

Blackhead disease in turkeys – loss containment

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Even though we have no treatment for histomoniasis, the spread of blackhead through a flock of turkeys might be controlled by a simple preventive management trick.

Turkey growers once achieved remarkable success in elimination of blackhead disease by the use of dedicated facilities and strict isolation from chickens. In recent years we have seen sporadic, but disastrous outbreaks in turkey flocks. There is no approved treatment for blackhead in turkeys, and mortality and morbidity may approach 100%.

As a result of recent discoveries in the mode of transmission of blackhead disease (*Histomonas meleagridis*) we are now prepared to make recommendations aimed at minimising the effects of outbreaks.

How does it control itself?

Outbreaks in turkeys are characterised by rapid spread through a flock. However, it is not unusual for only one house of a four house farm to be involved.

Recent outbreaks in North Carolina, California and Europe are good examples of this, where a single house is decimated by blackhead but it does not jump to the next house (Fig. 1).

In another example, one half of a turkey house suffered high morbidity and mortality. The other half, separated only by a storage

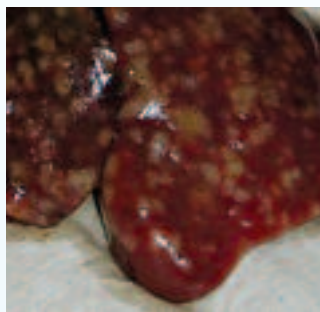
room, escaped with no infection. Investigators are confounded when they are unable to find caecal worms in affected flocks.

The following series of experiments seems to shed light on these enigmatic experiences.

Where are the worms?

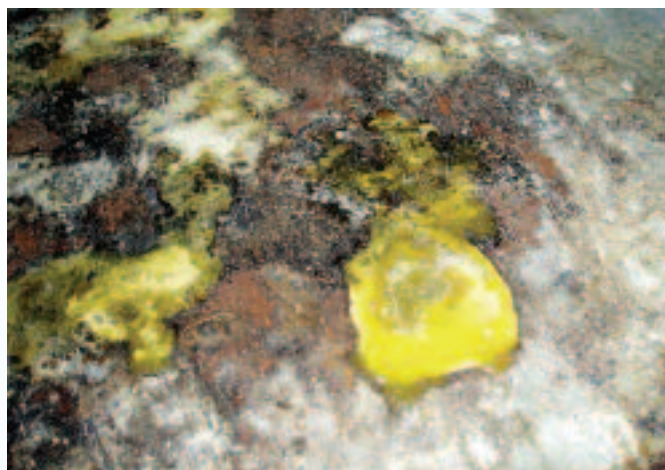
Conventional wisdom suggests that birds may only become infected by ingesting caecal worm eggs (*Heterakis gallinarum*), which are known to harbour the protozoan parasites.

This mode of transmission is inadequate to explain the expo-



Liver of experimentally infected turkey showing severe blackhead infection.

sive involvement of an entire flock within one or two weeks. We know from experimental work that birds can become infected after cloacal inoculation with *Histomonas* cultured in vitro.



Sulphur yellow droppings characteristic of advanced stage blackhead infection.

To test the ability of the organism to spread from bird to bird without the aid of the caecal worm, we infected young turkeys by cloacal inoculation with cultured *Histomonas* and placed them in floor pens with uninoculated birds. The infection quickly spread to other birds in the pen (Fig. 2).

The results were clear cut. Even at the lower exposure level (10%) all but one of the birds died or became moribund from blackhead within 30 days. This experiment was done totally without caecal worms or other potential vectors.

The bottom line here was that blackhead was able to spread

rapidly through the pen without the help of caecal worms or other vectors.

Another surprise was how rapidly the infection spread from bird to bird. We tested this model in battery cages. When two, three, or four poults in cages of eight birds each were infected by cloacal inoculation of cultures, the infection quickly spread to the uninoculated birds (Fig. 3).

Even the lowest exposure level (two birds/cage) gave high infection rates (Fig. 4).

Mortality among uninoculated birds began only a few days after that of inoculated birds.

In another similar experiment

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Fig. 1. Natural limitations to spread of blackhead in a flock of turkeys. Outbreaks often involve a single house on a multiple house farm, or only one end of a divided house.

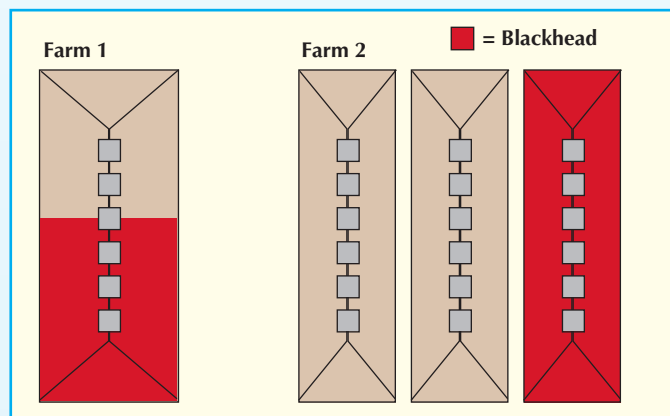
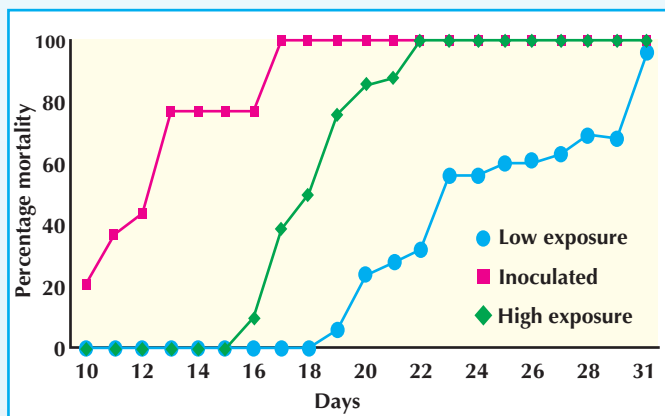


Fig. 2. Spread of blackhead disease through pens of turkeys after introduction of infected birds. No vectors were present. Mortality of inoculated birds was recorded on days 10-17. Uninoculated birds died on days 16-22 (high exposure), or days 19-31 (low exposure).



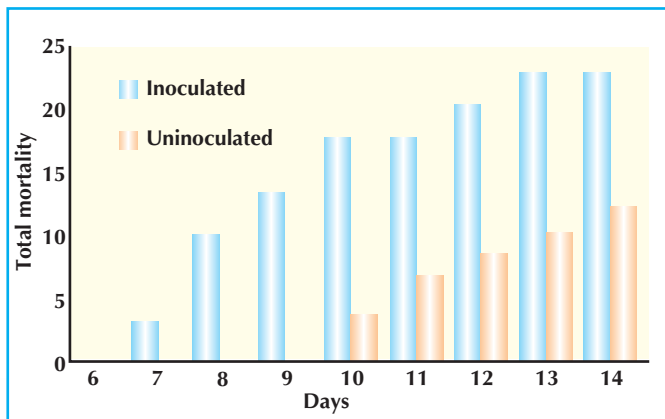


Fig. 3. Indirect infection of turkeys with blackhead disease in a battery cage model. Pattern of mortality after 2-4 birds were inoculated with cultured *Histomonas* and placed in a cage of eight birds.

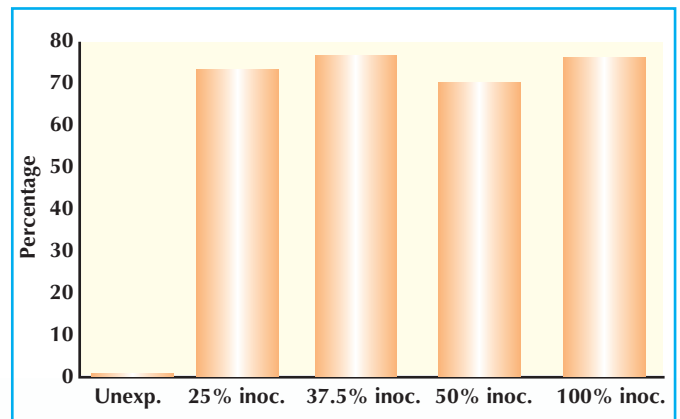


Fig. 4. Mortality or lesions of blackhead disease in cages of eight turkeys after inoculation of two, three, or four birds in the cage with cultured *Histomonas*. No vectors were present.

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 we wanted to see how quickly the inoculated birds became infectious. We inoculated two birds/cage and left them in contact with uninoculated birds for one, two, three, four, or five days. Over 90% of birds exposed to the infected birds for two days or more became infected (Fig. 5). A small percentage of birds became infected after being exposed to birds inoculated only one day.

The actual means by which infection is transferred from one bird to another has not been conclusively determined. We know that poults can be infected by a process called cloacal drinking.

Even as early as 1943, parasitologists infected chicks with trematode larvae by placing a drop containing the larvae on the vent and stimulating the lips with a glass rod.

Any liquid in contact with the vent is sucked inside and immediately taken to the bursa of Fabricius and caeca by retrograde peristalsis.

Tests of the cloacal drop method with *Histomonas* cultures have proved successful (Fig. 6).

Direct oral inoculation with cul-

tures or contaminated droppings was unsuccessful. This work seems conclusive, but there may be other possible routes of infection such as aspiration. Further work is needed to conclusively identify the natural route of infection.

These experiments suggest that we can amend the traditionally accepted model of the life cycle of blackhead in turkeys to include direct bird to bird transmission.

Practical implications

There is no question that blackhead is carried by the caecal worm *Heterakis gallinarum*. No other organism has been proved to serve as a host. Turkeys are not good hosts for the caecal worm.

A recent survey of turkey flocks in Europe detected only a modest number of caecal worms, not enough to account for the latest blackhead outbreaks. Other investigators in the USA were unable to find caecal worms in turkey flocks during severe outbreaks of blackhead.

From this experience, it seems apparent that most, if not all outbreaks in turkeys follow the

chance introduction of a few caecal worm eggs into a facility.

After a few birds become infected they quickly expose others and the outbreak is magnified in a geometric progression.

The source of infectious caecal worms may be nearby chicken layer or breeder farms, pet birds, backyard flocks, game birds or other 'as yet unidentified carriers'.

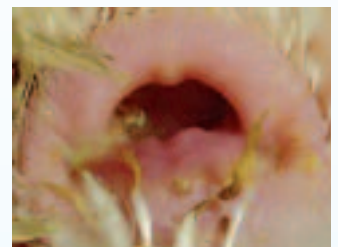
Most broiler breeder pullet farms and layer pullet farms in the USA are heavily contaminated with caecal worms. With many potential sources of contamination, we cannot guarantee complete exclusion of random exposures. What we can do is limit the consequences of such exposure.

Migration barriers

A simple alteration in housing would contain any chance outbreak. The evidence suggests that infection with blackhead are transmitted through turkey flocks by direct contact. Freshly voided droppings from birds sick with blackhead are liquid, and could be taken in by other birds while

they are still warm. Studies show that histomonads in droppings die quickly upon cooling and are not infective.

Therefore, our job is to make it



Turkey vent showing tactile sensitive area involved in cloacal drinking.

difficult for infected birds to have contact with uninfected birds. In the split house example, the exposure was limited to half the flock. Even though the workers walked through both halves of the house every day, the birds did not. What would have happened if the house was divided into fourths, eighths or sixteenths?

If our theory is correct, the outbreak would have been limited to the section which received the initial exposure via caecal worm eggs from outside.

For obvious reasons the division of large turkey barns into small

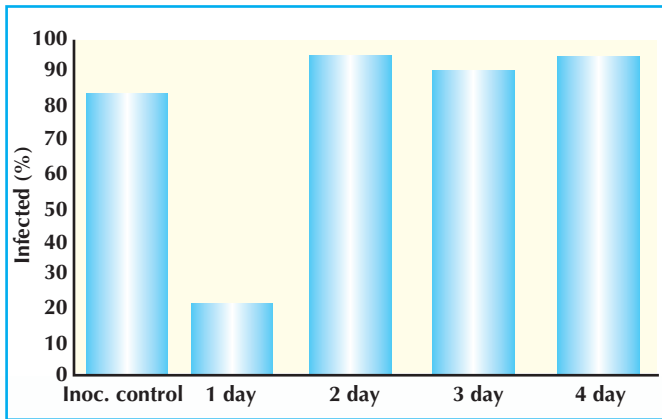


Fig. 5. Infection rate of turkeys exposed to two seeder birds/cage for 1-4 days. The two infected birds were inoculated with cultured histomonas and placed in cages in contact with the other birds for the indicated period.

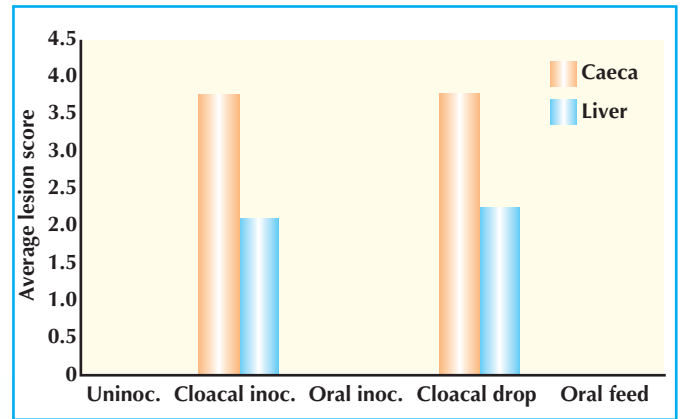


Fig. 6. A test of various inoculation routes for production of blackhead disease from cultured histomonas in turkeys. No vectors were present. Direct cloacal inoculation (traditional method of experimental infection) was highly successful. The cloacal drop method (application of liquid cultures to the vent, stimulation to induce cloacal drinking) was equally successful. Oral inoculation, whether by pipette into the oesophagus or in-feed administration of infected droppings, was unsuccessful.

rooms would be difficult and expensive, and would cause other problems.

However, solid walls are not needed. All that is needed is some means to prevent mingling of birds from one section of the house to another.

The erection of simple netting as migration barriers would be effective, as long as it limited the movement of birds.

Since turkeys have some ability to fly when they reach six weeks of age, the nets would have to be several feet high. This method would not prevent the introduction of blackhead into a flock.

However, it could limit the scope of the outbreak to the birds in one pen or section of a barn. Field experience suggests that immediate action could prevent the spread of a break and save the flock.

Recovery after an outbreak

Common sense dictates that intensive disinfection would be needed on farms after blackhead outbreaks. Producers frequently inquire about the effectiveness of

one method or another. With this new understanding on the mode of transmission of blackhead and the probable origin of the exposure, it is unlikely that any reservoir of infection exists within the affected barns.

Caecal worms would be unable to mature and reproduce during a blackhead outbreak. Further, it is unlikely that disinfection would completely eliminate caecal worm eggs from contaminated premises. Studies with sentinel birds have failed to isolate blackhead disease from turkey farms where outbreaks have taken place.

While disinfection and sanitisation of facilities between flocks is a good practice for other reasons, it is not likely to affect the potential for another outbreak of blackhead.

Recommendations

- Blackhead in turkeys results from the spurious introduction of infected caecal worms from outside the farm.
- Blackhead is spread through the flock by bird movement.

Infected turkey showing severe lesions in caeca and liver.



- Exposed birds may become infective to others within two days.
- Containment of blackhead outbreaks could be accomplished by erection of migration barriers, dividing large barns into smaller units to prevent mingling of birds

- Simple netting should be sufficient as migration barriers.
- Extensive disinfection after an outbreak of blackhead in turkeys is not necessary if there is no reservoir of infection. ■

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White droppings indicating blocked caecal function. Note the expelled caecal caste.

