | • enteritis (may involve haemorrhage – species) |
| Diagnosis                 | • clinical signs, gross and histopathology  
|                           | • isolation of oocysts from scrapings |
| Treatment & Control       | • infected flocks can be water medicated with a range of coccidiocidal products (ie amprolium, toltrazuril) |
| Prevention                | • good hygiene & shed management (disinfection)  
|                           | • in feed coccidiostats (ionophore antibiotics such as monensin, salinomycin, narasin)  
|                           | • shuttle or rotation programs  
|                           | • controlled exposure in pullets  
|                           | • vaccination (Paracox) |
Coccidia Lifecycle

- Susceptible chicken ingests a sporulated oocyst
- Digestion “dissolves” the outer coating releasing the sporozoites which infect the epithelial cells lining the gut and multiply (trophozoites).
- A cell full of trophozoites forms a schizont which then reproduce by multiple division (schizogony) in which the parasite nucleus divides forming merozoites.
- The merozoites escape from the host cell and penetrate other cells forming 2nd generation schizonts. This can be repeated for several generations.
Coccidia Lifecycle

- In the sexual phase, some merozoites become differentiated into male and female forms (gametocytes)
- Fertilization results in the production of a macrogametocyte, forming a zygote which secretes a cell wall and the oocyst is formed
- Oocyst is excreted and matures on the ground forming sporoblasts which later become sporocysts
- A mature oocyst containing 4 sporocysts each of which contain 2 sporocysts
The Life Cycle of Eimeria spp. and Isospora spp.
(The causative agent of coccidiosis)

The oocysts complete development and become infective (sporulate) outside of the host's body.

The infective oocyst is ingested by a host.

The oocyst "excysts" in the small intestine, and sporozoites infect the cells lining the small intestine.

The parasite reproduces asexually in the cells of the small intestine producing merozoites. The merozoites infect more intestinal cells.

Oocysts are passed in the feces of the infected host.

After several generations of asexual reproduction, oocysts are produced.

Asexual reproduction (schizogony or merogony) is self-limiting and ceases after several generations. Oocysts are produced only as long as schizogony continues.
Coccidiosis - *Eimeria tenella*

- Involves the caecum affecting chickens up to 12 weeks of age
- Mortality can reach 50%
- Infected birds are listless, have bloody droppings, a pale comb and depressed appetite
- After heavy haemorrhage, cores can be seen in lumen of the caecum
Coccidiosis - *Eimeria tenella*
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2\(^{nd}\) stage schizonts

Single *E. tenella* Oocyst
**Eimeria necatrix**

- Can affect susceptible chickens up to 4 months of age
- Very pathogenic coccida affecting mid intestine
- Infection may result in two stage clinical outbreak. In the acute stage, mortality may be high in the first week post infection
- The chronic phase can result in blood in the droppings, birds are listless and lose weight
- At necropsy, the jejunum is primarily affected with spotty white areas (schizonts) intermingled with haemorrhages
Eimeria necatrix
Eimeria necatrix
Eimeria necatrix
**Eimeria acervulina**

- May affect chickens of any age
- Not normally very pathogenic but can result in mortality in favourable conditions
- Infected birds show weight loss, shriveled combs, egg production drop in layers
- Primarily affects the duodenal third of the small intestine
- At necropsy can see haemorrhages or whitish patches
Eimeria acervulina
Eimeria acervulina
Eimeria acervulina
*Eimeria brunetti*

- May affect chickens of any age
- Highly pathogenic strain, with high mortality
- Infected birds show emaciation and diarrhoea
- At necropsy a white cheese like material is found in the lumen of the lower intestine & rectum
- Caecum & cloaca are inflamed and the gut wall is thickened
Eimeria brunetti
**Eimeria maxima**

- May affect chickens of any age
- Less pathogenic than *E. acervulina*, *E. necatrix* & *E. brunetti*
- Diarrhoea & weight loss are seen infected birds, egg production drops can occur in layers, bloody droppings are common
- At necropsy the lower portion of the small intestine is dilated and the wall thickened
- Gut is filled with a thick grey/brown/pink mucous
Eimeria maxima
# Necrotic Enteritis

<table>
<thead>
<tr>
<th>Causal Agent</th>
<th><em>Clostridium perfringens</em></th>
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| **Major Clinical Signs** | • depression, ruffled feathers (sad looking bird)  
• reluctant to move, eyes closed  
• dark coloured diarrhoea  
• reduced growth rates, increased FCR  
• sudden death (ducks) |
| **Characteristics**    | • Mortality can vary from 5-50%  
Predisposing factors include:-  
• coccidiosis  
• high protein diet  
• high viscosity diets (high wheat)  
• other concurrent disease |
| **Route of Infection** | • infection occurs by faecal oral transmission |
Necrotic Enteritis
Necrotic Enteritis
Necrotic Enteritis
Clostridial Enteritis Scoring Guide

1. Thin-walled or friable small intestine

2. Focal necrosis or ulceration

3. Larger patches of necrosis

4. Severe and extensive necrosis typical of field cases

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## Necrotic Enteritis

| Major Post Mortem Findings | • characterised by a fibrino-necrotic enteritis in the jejunal section of the small intestine  
• infection results in an acute or chronic enterotoxaemia in chickens, turkeys & ducks |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Diagnosis                 | • clinical history  
• gross pathology  
• gram stain, abundant rods present  
• response to treatment |
| Treatment & Control       | • zinc bacitracin, penicillin  
• some protection from the use of ionophores  
• use of in feed antibiotic growth promotants  
• strategies promoting whole gut health |
Intestinal Integrity in Broilers

How Intestinal Integrity impacts performance

Microflora Imbalance

- Bacterial imbalances
- Bacterial overgrowth
- Microbial dysbiosis
- Malabsorption
- Inflammation
- Decreased nutrient absorption
- Increased gut permeability
- Increased risk of infection

How Intestinal Integrity impacts performance

- Reduced nutrient absorption
- Decreased gut health
- Increased risk of disease

Intestinal Integrity

- Normal gut flora
- Proper gut function
- Optimal nutrient absorption
- Reduced risk of disease

Coccidiosis

- Parasitic infection
- Causes severe diarrhea
- Can cause mortality
- Poor growth performance

Vitamin Deficiencies

- Causes neurological disorders
- Poor growth performance
- Decreased immune function

Promising Values

- Improved gut health
- Enhanced nutrient absorption
- Reduced risk of disease

Contact your Elanco representative for more information.
Intestinal Integrity Strategies

- Feed enzymes (improve gut viscosity)
- Probiotics
- Organic acids (must be protected)
- MOS products
- Natural immune stimulants/enhancers (oregano)