

Department of Animal Science

INTERNAL PARASITES OF POULTRY

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A parasite is an organism that lives in or on another organism of a different species, known as the host, and benefits by deriving nutrients to the detriment of the host. Parasites typically do not kill their host through diseases but do generally depend on the host to complete their life cycle. Low levels of parasitic infestations often do not cause serious problems and can even be left untreated. However, parasites can make a backyard flock more susceptible to viral and bacterial pathogenic diseases or worsen an existing infectious disease.

Internal parasites that affect poultry are classified into two distinct groups: worms and protozoa. Worms are large multicellular organisms that can be seen with the naked eye and are quite common in backyard and free-range poultry flocks. There are several types of intestinal worms, described below, that can cause problems for backyard flock keepers. Protozoa are single celled organisms that can't be seen with the naked eye and occupy many natural habitats. Seven families of protozoa exist, two of which have importance to backyard and commercial poultry and are described below.

Worms

The most common intestinal worms in backyard poultry flocks include roundworms (*Ascaridia spp.*), cecal worms (*Heterakis spp.*), threadworms (*Capillaria spp.*), tapeworms (*Raillietina* and *Choanotaenia spp.*), and gapeworms (*Syngamus trachea*). A small number of worms does not usually cause clinical problems for poultry. However, a high worm load can cause diarrhea, depression, weight loss, reduced weight gain, anemia and decreased egg production. In severe infestations worms can even be found in eggs and cause death.

Large roundworms

Adult worms are about 1 1/2 to 4 1/2 inches long with a diameter about the size of a pencil lead. They are easily seen with the naked eye. Large roundworms (Figure 1) are the most damaging of the worms that commonly affect backyard flocks. The life history of the roundworm is quite simple. Females lay thick-shelled eggs in the intestine that pass in the feces. A small embryo develops in the egg but does not hatch immediately. The larva in the egg reaches the infective stage within two to three weeks. Birds become infected by eating worm eggs that have reached

the infective stage. It is also common for worm eggs to be eaten or carried by snails, slugs, earthworms, beetles, grasshoppers and other insects. These intermediate hosts carry the eggs and when eaten by a bird pass the eggs to the bird. Chickens that reach three to four months of age generally show resistance to infection. Piperazine (Wazine), for many years, was the product of choice to treat roundworms. However, this product is no longer available in the United States. Fenbendazole and Ivermectin are products that are currently approved for treatment and control of roundworms.



Figure 1. Large round worms
(www.backyardchickens.com).

Small roundworms

Small roundworms of various species can infest and affect different parts of the digestive track of chickens. Some species infect the crop and esophagus, causing thickening and inflammation of the mucus membranes. Other species are found in the lower intestinal tract and cause inflammation, hemorrhage and erosion of the intestinal lining. These worms can be seen during necropsy if present in very large numbers. Heavy infestations can result in reduced egg production, reduced fertility and depressed growth.

Cecal worms

Cecal worms are fairly common and infect blind pouches in the digestive tract known as the ceca (singular: cecum). These worms most often do not cause clinical issues for chickens but can be problematic for turkeys because they may carry *Histomonas meleagridis*, a protozoal parasite that causes blackhead disease (see below). Specifically, the cecal worm *Heterakis gallinarum* serves as the intermediate host of *H. meleagridis*. That's why it's best not to keep both chickens and turkeys at the same premises. In addition, turkeys should not be allowed to range in areas where chickens have ranged previously. Earthworms can ingest cecal worm eggs that contain *Histomonas meleagridis* deposited in poultry feces; turkeys that then consume the earthworms become infected and succumb to the blackhead organism. Turkeys can also become infected with the blackhead organism from direct oral contact with infected cecal worms.

Capillaria (Capillary or Thread Worms)

Capillaria is a genus of parasitic roundworms that infects chickens, turkeys, ducks, geese, grouse, quails, pheasants, guinea fowl and other domestic and wild birds. There are hundreds of species worldwide and they are very common in chickens where up to 60 percent of the population can be infected. *Capillaria annulate* and *Capillaria contorta* occur in the crop and esophagus where they can cause thickening and inflammation of the mucosa. Occasionally, severe losses may be sustained in turkeys and game birds from these parasites. In the lower intestinal tract, several different species may be present but *Capillaria obsignata* is the most prevalent.

Some species of *Capillaria* have a direct life cycle while others have an indirect life cycle with various earthworm species as intermediate hosts. If the life cycle is direct, the adult worms may be embedded in the lining of the intestine. The eggs are laid and passed in the droppings. Following embryonation that takes six to eight days, the eggs are infective to any other poultry that eat them. If the life cycle is indirect, earthworms eat the eggs, and the eggs release the larvae inside the worms. These larvae become infective inside the earthworm in two to four weeks.

The most severe damage due to *Capillaria* occurs within two weeks of infection. The parasites frequently produce severe inflammation and may sometimes cause hemorrhaging. Erosion of the intestinal lining may be extensive and can result in death. *Capillaria* may be a problem in deep litter houses; with heavy infestations resulting in reduced egg production, decreased fertility and depressed growth. These parasites can be seen at necropsy if they are present in large numbers. However, the eggs are small and so are difficult to find in droppings.

Tapeworms

Tapeworms are flattened, ribbon-shaped worms composed of numerous segments or divisions. Several species of tapeworms can affect poultry. They range in size from very small (unseeable with the naked eye) to over a foot in length. The head or anterior end is much smaller than the rest of the body. Because tapeworms may be quite small, careful examination is often necessary to find them. Each species of tapeworm attaches to a different section of the intestinal tract using four pairs of suckers located on their heads. Most tapeworms are host specific. Therefore, chicken tapeworms affect only chickens. Tapeworms must have an intermediate host to complete their life cycle. Chickens become infected by eating an intermediate host, which can include ants, beetles, grasshoppers, snails, slugs, houseflies, earthworms and others. The intermediate host becomes infected by eating tapeworm eggs that are shed in bird feces. The system of raising birds determines the likely intermediate host. House flies tend to be the intermediate host for caged raised birds while beetles tend to be the intermediate host for litter raised birds. Free-range birds are likely infected by eating snails and earthworms. Tapeworms are made up of numerous flat sections that are shed in groups of two to three each day. Each section contains hundreds of eggs.

Gapeworms

Gapeworms (*Syngamiasis trachea*) are parasitic worms found in the trachea (windpipe) of domestic and wild birds worldwide. Gapeworms are tiny, bright red (caused by ingestion of the host's blood) worms that have a y-shaped appearance because they are actually two worms, the male and the female joined together, with the male acting as the anchor for the female. The female is the larger of the two and is 1/4 to 1 inch in length. The male may obtain a length of 1/4 inch. These worms attach to the mucosa of a chicken's trachea, where they feed on blood. The life cycle of the gapeworm is similar to that of the cecal worm. The parasite can be transmitted when birds eat embryonated worm eggs or earthworms containing the gapeworm larvae. The female worm lays eggs in the trachea which are coughed up or swallowed and passed out in the droppings. Within eight to fourteen days the eggs embryonate and are infective when eaten by birds or an intermediate host. Earthworms, snails, and slugs serve as primary intermediate hosts for gapeworms. Once chickens ingest the larvae, they will migrate through the gastrointestinal system to the trachea, where they live, feed on blood, reproduce and lay eggs. Affected chickens are often seen stretching their necks out, while opening their mouths and gasping or gaping for air. The gaping is caused by the presence of numerous worms in the trachea, causing a partial or

even complete blockage in airflow. Without treatment, heavily infested birds can die from suffocation.

Protozoa

Protozoa are single-celled organisms found throughout the natural environment. Protozoan parasites that are important to poultry producers are coccidia (several species in the *Eimeria* genus) and flagellates, including the histomonads (*Histomonas meleagridis*).

Coccidia

By far the most common protozoa parasite of the chicken is in the *Eimeria* family, commonly referred to as coccidia. Nine types of coccidia affect chickens while seven affect turkeys. All the coccidia are parasitic/pathogenic, although some to lesser degrees than others. Mortality is common with *E. tenella* and *E. necatrix* in chickens. The most commonly recognized species in broiler chickens are *E. acervulina*, *E. tenella* and *E. maxima*. The *Eimeria* infecting chickens and turkeys do not infect other animals, nor do those infecting other animals infect poultry. Coccidia have a direct life cycle that does not involve intermediate hosts. Intestinal coccidiosis is a common protozoal gastrointestinal (GI) disease that primarily affects young chickens. It is one of the most devastating of all poultry diseases. Coccidiosis can be difficult to control in backyard flocks because of the presence of mixed aged flocks. In mixed aged flocks, older, apparently healthy chickens often shed coccidial oocysts (a life stage built for survivability in the open environment) in their feces and subsequently infect younger birds that have yet to build immunity.

Coccidia live and reproduce in the GI tract, where they cause tissue damage. One oocyst in the intestinal wall will only damage a few epithelial cells. Therefore, the extent of the damage to the intestinal wall is dependent on the number of oocysts present in the GI tract. As the coccidia reproduce, there will eventually be millions of oocysts present at the height of the disease, many of which will form oocysts. At the time the oocysts are shed in the droppings, they are not infective. To become infective, the oocysts must first sporulate, a process dependent on climate and ideal moisture, air and temperature conditions. Sporulation requires two to four days to complete, and after this time, if the sporulated oocyst is ingested by a chicken and finds its way to the intestinal tract, a complicated series of multiplications and divisions occur that eventually completes the coccidia life cycle.

Coccidia are very common in any poultry environment. Given time, chickens generally develop immunity to coccidial species they are exposed to. The most critical time for the disease is when birds are between three and six weeks of age. Signs of coccidiosis include bloody diarrhea, watery diarrhea, ruffled feathers, depression, weight loss and lethargy. Medicated feed containing a coccidiostat (antiprotozoal agents akin to antibiotics) can help control but not eliminate coccidia, allowing birds an opportunity to build resistance to coccidiosis. Floor- or ground-raised chickens are exposed to coccidia their entire lives. Cage-raised birds aren't exposed to the infective materials and never develop resistance. Moving cage-raised birds to a floor or ground system will result in severe disease and heavy losses due to a lack of immunity after exposure. Coccidiosis vaccines are available and given at hatch they can provide newly hatched chicks a small amount of coccidia exposure which helps them develop immunity without getting the disease. Chicks that are vaccinated for coccidiosis should not be given medicated feed

containing a coccidiostat. The coccidiostat can kill the modified organism in the vaccine, making it more difficult for the bird to build immunity.

Histomoniasis (Blackhead Disease)

Histomoniasis was first described in 1893 as a fatal disease in turkeys. The parasite *Histomonas meleagridis* is the causative agent of histomoniasis, commonly known as blackhead disease. While all gallinaceous birds are susceptible to the infection, turkeys are the most susceptible species. A cecal worm (*Heterakis gallinarum*) is the intermediate host of *H. meleagridis*. This cecal worm is fairly common in chickens so it is not recommended to raise chickens and turkeys on the same premises. *H. meleagridis* is not a hardy organism and won't survive long in the environment without being enclosed within a cecal worm egg or an earthworm. However, nematode (worm) eggs infected with *H. meleagridis* can remain viable in the environment for many years. *Histomonas* transmission is complicated because the protozoan is carried by another parasite, the poultry cecal worm.

The *Histomonas* protozoan infects the cecal worm and becomes incorporated into the worm's eggs. This allows the protozoan to be protected from harsh environmental conditions which, otherwise, it would not typically survive. Both parasites are then transmitted when a bird ingests the cecal worm's eggs. Earthworms can act as an intermediate host for cecal worm larvae that are carrying *Histomonas*. Birds become infected with both parasites when they ingest the infected earthworms. The disease is called blackhead because birds will sometimes develop a bluish or blackish coloration of the head due to an excessive concentration of poorly oxygenated hemoglobin in the blood. However, this is not a reliable clinical sign and, in many cases, does not occur. Turkeys usually develop more severe disease than chickens. However, severe outbreaks have also been reported in chickens.

The most characteristic sign of histomoniasis, seen during the later stages of the disease, is sulfur-colored, bright yellow droppings, which occur because of severe damage to the liver. The primary gross lesions occur in the ceca and liver. The cecal walls are thickened by inflammation and the lumen (open tube) is distended with a cheesy or caseous core. Lesions in the liver are necrosis and chronic inflammation and a classic presentation of bullseye type lesions with a dark red center and pale outer ring. These are easily seen during necropsy (Figure 2).

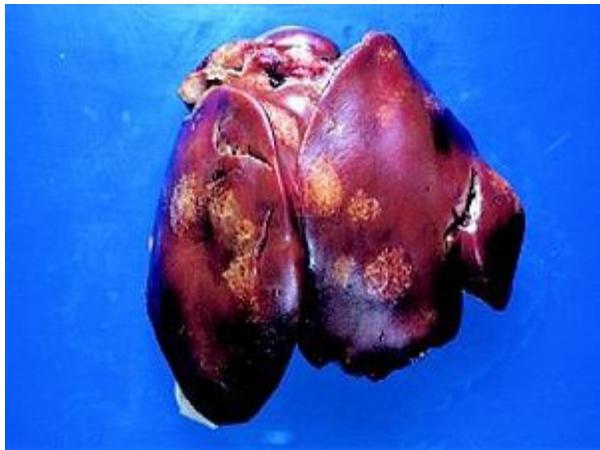


Figure 2. Liver lesions in a bird infected with *Histomonas meleagridis* (wikipedia).

There is no current available treatment for blackhead and a reliable vaccine does not exist, therefore, control measures are focused on prevention. Histostat (nitarsone), an arsenic-based animal drug, was the only FDA-approved treatment that prevented blackhead disease in poultry, but the drug manufacturer voluntarily stopped marketing this drug in 2015.

Cryptosporidium

Cryptosporidia are parasitic protozoa that occur in the intestines of mammals, but in birds they are often found in the bursa (a sac-like organ near the rectum) and in the respiratory tract.

Cryptosporidiosis is caused by protozoa that are related to, but distinct, from coccidia. Cryptosporidiosis is more severe in turkeys than in chickens and is often fatal in quail. There are numerous species of *Cryptosporidium* that infect a wide range of animal species, including humans. *C. baileyi*, found worldwide and infecting a wide range of birds, is the most common of several species. *Cryptosporidium* is somewhat opportunistic, tending to infect young and/or immunocompromised birds. Naturally occurring cryptosporidiosis in chickens usually occurs as respiratory disease which is often more severe than the intestinal form. Chickens can become infected by ingestion or inhalation of oocysts present in the environment (litter, feces, water, dust, etc.). As few as 100 oocysts can result in intestinal or respiratory infections. Hygienic conditions and good management strongly influence the incidence and persistence of avian cryptosporidiosis. With no known effective treatments for *Cryptosporidium*, good biosecurity and sanitation are the most important factors to minimize transmission.

Summary

Internal parasites are a common problem for backyard and free-range poultry flocks. Cecal worms, gapeworms, roundworms, tapeworms, and threadworms are all threats to your backyard flock. While a low-level infestation may not cause serious issues, a severe infestation will result in production losses, poor feed efficiency, reduced health and increased mortality. Protozoa parasites are also serious disease threats to your flock, with coccidiosis in chickens and histomoniasis in turkeys being two of the most devastating. Good biosecurity and sanitation are critical to keep parasite infestation to a minimum. With the movement toward antibiotic free poultry production in recent years and implementation of the veterinary feed directive in 2017, the number of available products to treat internal parasites and the disease issues they cause is now extremely limited. This highlights the value of biosecurity and sanitation and emphasizes the importance of prevention over treatment in keeping backyard flocks safe and healthy.



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