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Investigation of Hunter-harvested Carcasses and Laboratory Trial to Understand the Potential Transmission of Pathogens from Poultry Litter to Wild Turkeys. by Richard Gerhold ¹, Michelle Nobrega ¹, and Roger Applegate ²

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Hunters and citizens have expressed concerns about wild turkey populations in southern middle Tennessee due to reduced observations in the last several years. Many local residents voiced concern that the decline might be associated with landowners using chicken litter from commercial poultry houses as fertilizer on agriculture fields. Tennessee Wildlife Resources Agency (TWRA) turkey harvest records for these three counties do show a decline over the past several years, a phenomenon reported in other southeastern states as well; however many factors influence turkey harvest, including hunter effort and weather. At the time this study was initiated, TWRA did not have information on causes of turkey mortality or disease types and prevalence in Tennessee. TWRA partnered with the University of Tennessee, College of Veterinary Medicine (UT-CVM) and conducted a general disease surveillance of harvested turkeys and also studied domestic turkey poults raised on chicken litter.

Blackhead, also known as *Histomoniasis*, is a disease of particular concern in this study because it is one of the most important parasitic diseases in wild turkeys and is shed in the feces of affected birds.

- Blackhead develops from a protozoan parasite that turkeys may obtain when ingesting the parasite's host (such as beetles or worms), contaminated soil, or other food.
- It mainly affects the liver and cecum and can lead to death; however it is a disease commonly found at some level in otherwise healthy wild and domestic populations of turkeys, pheasants, quail, grouse and chickens.
- At the time of this study, there was no evidence of transmission from chicken litter to wild turkeys when they are exposed to litter on agricultural fields.

Diseases in hunter-harvested birds

The objective for this phase of the study was to determine the presence of potential disease agents and measure exposure to various infectious diseases of turkeys from southern middle Tennessee counties.

- Disease occurrence in turkeys harvested in Giles, Lawrence, and Wayne Counties (decreased turkey observation counties) was compared to disease occurrence in turkeys harvested in Maury and Bedford counties (stable observation counties).
- During the 2014 and 2015 spring turkey seasons, a total of 218 hunter-harvested birds were analyzed.
- Laboratory analysis showed the presence of antibodies to several pathogens (indicating previous exposure) including avian influenza, New Castle Disease virus and *Mycoplasma* species (respiratory infections). None of these birds had microscopic evidence of an active or previous infection of avian influenza, New Castle Disease virus and *Mycoplasma* species.
Of note, only three (3) out of 218 (or 1.4%) turkeys examined showed DNA evidence of blackhead.
- Population impacts of these diseases could not be determined.

Disease transfer from chicken litter to live turkeys (UT-CVM laboratory study)

The objective of this phase of the study was to determine if diseases (primarily blackhead) could be transferred from a chicken litter substrate to live turkeys. Twenty-four (24) domestic Eastern wild turkey poults were raised on freshly collected chicken litter from one poultry house. Twelve (12) additional poults were raised on clean wood shavings for comparison.

- Two (2) of the 24 (or 8.3%) turkeys raised on chicken litter tested positive for blackhead. None of the 12 turkeys raised on wood shavings (control group) tested positive for blackhead.

Conclusions

Results only indicated a possible pathway for transmission. UT-CVM cautions that further work on prevalence, transmission dynamics, environmental persistence and control measures of blackhead in chicken litter is warranted before any definitive statements can be made.

The study was not designed to identify direct sources of diseases (including blackhead) in wild turkeys, nor was it designed to determine if diseases (as opposed to predation or other factors) is the cause of turkey harvest declines in middle Tennessee.

This study included litter from only one (1) poultry facility and included only a small number of turkey poults. It is unknown if blackhead is widespread in the poultry litter being used as fertilizer. Additionally, the litter was not examined to determine the level of blackhead pathogen present; testing of litter is pending.

This study did not address whether disease is a determining factor that limits wild turkey populations in in Wayne, Lawrence, Giles, Maury, or Bedford Counties.

Because of these factors and the limited scope of the poultry litter project, this study is inconclusive and we recommend using caution when drawing any conclusions from the results.

It is important to note that pathogens that are found in hunter-killed turkeys do not necessarily mean that these pathogens are causing mortality or even sickness. Birds taken by hunters are assumed to be exhibiting normal breeding behavior and be in good physical condition; none were reported otherwise. Thus, these hunter-killed birds are likely survivors of a previous infection or did not experience significant illness. If a hunter-killed bird was infected with a potentially fatal pathogen, the disease process would be in the early stages since birds in late stage disease would likely exhibit abnormal breeding behavior. In this case, disease testing of hunter-killed birds serves more as sentinels of diseases which may be circulating within a population.

One previous study³ suggested that litter from commercial poultry breeder and layer operations has the potential for transmission of blackhead in areas where susceptible wild birds may be exposed. The litter used in our study was from a single poultry breeder facility in the study area, but was not tested for presence of blackhead.

Collectively, our results suggest that blackhead may be associated with poultry litter but further research is needed before this connection can be confirmed and before any possible impacts to turkey populations can be assessed. If you have questions about the disease project, contact Dr. Richard Gerhold (rgerhold@utk.edu).

³Waters, C. W., L. D. Hall, W. R. Davidson, E. A. Rollor, K. A. Lee. 1994. Status of commercial and noncommercial chickens as potential sources of histomoniasis among wild turkeys. Wildlife Society Bulletin 22: 43-49.

Next Steps

Turkey harvest is not just declining in Wayne, Lawrence and Giles counties; other Southeast states share our concerns, namely similar declines in turkey harvest in recent years and an uncertainty about the cause(s). Turkey populations are shaped by a number of factors including competition, predation and disease. These factors also interact and have their greatest effect as populations are reaching or exceeding the habitat's carrying capacity (i.e. the maximum number of birds the habitat can support). Reduced population size can be influenced by lowered poult survival because hens compete for prime nesting habitat and mortality from disease, nest predation, and hunting.

Because **impacts of disease could not be determined from our study** and factors driving turkey population levels are also unknown, the Tennessee Fish and Wildlife Commission recently funded a multi-year turkey research project. The project will provide a comprehensive look at turkey survival, reproduction and other factors affecting population trends in middle Tennessee. The project also seeks to identify and understand all causes of turkey mortality, including disease, and the relation of these mortality sources to population variation. Although fall hunting has not been confirmed as a reason for turkey population decline in Tennessee, the TN Fish and Wildlife Commission took a proactive conservative approach by reducing fall hunting pressure.

The TWRA is partnering with the University of Tennessee to conduct this 6 year multi-phase project. Objectives include:

- Monitoring turkey reproduction, survival and habitat use.
 - Researchers will trap, radio-mark, and monitor a targeted population of 200 adult and juvenile turkeys (100 hens and 100 gobblers) plus up to 50 poults across ten study sites in Wayne, Lawrence, Giles, Maury and Bedford Counties for 5 years.
 - Nests success and poult survival will be monitored through radio-marking poults.
 - Hen and poult habitat use will be monitored by tracking the movements of the marked birds.
- Monitoring turkey harvest.
 - Mandatory check-in will be employed to monitor turkey harvest.
 - Reward bands will be used to retrieve information on radio-marked birds.
- Monitoring hunter numbers, effort, and satisfaction
 - Use of mail/telephone surveys will be employed.
- Turkey disease surveillance
 - Researchers will draw blood and a fecal swab from all captured turkeys. Birds will also be examined for gross lesions or any other abnormalities. Additional tissue samples will be collected as needed.
 - The radio transmitters will employ a mortality signal that will notify researchers when a turkey dies; researchers will attempt to locate the bird and determine cause of death.
- Management strategies
 - With information gained from this project, we hope to better understand factors that influence turkey populations in middle Tennessee. We will then develop management strategies to maintain turkey populations at carrying capacity and sustain or enhance hunter satisfaction.

Landowners in the above listed counties are encouraged to support the project by granting university researchers and TWRA staff access to their lands during the course of the project.

If you have questions [about the 6-year turkey research project](#), contact Joy Sweaney, TWRA's Wild Turkey Program Leader (Joy.Sweaney@tn.gov or 615-781-6656).