DIAGNOSING COCCIDIOSIS AND ENTERITIS

Conquering poultry’s most costly opponent
A COMPASS POINTING TOWARD OPTIMAL INTESTINAL PERFORMANCE

Coccidiosis and enteritis represent poultry’s greatest theft of health and profitability. This guide helps diagnose and define coccidiosis and enteritis within your flock, opening the door for appropriate management action.

As you assess your birds, Zoetis can provide your team with technical support that’s backed by decades of experience and committed resources. We draw from this bank of expertise to customize programs that elevate your flock’s intestinal health — advancing your business to a new level of success.

For more information, please contact your Zoetis representative or visit www.zoetis.com/poultry
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Healthy intestinal tissue of chickens

1. Duodenum and pancreas
2. Jejunum
3. Ileum
4. Ceca
5. Colo-rectum

Glandular stomach (proventriculus)
Gizzard (ventriculus)
Meckel’s diverticulum

Diagnosing coccidiosis and enteritis
Before identifying coccidial damage, understand the roles of the small and large intestine.

**Small intestine**

The main absorber of nutrients released by the digestive process, the small intestine begins at the connection with the gizzard and ends at the ileocecal junction. It’s divided into three regions based on anatomical landmarks: duodenum, jejunum and ileum.

1. **Duodenum**: This is the first loop of the intestine. The pancreas is located within the duodenum loop. The duodenum receives digestive enzymes and bicarbonate from the pancreas that counters the hydrochloric acid from the proventriculus. Via the gallbladder, the duodenum is supplemented with bile from the liver for digestion of lipids and absorption of fat-soluble vitamins.

2. **Jejunum**: The longest part of the small intestine, its primary function is nutrient absorption. The jejunum begins at the end of the duodenum loop and ends at Meckel’s diverticulum, a short, blind remnant of the yolk stalk.

3. **Ileum**: Beginning at Meckel’s diverticulum and ending at the ileocecal junction, the ileum’s primary function is nutrient absorption.

**Large intestine**

The large intestine, consisting of paired ceca and the colo-rectum, is actually shorter than the small intestine.

4. **Ceca**: The ceca are two blind pouches located where the small and large intestine connect. Some of the water remaining in the fecal material is reabsorbed here. Further, the ceca ferments the remaining coarse materials. The ceca empties its contents two to three times per day, producing pasty liquid droppings with a mustard to dark brown color.

5. **Colo-rectum**: This is the short, straight portion of the large intestine that begins at the ileocecal junction and ends at the cloaca. This is where water is reabsorbed a final time.
### VARYING COCCIDIA SPECIES IN CHICKENS

<table>
<thead>
<tr>
<th>Species</th>
<th>Site of infection</th>
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<tr>
<td>E. acervulina</td>
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<td>E. mitis</td>
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Diagnosing coccidiosis and enteritis

Oocyst shape & size

<table>
<thead>
<tr>
<th>Unsporulated oocysts</th>
<th>Sporulated oocysts*</th>
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<tr>
<td><img src="image1" alt="Unsporulated oocyst 1" /></td>
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18.3 x 14.6 μm
30.5 x 20.7 μm
22.0 x 19.9 μm
20.4 x 17.2 μm
24.6 x 18.8 μm
15.6 x 14.2 μm

*Original images of sporulated oocysts by Drs. A. Gruber and C.A.B. Castañón, copied and printed with permission from the Eimeria Image Database www.coccidia.icb.usp.br/imagedb/
Scattered white plaquelike lesions are confined to the duodenum. These lesions may be elongated with the longer axis transversely oriented on the intestinal wall like rungs on a ladder. They may be seen from either the serosal or mucosal intestinal surfaces and may range up to a maximum of five lesions per square centimeter.

Lesions are much closer together but not coalescent. They may extend as far posterior as 20 centimeters below the duodenum in 3-week-old birds. The intestinal wall shows no thickening. Digestive tract contents are normal.

Lesions are numerous enough to cause coalescence, giving the intestine a coated appearance. The intestinal wall is thickened and the contents are watery. Lesions may extend as far posterior as Meckel’s diverticulum.

The mucosal wall is grayish, with coalescent lesions. Individual lesions may be indistinguishable in the upper intestine. Typical ladderlike lesions may appear in the middle part of the intestine. The intestinal wall is very much thickened, and the intestine is filled with a creamy exudate.
Diagnosing coccidiosis and enteritis
A few red petechiae, or pinpoint lesions, may appear on the serosal side of the midintestine. There is no ballooning or thickening of the intestine, though small amounts of orange-tinged mucus may be present. Microscopic examination is essential for confirmation.

The serosal surface may be speckled with numerous red petechiae, and the intestine may be filled with orange-tinged mucus. There is little or no ballooning of the intestine. The intestinal wall will be thickened.

The serosal surface is speckled with numerous red petechiae. The intestinal wall is ballooned and thickened, as illustrated in the left image. The mucosal surface is roughened, and the intestinal contents consist of scattered blood clots and orange-tinged mucus.

The intestinal wall may be ballooned for most of its length and greatly thickened, containing numerous blood clots and digested red blood cells, giving a characteristic color and putrid odor. Dead birds are scored +4.
Diagnosing coccidiosis and enteritis
E. TENELLA
LESION SCORING

+1 There are very few scattered petechiae on the cecal wall, with no visible thickening. Normal cecal contents are present.

+2 Lesions are more numerous with noticeable blood in the cecal contents. Cecal wall is somewhat thickened. Normal cecal contents are present.

+3 Large amounts of blood, caseous debris or caseous cores are present. Cecal wall is greatly thickened. Fewer fecal contents, if any, are present in the ceca.

+4 The ceca are greatly distended with blood or large caseous cores. Dead birds are scored +4.
Diagnosing coccidiosis and enteritis
Small, scattered petechiae and white spots are easily seen from the serosal side. Little damage, if any, is apparent on the mucosal surface.

Numerous petechiae are visible on the serosal surface. A slight ballooning confined to the midgut area may be present.

There is extensive hemorrhage into the lumen of the intestine, and the serosal surface is covered with red petechiae and/or white plaques. The serosal surface is rough and thickened with many pinpoint hemorrhages. Normal intestinal contents are lacking. Ballooning extends over the lower half of the small intestine.

Ballooned intestine with thickened wall, dark and white spots on serosa (salt-and-pepperlike appearance); heavy mucous production and massive hemorrhage with coagulated blood. Dead birds are scored +4.
Diagnosing coccidiosis and enteritis
There are no gross lesions. In the absence of distinct lesions, parasites may go undetected unless scrapings from suspicious areas are examined microscopically.

The intestinal wall may appear gray in color. The lower portion may be thickened. Flecks of salmon-colored material sloughed from the intestine are present.

The intestinal wall is thickened and blood-tinged mucoid exudate is present. Transverse red streaks may be present in the lower rectum and lesions occur in the cecal tonsils. Soft mucous plugs may be present.

Extensive necrosis of the mucosal surface of the lower small intestine may be present. In some birds, a dry, necrotic membrane may line the intestine and caseous cores may plug the ceca. Lesions may extend into the middle or upper intestine. Dead birds are scored +4.
Diagnosing coccidiosis and enteritis

E. BRUNETTI

LESION SCORING
The location of *E. mitis* is the lower small intestine, from Meckel’s diverticulum to the ileocecal junction. Although it can reduce weight gain and cause morbidity, there are no distinct gross lesions in the intestine.
Lesion scoring from 0 to 4

**NECROTIC ENTERITIS — GROSS PATHOLOGY**

+1 Dilated small intestine contains yellow-brown, watery, foul-smelling contents. Intestinal wall is thin and weakened. The thickened mucosal layer has separated from the gut muscular layer.

+2 Swelling of the intestine is noticeable. Intestinal wall is reddened and there are several pale yellow areas of necrosis, with ulceration of the mucosa.

+3 Intestine is dilated and thin-walled with extensive areas of necrosis and ulceration. Flecks of blood are present. Intestinal content is brown from sloughed mucosa and necrosis.

+4 The entire surface of the mucosa is necrotic. Sloughed necrotic debris has left paler areas where no mucosa remains and the underlying submucosa is exposed.
+1 Mild erosion and some separation of the villi tips. There is early separation of cells from the basement membrane.

+2 Moderate erosion of the villi tips with loss of villi material and mild leakage of fibrin into the gut lumen.

+3 Severe erosion of the villi tips with leakage of villi material into the gut lumen. The epithelium of the upper half of the villi separates from the basement membrane.

+4 Virtually all the surface enterocytes are necrotic, resulting in a layer of fibrin and necrotic debris over the entire mucosal surface.
Diagnosing coccidiosis and enteritis

NECROTIC ENTERITIS — HISTOPATHOLOGY
DYSBACTERIOSIS

Signs of dysbacteriosis

The intestinal wall appears fragile, thin and lacks sufficient tonus (when incising the gut, its wall is flaccid instead of curling inside out). Excessive watery contents throughout the small intestine, ballooning of the intestine, undigested feed particles in the distal part of the intestine, an oily, greasy layer on top of the feed and orange mucus in the intestinal lumen all are indicative of the condition. Sometimes inflammation and/or hyperemia of the intestine are obvious.
Although scientific debate continues, the general consensus is that most probably the condition is due to an imbalance of the normal microbiota. Among others, dietary changes (high viscosity and high protein diets), poor management and subclinical coccidiosis may be predisposing factors.

Dysbacteriosis is characterized by inflammation of the small intestine associated with wet litter, diarrhea, increased or irregular water intake, stagnating feed intake and droppings containing undigested feed particles (feed passage) and/or orange mucus.

**Scoring system**

- Score from 0 (no dysbacteriosis) to 4 (severe dysbacteriosis) taking into account the presence and severity of the different symptoms.

- Validated by histopathological research: increasing dysbacteriosis scores correspond with:
  - A decrease in villus length
  - An increase in villus fusion
  - A decrease in thickness of tunica muscularis
  - Higher T-lymphocyte infiltration
  - An increase in goblet cells along the villi and in the crypts, along different parts of the intestine
Do not use the same anticoccidial drug for too long. Overuse leads to reduced efficacy. Adhere to these timelines before rotating:

- Ionophore: up to six months.
- Chemical in a full cleanup program: three months.
- Chemical in a shuttle cleanup program: four-and-a-half months.

Give a product a sufficiently long rest after each period of use.

Note the following to help restore sensitivity of coccidia population:

- After using an ionophore, do not use it or any other ionophore from the same class again for at least six months.
- Use a chemical cleanup once per year. If a chemical is implemented for three months in a full program, give it at least two years of rest in built-up litter production systems. In production systems with routine clean-out between cycles at least one year of rest is recommended. During this resting period, other chemicals can be used as there is no cross-resistance between them.
3 Rotate between different types and classes of products.
   • This will minimize the impact of cross-resistance and allow for renewed sensitivity.
   • Include vaccines such as Inovocox® EM1.

4 Use a chemical cleanup once per year.

This will help reduce infection pressure.
Sustained prevention of coccidiosis and necrotic enteritis requires a broad range of customizable tools, ensuring rotation programs are tailored to your needs. To help you develop a true rotation program that secures the long-term future of all products and maximizes the profitability of your flock, Zoetis offers a complete line of divalent, monovalent and monovalent glycoside ionophore feed additives, chemicals.

**Divalent ionophore**
- **Avatec®**

**Monovalent glycoside ionophore**
- **Cygro®**

**Chemicals**
- **Deccox®**
- **Robenz®**
- **Cycostat®**

Not all products are available in all regions.
NOTES:
Zoetis is dedicated to providing insightful technical support that meets the needs of veterinarians and producers. We are here to serve you so that your focus is where it needs to be.

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