Technical Report: Coccidiosis in poultry with an emphasis on backyard poultry

Dr. Geoffrey Lossie, edited by Dr. Pat Wakenell: Purdue University- Indiana Animal Disease Diagnostic Lab

Abstract:

Coccidia are single celled, eukaryotic organisms that affect a wide range of birds from the tiniest finch to the biggest eagle and everything in between, but especially poultry. In fact, coccidiosis is the most costly disease to the poultry industry with losses from decreased weight gain, feed efficiency, and cost of treatment and prevention exceeding 1.5 billion (in 1999) \(^6\). Coccidiosis, however, is not just a problem for the commercial industry. In a survey of postmortem examinations done on backyard poultry in California, coccidiosis was the third most common disease encountered \(^7\). The most common complaint of owners with birds with suspect coccidiosis is diarrhea. Common clinical signs of coccidiosis are diarrhea (often bloody or spotted with blood), dehydration, listlessness and weakness with ruffled feathers, anemia, and decreased growth rates and egg production \(^3\). Diagnosis is based on clinical signs, fecal screening, gross lesions at the time of necropsy, and histopathologic examination. Treatment can be complicated especially in backyard flocks, as coccidiosis is largely a matter of poor or inadequate husbandry. Typically, a short course of anticoccidial medication and addressing the husbandry issues is usually enough to break the cycle.

Introduction:

Coccidiosis is a protozoal disease of the intestines (or kidneys in geese) caused primarily by parasites in the genus Eimeria. There are nine described species of Eimeria in chickens and seven in turkeys, but not all of the species are capable of causing disease. It is important to note that coccidia is species specific, meaning that chicken coccidia do not affect turkeys and vice versa. The terms coccida/ coccidiosis/ and coccidiasis do not refer to any particular species but to the clinical and subclinical (coccidiasis) manifestation of infection by any of the different species. This technical report will use the term coccidiosis to refer to active disease producing clinical signs. The coccidial life cycle is complex but direct, with infection occurring via the fecal-oral route. Oocysts (similar to an egg) are shed directly in the feces where they can contaminate feed, water, litter, and soil. Fresh oocysts are not infective until they incubate in the environment for 1-2 days and become sporulated at the proper temperature, moisture, and oxygen levels \(^1\). Mechanical and biological vectors are important as well. Mice and flies can transport infective oocysts during their normal feeding habits, while other insects such as darkling
beetles can ingest the oocysts which can remain infective until the darkling beetle is consumed by a chicken. The most common means of spread, however, is via movement of personnel between pens, houses, or farms that are harboring oocysts on their clothes or boots. Once the oocyst is ingested, sporozoites are released and initiate multiple stages of asexual replication. Following is a sexual reproduction phase that produces thousands of new oocysts in the intestines and ceca. The whole cycle from ingestion to the release of new viable oocysts is 4-6 days. Lesions in the gut are produced by destruction of the epithelial cells via development, multiplication, and release of various life cycle stages from the epithelial cells. The intestinal mucosa and submucosa are also affected. Damage from the continuation of the coccidia life cycle leads to diarrhea, dehydration, weight loss, rectal prolapse and death. Coccidiosis can also increase the severity of or predispose birds to other diseases like *Clostridium perfringens*, *Salmonella typhimurium*, and *Histomonas meleagridis* (commonly referred to as black head). Any immunosuppressive disease like Marek’s disease or infectious bursal disease, or any condition that ends up producing immunosuppression, can increase the severity of coccidiosis.

Coccidia in Chickens:

Coccidiosis in chickens is observed in all types of production from the backyard flock owner with three chickens up to multi million commercial hen operations. One of the challenging aspects regarding coccidia, not only in chickens but other poultry, is that due to its ubiquitous nature, coccidia cannot be eliminated or prevented by quarantine, disinfection, or sanitation. Coccidiosis in chickens is caused by nine recognized species, with multiple species often infecting the same bird. Each species of coccidia has its preferred anatomic location for infection and produces relatively unique lesions. Less pathogenic species tend to cause few or no lesions whereas the more pathogenic species cause diarrhea that can be mucoid or bloody. Beyond diarrhea and dehydration, birds soon develop ruffled feathers, anemia, become listless and weak, and have decreased growth rates and egg production (Figure 1). *Eimeria acervulina* is the most frequently encountered species in poultry in both North and South America. Reduction in weight gain, watery and mucoid droppings, and loss of pigmentation from the blood and skin, due to decreased absorption of various pigments in the gut are the most common clinical signs. The classic gross lesion associated with *E. acervulina* is transverse, white to gray, striations along the upper third of the intestinal mucosa. *Eimeria necatrix* is one of the more pathogenic species causing severe enteritis with congestion, hemorrhage, and necrosis of the middle third (see figure 1) of the intestines and is associated with high mortality. *Eimeria tenella* is a highly pathogenic species that causes spectacular lesions of the paired ceca. Blood, and in later stages of infection, cheesy, cecal,
cores, can be found occluding the entire lumen. Determining the species of coccidia infecting your birds is not nearly as important for backyard producers, as the treatment is generally the same regardless of coccidia species. Commercial producers are more interested in speciating coccidia as it is important to determine if the primary species affecting the flock is one of the species for which the flock has been vaccinated.

**Coccidia in Turkeys:**

The clinical signs associated with coccidiosis are similar to that seen in chickens. There are seven recognized species of Eimeria in turkeys with four species recognized as pathogenic. *Eimeria meleagrimitis* is one of the more prevalent species of coccidia found in turkey operations and is moderately pathogenic. *E. meleagrimitis* causes congestion and petechiae from the duodenum to the ileum, with lesions being more severe in the jejunum. In young poults there can be weight loss, dehydration, general unthriftiness, and even death. One of the most pathogenic and common species of coccidia in turkeys is *Eimeria adenoides* which affects the distal third of the intestines causing liquid feces containing mucus and flecks of blood. The cecum often contains hardened mucosal debris that appears as loose, whitish, cecal cores.

**Coccidia in other poultry species:**

As mentioned previously, coccidia are species specific and so it should be no surprise that other species of poultry have their own coccidia capable of causing disease. Coccidia is sporadic in ducks but has been shown to cause moderate to heavy mortality in commercial duck farms in New York, New Jersey, Hungary, and Japan. Coccidia in ducks is caused by three different genuses: *Eimeria*, *Wenyonella*, or *Tyzzeria*. Finally, coccidiosis in pigeons is similar to that in chickens caused by *E. necatrix*. The most common species in pigeons are *Eimeria columbarum* and *Eimeria labbeana* with mortality varying from 5-70%. Clinical signs include anorexia, dehydration, cachexia, and greenish diarrhea (that can be blood tinged).

**Diagnosis:**

Diagnosis of clinical coccidiosis is relatively straightforward but can be impaired by postmortem changes in birds that have been dead for an hour or longer. Diagnosis in backyard flocks is typically made via observation of clinical signs, and is easily confirmed by running a fecal flotation test. It is recommended that backyard poultry keepers have their birds feces tested once to twice a year to determine overall parasite burden. Diagnosis of coccidiosis in cases where postmortem examination and histopathologic
examination are performed is based on gross pathology findings and histopathologic findings. Mild coccidia infection with concurrent lesions is common in birds of 3-6 weeks of age, so diagnosis of clinical coccidiosis relies on the presence of clinical signs, gross lesions, histopathologic lesions, and demonstration of the organism.

Prevention and Control:

Successful prevention and control in both backyard flocks as well as commercial flocks depends entirely upon identifying the predisposing factor that allows for increased numbers of coccidial oocysts in the environment. Poultry density is a key factor in preventing coccidia outbreaks. Stocking birds at high densities increases the overall number of oocysts in the environment, and once a critical level is reached, a clinical outbreak can occur. Density issues tend to occur with new poultry keepers unfamiliar with proper stocking densities and during the winter months when large numbers of birds are housed in temporary housing or coops. Keeping the poultry house clean is another key component. Litter should be cleaned out regularly and with increased frequency if the poultry density in the house is high. To reduce oocyst numbers in the environment dilute bleach or lime can be applied to the soil on a monthly basis followed by rototilling of the soil. For backyard producers it is highly recommended to use commercial, non-organic, poultry feed as it contains low levels of amprolium, a coccidiostatic drug, that helps keep coccidiosis under control. Organic feed does not contain amprolium, and owners feeding their birds organic feed must be vigilant for signs of coccidiosis. Submitting a pooled fecal sample once or more a year is a good way to screen for coccidia and alert the grower to any potential issues.

Prevention of coccidiosis in commercial poultry is much different, but even more important as by the time signs of coccidiosis are noticed within a flock, the damage to the intestines and subsequent decrease in either meat or egg yield has already occurred. Vaccination, within the egg or at hatch, is key to controlling coccidia in production medicine. In broiler production a practice known as a “shuttle program” is used. Within a shuttle program, a coccidiostatic drug is used in the starter feed, and one to even three different products are then used during the grow-out and finishing period. The purpose of the shuttle program is to improve coccidia control and to help prevent resistance to a single coccidiostat. Drug resistance in coccidia is a worldwide problem and well documented in the United States, South America, and Europe.
Treatment:

While coccidia is considered to be self-limiting in normal birds, in an environment that is not heavily contaminated with oocysts, treatment in the event of an active outbreak is required to reduce clinical signs and prevent mortality. Amprolium, a poultry labeled product, is dosed via the drinking water, and is the medication of choice. Backyard producers may have trouble finding Amprolium labeled for poultry, but can use the cattle product off label with recommendation by their veterinarian. The treatment course is for 5-7 days (follow label directions), but may need to be extended in difficult or persistent cases. Treatment will never be successful as long as the predisposing factors remain.

Works Cited:

Figure 1: Two backyard chickens with coccidiosis in a repurposed swine barn. There are multiple piles of loose stool. Both birds were listless with a hunched posture. This image illustrates the necessity of having appropriate litter that can be regularly cleaned.
Figure 2: Small mobile chicken coop housing numerous birds. In the winter this coop was used to house the birds in the image. This amount of space was inadequate, and the birds developed clinical coccidiosis.

Figure 3: Section of small intestine from chicken infected with *E. necatrix*. The lumen is full of frank blood with flecks of clotted blood. Note the necrotic, hemorrhagic, debris within the lumen (green arrow).