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West Nile virus in red-tailed hawks

Investigator: Dr. Arno Wuschmann

Mentor & Co-Investigator: Dr. Pat Redig

University of Minnesota

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Dr. Wünschmann is an assistant professor at the University of Minnesota and a diplomate of the American College of Veterinary Pathologists. He received his veterinary degree from the Justus Liebig University in Germany. With MAF funding, he is studying how West Nile Virus affects hawks.



Dr. Redig is professor (and director) of The Raptor Center at the University of Minnesota. He received his DVM and PhD from the University of Minnesota. Caring for West Nile virus infected patients is a daily challenge for him as clinician at The Raptor Center during the summer and fall months.

How does West Nile Virus (WNV) affects hawks' vision?

Dr. Redig: The West Nile virus causes varying degrees of inflammation of the retina, which are the light-sensitive cells that form the inner layer of the rear part of the eyeball. This inflammation causes destruction of areas of the retina, ranging from small focal areas to larger patches. During the acute stages of the infection, the eyes are very sensitive to light and the bird will keep its eyes closed to protect them. As the inflammation progresses, damaged tissues lose their ability to process incoming light signals and do not regenerate. Instead, they are replaced by scar tissue during the healing process. Depending on the amount of the retina that is affected and the location of the lesions, an affected bird will have varying amounts of visual impairment, ranging from impaired vision to complete blindness. Sometimes it occurs in only one eye, sometimes in both.

Are there any treatments for WNV in hawks?

Dr. Redig: We have been able to prevent the development of severe damage to eyes from West Nile virus by giving birds high doses of anti-inflammatory drugs, chiefly meloxicam, a non-steroidal agent. Administered during the early stages of infection, this drug has brought about complete recovery in many birds, including those that were already showing signs of visual impairment. It also has provided a great deal of relief from the pain of light hypersensitivity in birds dealing with the acute stages of the disease.

How are you going to try to identify the cells that are targeted by

the virus?

Dr. Wünschmann: The retina is composed of a variety of cell types. The light-microscopic investigation of the retina in this study allows us to identify a few of the cell types affected by WNV. In addition, we will use special light-microscopic techniques, such as special stains and “immunohistochemistry,” to detect and locate viral antigen and to identify glial cells. Most importantly, we will use the electron microscope to study the ultrastructure of the infected retina, detect viral particles and identify more cell types.

What do you hope to learn from your study?

Dr. Redig: We hope that the study will not only show the range of ocular and specifically retinal damage that is caused by West Nile virus in red-tailed hawks but also will help to show how West Nile virus damages the eye. By understanding how the damage occurs, we hope to contribute to the development of improved treatment and prevention strategies. We hope that the study will produce results that also can be applied to other species of birds or even mammals.

Results so far that you wish to share?

Dr. Wünschmann: Early results of the study confirmed that a high percentage of West Nile virus-infected red-tailed hawks suffer from lesions in the retina of one or both eyes, leaving them visually impaired at best and at worst, blind. The key finding will help to diffuse inflammation of the retina. Further studies are needed to more accurately define the nature and extent of this inflammation.

Why should the average animal lover care about your study?

Dr. Wünschmann: Besides our human and veterinary moral obligation to understand disease processes in order to prevent or at least minimize animal suffering, these magnificent birds and the many other species of raptors that are affected by West Nile virus play an important role in the ecosystems that they inhabit and that we share. Pristine vision not only is fascinating in itself but is the key sense for the survival of birds of prey in nature. While there is little we can do that will impact birds in the wild, there are many thousands of raptors held in zoological collections, nature centers, and other venues of public education that will be positively impacted by a better understanding of the processes by which West Nile virus causes injury to the eye.