

Blackhead Disease in Poultry

Cecal worms carry the protozoan that causes this disease

By Dr. Mike Catangui, Ph.D., Entomologist/Parasitologist Manager, MWI Animal Health Technical Services

In one of the most unique forms of disease transmissions known to biology, the cecal worm (*Heterakis gallinarum*) and the protozoan (*Histomonas meleagridis*) have been interacting with birds (mainly turkeys and broiler breeders) to perpetuate a serious disease called Blackhead (histomoniasis) in poultry. Also involved are earthworms and house flies that can transmit infected cecal worms to the host birds. Histomoniasis eventually results in fatal injuries to the liver of affected turkeys and chickens; the disease is also called enterohepatitis.

Importance

Blackhead disease of turkey was first documented in the United States about 125 years ago in Rhode Island (Cushman, 1893). It has since become a serious limiting factor of poultry production in the U.S.; potential mortalities in infected flocks can approach 100 percent in turkeys and 20 percent in chickens (McDougald, 2005).

Biology

The biology of histomoniasis is quite complex as several species of organisms can be involved in the transmission, pathogenicity, and maintenance of the disease in the environment—the protozoan parasite *Histomonas meleagridis* (Smith, 1895); the potential hosts (turkey, chicken, pheasant, ruffed grouse, bobwhite quail, Japanese quail, guinea fowl, chukar partridge, and peafowl) (Lund and Chute, 1974); the cecal worm (*Heterakis gallinarum*) vector or carrier of the protozoan parasite (Gibbs, 1962; Park and Shin, 2010); the potential vectors or carriers of the worm vector (earthworms, house flies, flesh flies, grasshoppers, and sow-bugs) (Lund et al., 1966; Spindler, 1967); and the bacteria and cecal coccidia that can cause secondary infections to the hosts (McDougald and Hu, 2001).

1. Through some biological mechanisms, the protozoan *Histomonas meleagridis* enters the body and eggs of the cecal worm in the cecal environment of an infected bird host. Cecal worms (*Heterakis gallinarum*)



[Fig. 1] are parasites of turkeys, chickens and other birds; *Histomonas meleagridis* probably just started as a parasite of cecal worms before it evolved into a parasite of turkey and other birds.

2. The eggs of the cecal worms (containing the histomonad protozoan) are excreted by the infected bird into the poultry barn litter and other environment outside the host; these infective cecal worm eggs are picked up by ground-dwelling organisms such as earthworms, sow-bugs, grasshoppers, and house flies. Infective cecal worm eggs can persist in the environment for up to three years (Farr, 1959).
3. Healthy turkeys **[Fig. 2]** and game birds ingest infective histomonad protozoans (contained in the eggs of cecal worms) directly or by ingesting ground-dwelling earthworms and invertebrates carrying the cecal worm eggs (containing the histomonad protozoan parasites); infection in the birds starts by the release of the histomonad protozoan when the cecal worm eggs hatch into larval cecal worms in the ceca of the birds.
4. The histomonad protozoans, as well as the cecal worms, proliferate and infect the ceca of the digestive system of the host birds; the histomonad protozoans eventually spread and cause injuries to the liver of the host.
5. Pathogenic bacteria and coccidia already present in the digestive system of the host bird interact with

the histomonad parasites and cecal worms to cause full pathogenicity of the histomoniasis (blackhead or enterohepatitis) disease.

6. The cycle starts anew in the ceca of infected birds when free histomonad protozoans enter newly-formed cecal worm eggs in the body of adult female cecal worms.
7. Once started in the flock, lateral transmission of the disease can also occur in turkeys by the direct entry of free histomonad protozoans (in the absence of cecal worms) through the cloacal opening via bird-to-bird contact or from the infective excreta on the barn litter. Lateral transmission has not been shown in chickens; infections in chickens appear to be dependent on the presence of cecal worms as carriers of the histomonad parasite (McDougald, 2005).
8. Symptoms of histomoniasis in turkeys are ruffled feathers, drooping wings, drowsiness, huddled birds, reduced food intake, reduced weight gain, and bright-yellow excreta; clinical symptoms develop from 12–15 days after infection and mortality may follow at 15–21 days after infection (Hu, 2002).

Keep turkeys apart from chickens and game birds

Turkeys are much more susceptible to histomoniasis than chickens and game birds such as pheasants and quails; cecal worm eggs potentially carrying histomonad protozoan parasites excreted by chickens and pheasants will also infect healthy turkeys. To prevent cross-infections, turkeys must be kept separate and far from where chickens and other bird species are being raised. Because infective cecal worm eggs can persist in the environment for up to three years, potentially contaminated litter and bedding materials must be kept away from turkeys as much as possible, or not used or recycled at all in turkey barns. The sand grits used in turkey feeds must be inspected under the microscope for the potential presence of cecal (or other helminths) eggs before being added to the feed.

Use anthelmintic (dewormer) to control cecal worms

Because the histomoniasis disease cycle can only be initiated when healthy birds ingest cecal worm eggs containing the infective histomonad protozoan parasite, and because cecal



Fig. 1. Cecal worm (*Heterakis gallinarum*) adult male (top, A) and female (bottom, A); and close-up of the spicules of the male (B). (Photo: Park and Shin, 2010; *Korean Journal of Parasitology*)



Fig. 2. Healthy turkey poults (four-week-old turkeys) in a commercial turkey farm. (Photo: Dr. Mike Catangui)

worms on their own (without the histomonad parasite) are recognized parasites of turkeys, chickens and other birds, it is recommended that cecal worms be controlled using available effective anthelmintics. According to McDougald (2005), the lack of suitable treatment drugs or vaccines for controlling histomoniasis emphasizes the importance of prevention by worm control and management. On page 21, **Table 1** lists anthelmintics or dewormers labeled for controlling cecal worms (and roundworms) in chickens and turkeys. Safe-Guard[®] AquaSol is labeled for use in broiler chickens, breeding chickens and replacement chickens intended to become breeding chickens; it is administered to chickens via drinking water. A feed-grade anthelmintic

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(Safe-Guard Dewormer 20% Type A Medicated Article) is labeled for use in growing turkeys and is administered through the feed (feed-through dewormer). Always read and follow label directions.

Control house flies and limit bird access to earthworms

House flies [Fig. 4] had been conclusively shown to be vectors or carriers of cecal worm eggs through research that involved feeding healthy birds with house flies and other invertebrates collected from areas where birds with histomoniasis were kept (Spindler, 1967). Experiments conducted by Lund et al. (1966) similarly confirmed that earthworms [Fig. 3] can act as vectors of both the cecal worm and histomonad parasites. Thus, long-term control of histomoniasis must include limiting the access of healthy turkeys and chickens to earthworms as well as adopting an effective house fly control program.



Fig. 3. Common earthworm or nightcrawler (about a foot long) on concrete surface after a rain event. Earthworms can act as hosts and carriers of cecal worms (that may in turn contain histomonad protozoan parasites). (Photo: Dr. Mike Catangui)



Fig. 4. An adult house fly. House flies can act as vectors or carriers of cecal worm eggs (that may in turn contain histomonad protozoan parasites). (Photo: Dr. Mike Catangui)

References

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Also see 'Controlling Disease-Carrying House Flies in Poultry Houses' on page 7 of this issue for a listing of effective house fly control products.

TABLE 1. ANTHELMINTICS LABELED FOR USE AGAINST CECAL WORMS

MFR.	ACTIVE INGREDIENT	BRAND NAME	LABEL INDICATIONS AND DOSE	ADMIN. ROUTE	TARGET PARASITES	PRE-HARVEST INTERVAL (DAYS)
MERCCK ANIMAL HEALTH	fenbendazole suspension for oral suspension (200 mg fenbendazole/mL)	Safe-Guard® AquaSol	Labeled for the treatment and control of <i>Heterakis gallinarum</i> (cecal worm) and <i>Ascaridia galli</i> (chicken roundworm) in breeding chickens; also labeled for the treatment and control of adult <i>Ascaridia galli</i> (chicken roundworm) in broiler chickens and replacement chickens intended to become breeding chickens. Safe-Guard® AquaSol must be administered orally to chickens via the drinking water at a daily dose of 1.0 mg/kg BW (0.454 mg/lb) for 5 consecutive days. See label for details. Not labeled for use in turkeys, and laying chicken hens and replacement chickens intended to become laying hens.	water	<i>Heterakis gallinarum</i> (cecal worm) and <i>Ascaridia galli</i> (chicken roundworm)	0
	fenbendazole (200 g/kg)	Safe-Guard® Dewormer 20% Type A Medicated Article	Labeled for the removal and control of adults and larvae of <i>Heterakis gallinarum</i> (cecal worm) and <i>Ascaridia dissimilis</i> (turkey roundworm) in growing turkeys. It is recommended that Safe-Guard® 20% Type A Medicated Article be diluted before addition to the feed. A dilution of one part of Safe-Guard® 20% Type A Medicated Article and nine parts of grain carrier is the suggested working premix. The working premix is then blended with the complete feed mixture. Thoroughly mix both working premix and complete feed to ensure complete and uniform distribution of the Safe-Guard® 20% Type A Medicated Article. Dosage regimen is 14.5 grams fenbendazole per ton of feed fed as a sole ration for 6 days. See label for details. Not labeled for use in chickens.	feed	Larva and adult <i>Heterakis gallinarum</i> (cecal worm) and <i>Ascaridia dissimilis</i> (turkey roundworm)	0

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer.