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Analysis of Internal Parasites Between Wild and Captive White-Tailed Deer in Lancaster County, Pennsylvania

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Abstract

Disease transmission between farmed and wild white-tailed deer was studied using internal parasites as a model. Because wild deer visit captive deer frequently during the breeding season in late October and November, samples were collected during the fall of 2017. The fresh fecal samples were collected from inside and outside of deer pens around Lancaster County and stored in 10% formalin. Parasite analysis was conducted in the winter of 2018, using the fecal float method and light microscopy. The hypothesis was that there would be a positive correlation between the types of parasites found in the captive and wild deer populations in each area, because of similar environmental factors and transmission through potential direct and indirect interactions. The results of this research will directly aid farmers and veterinarians in improving herd health and mitigating disease.

The white-tailed deer (Odocoileus virginianus) is the most abundant and widely distributed deer species in North America (Davidson & Crow, 1983). One of the large mammals found in the United States, white-tailed deer coexist and interact with a variety of animals, including domestic livestock, other wildlife, humans, and captive deer (Davidson & Crow, 1983). These interactions are likely to increase as deer populations continue to grow. Since 1900, the number of white-tailed deer within the United States has grown from approximately 500,000 individuals to an estimate of more than 25,000,000 individuals, and it is still growing ("Deer eating," 2005). White-tailed deer are rapidly increasing in number in captive populations as well, and the deer farming industry is growing (Petersen, et al. 2012). In Pennsylvania alone, there are more than 12,000 deer farms distributed in 63 counties across the state (Petersen, et al. 2012). According to the North American Deer Farmers Association, deer farming contributes $3 billion dollars annually to the economy and supports thousands of jobs in rural America (North American Deer Farmers Association, n.d.). White-tailed deer play a large role in the ecological systems in which they occur. As a keystone herbivore

for many eastern deciduous forests, they affect a wide variety of organisms (Waller & Anderson, 1997). Through sustained browsing pressure on dietary plants, and through the seed dispersal of other plants, white-tailed deer directly and indirectly influence the entire ecosystem (DeCalesta, 1994; Myers, et. al., 2004; Rooney & Waller, 2003; Russell, et al., 2000). For these reasons and more, understanding the disease ecology of white-tailed deer is vitally important. Numerous diseases pose a threat to white-tailed deer in the United States. For example, chronic wasting disease is a fatal neurodegenerative disease that is now found in 24 states across the United States, and is rapidly devastating deer populations within Pennsylvania (Foley, et. al., 2016; Samuel & Storm, 2016). Although multiple studies have focused on diseases within captive populations or within wild populations of white-tailed deer, very few have analyzed the spread of disease between two small populations of deer living in the same geographical area. This current study explored the link between disease in separate captive and wild whitetailed deer populations within Lancaster County, Pennsylvania. Internal parasites were used as a model for disease transmission between the two populations. The hypothesis was that there would be a positive correlation between the types and numbers of parasites found in the captive and wild deer populations in each area, because of similar environmental factors and potential disease transmission through direct and indirect interactions. Most parasites thrive in dense populations when weather conditions are warm and moist (Dusek, et. al., 1989). For this reason, it is best to sample parasites in the late summer and fall. The breeding season for captive and wild, native white-tailed deer takes place in late October and November (Verme, 1969). At this time, wild male deer often visit ovulating captive does (Woolfe & Harder, 1979). For these reasons, the late fall was selected as the ideal time for sampling fecal matter from both wild and captive deer. Twelve white-tailed deer farms were identified throughout Lancaster County, Pennsylvania with the help of local veterinarians. The famers were approached and eight of them agreed to participate in the research project. Fresh fecal samples were taken from pre-identified quadrants within the individual pens on each farm. The samples were stored and later used to determine the relative abundance and types of parasites present in each pen. The wild deer feces were similarly obtained by sampling around the outside of the pens on each farm. A total of five to ten fecal pellets were taken from each sample. They were labeled and sealed in collection tubes with 10% formalin, a preservative, at three to four times the sample volume (Samuel & Trainer, 1969; Cook, et al., 1979; Foreyt, 1986). In January and February of 2018, the formalin was drained off of the samples. One gram of each sample was analyzed using the fecal floatation method (Samuel & Trainer, 1969). After floating for 15 minutes, the coverslips containing parasitic ova were delicately transferred to a microscope slide (Samuel & Trainer, 1969). The slide was then examined using a compound light microscope at 100x and 400x total magnification. Parasite ova and protozoa were identified and quantified using keys for the internal parasites of deer and domesticated animals (Kates & Shorb, 1943; Samuel & Beaudoin, 1966; Shorb, 1939; Shorb, 1940). Strongyles, coccidia, roundworms, hookworms, tapeworms, liver flukes, and giardia were parasites found in the samples (n=301 samples). There were significantly more strongyles (P=0.000) and roundworms (P=0.031) found in the wild deer than the captive deer populations. Strongyles were the most common parasite observed and there was a significant correlation found between their presence in

captive and wild samples for each location (R2 =0.93, P=0.008). This was expected due to the close interaction of wild and captive deer and the prevalence of strongyles in both populations. There were no significant correlations found between the wild and captive deer among the other families of parasites, which was likely due to the small sample size and their relative scarcity in the samples tested. Through this study, it was observed that wild deer visit captive deer during the breeding season. Because of this close interaction, additional research should be done to further examine disease transmission between captive and wild deer.

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