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Avian Mortality as an Indicator of Human Risk for West Nile Virus

In addressing the topic of avian mortality as an indicator of human risk for West Nile Virus, I will first provide a basic understanding of the West Nile Virus itself. Following that, several studies that analyzed and reviewed the connections between avian mortality (and other factors) and human contraction of the West Nile Virus. I will then summarize these findings and share my thoughts for a possible solution to this serious, challenging issue.

Before discussing the human risk of contracting West Nile Virus, it is important to understand the disease itself. Origins of this malady date back to 1937, when it was first identified in the West Nile District of Uganda, Africa. The disease has spread broadly around the world, making its first validated appearance in the U.S. in 1999 (New York City). Since that time, the West Nile Virus has killed more than 1,700 people in the U.S. with cases reported in all 48 of the continental United States. 75% of the reported cases in the U.S. have come from 5 states (Texas, Mississippi, Louisiana, Oklahoma and South Dakota). South Dakota is particularly interesting as it is the most northernmost and least populated of the 5 states. Infected people can develop West Nile encephalitis, which is an inflammation of the brain. Symptoms of the disease include headaches, fever, tremors, and stiffness, and are often accompanied by skin rash or swollen lymph nodes.

The disease originates in birds (crows seem to be one of the most susceptible species). Mosquitos feed on birds and can pass the disease on to humans. There is no evidence that the disease can be passed from one human to another. Medical statistics show that approximately 80% of people infected with the disease will show no symptoms, while only about 1% of these people become seriously ill. There is no approved vaccine for West Nile virus at this time, though experimental treatments are now being tested.

There have been numerous studies considering avian mortality as an indicator of human risk for contracting West Nile Virus. A study in 2001 and 2002 focused on U.S. counties where birds were identified with the virus early in the transmission season (before August 5). Of the 93 counties reporting at least one early-season bird infection, 28 (30%) reported human case of West Nile Virus in that year. The study compared that to less than 5% of the remaining U.S. counties reporting a human West Nile Virus case in that year. Researchers concluded a very clear connection / correlation between early season bird infections with ultimate human contraction of the disease in that calendar year.

Another study, in 2006, was focused in Mississippi (one of the top 5 U.S. states for West Nile Virus cases). This study, too, found a clear correlation between dead bird occurrences (from the virus) and human risk of contracting the disease. Researchers utilized tools such as Geographic Information Systems (GIS), and included other important variables including environmental conditions, mosquito habitat, and vegetation in assessing the human risk to this disease. Mississippi researchers used

techniques that have also been used to study Lyme disease and Malaria, providing additional credibility to this study.

The Mississippi study also considered a hypothesis West Nile Virus in the human population to the occurrence of specific climate conditions. This theory, named the "drought hypothesis", speculates that West Nile Virus emerges in greater measure after mild winters, extended periods of hot, dry spring weather followed by significant amounts of rain. Of course, given the clear role of mosquitos in carrying the virus, it would seem obvious that conditions noted in the "drought hypotheses" would also be conducive to major explosions in the mosquito population (although different species of mosquitos thrive in different climate conditions). More mosquitos mean more potential carriers of West Nile Virus.

A third study worth noting here was conducted in California over a ten-year time horizon (2003-1012). In this study (published in the Journal of Wildlife Diseases), it was concluded that in the years of highest avian mortality (2004, 2008, and 2012), researchers also found the highest level of infected mosquitos. The study, however, did not conclude that these years of highest avian mortality and mosquito infection resulted in the highest level of human cases of West Nile Virus. While researchers determined some correlation did exist between avian mortality and human contraction of the virus, the connection did not seem as strong as researchers found in the U.S. and the Mississippi studies.

Many other studies have been conducted and have been largely consistent in their findings that avian mortality is clearly correlated with human risk for contracting

West Nile Virus. Studies have shown that crows are one of the species of bird most susceptible to the West Nile Virus, while the sparrows in New York seem to be the primary carriers in that city (where the first U.S. West Nile Virus death in a human was reported in 1999).

In discussing a potential solution to human risk to the West Nile Virus, it is important to understand the channels through which humans can contract the disease. Given the recognized, undisputed conduit that mosquitos provide in transporting the disease from birds to humans, it would seem obvious that aggressive efforts toward mosquito control / management would be the obvious approach to minimizing the impacts of this potentially devastating disease. While managing the mosquito population is clearly a complex, challenging activity, it would appear to be, by far the best opportunity for eradication of the West Nile Virus in humans, at least until a vaccine can be tested and approved.

In summary, West Nile Virus is a potentially dangerous / fatal disease to the global human population, and is one that should be strongly studied / managed in the months and years ahead. The virus originates (is hosted) in birds and is carried (by mosquitos) to human beings. West Nile Virus has spread from Africa (in 1937) to nearly all regions of the world. Many studies have been quite consistent in the correlation of avian mortality with risk of human contraction of the virus. The most obvious, rational solution to this situation is to aggressively understand and manage the mosquito population, particularly in the areas at highest risk for incidences of this disease. Beyond strong mosquito control and management processes, significant research continues toward the development and approval of a vaccination for West Nile Virus.

With appropriate research, understanding and management, West Nile Virus can join other eradicated diseases as a mere distant memory in journals of dangerous global diseases that no longer pose a risk to the human population.

Bibliography

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