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West Nile Virus: what ornithologists and bird banders should know

Introduction

West Nile Virus (WNV) was first isolated in 1937 in Uganda. There have been outbreaks in Israel (1951-1954), France (1962, 2000), and South Africa (1974). It appeared in Western Europe in the mid-1990s and then traveled to the United States in 1999 where researchers – and their universities, government research agencies, and other research organizations – became concerned about the risk to field biologists, students, and others. Perhaps out of an abundance of caution and spurred by constant media attention to WNV, one university cancelled field research and field biology classes that involved bird banding. The Ornithological Council – a consortium of 11 scientific ornithological societies in the Western Hemisphere – consulted with a number of experts to compile this fact sheet about the risks of WNV to ornithologists and bird banders and to provide the most up-to-date public health recommendations for those handling live birds, carcasses, or tissues that are potentially infected with WNV.

Understand the risk

All research involves risk. Know the risks and take reasonable precautions. West Nile Virus should be no more of a deterrent to ornithological research and education than any other risk encountered in scientific research.

According to the Centers for Disease Control (as of 11 April 2003; see http://www.cdc.gov/ncidod/dvbid/westnile/qa/symptoms.htm)

- Most mosquito bites will not lead to a WNV infection
- Most people who are infected with WNV do not develop any type of illness
- It is estimated that 20% of the people who become infected will develop West Nile fever: mild symptoms, including fever, headache, and body aches, occasionally with a skin rash on the trunk of the body and swollen lymph glands.
- About 1 of each 150 infected persons becomes seriously ill with central nervous system infection (encephalitis &/or meningitis)
- About 6.6% of the 4,161 cases of the laboratory-positive 2002 WNV cases in the United States were fatal.

For young/healthy researchers who are not immunocompromised, West Nile Virus is unlikely to cause much more than a mild illness – typically "flu-like symptoms." A more serious case of West Nile Virus in humans results in fever, disorientation, muscle weakness, neck stiffness, headache, nausea. Persons over 50 years of age are at increased risk of severe disease. An analysis of attack rates per million persons during the 1999 New York City outbreak showed that compared with persons 0 to 19 years of age, the incidence of severe neurologic disease was 10 times higher in persons 50 to 59 years of age and 43 times higher in those at least 80 years of age. However, although older persons are at greater risk for West Nile Meningoencephalitis or

death, persons of any age might develop severe neurologic disease (Nash et al. 2001). CDC recommends that persons with severe or unusual headaches seek medical attention as soon as possible.

In the lab

As of February 2003, there have been only two documented cases of researchers contracting West Nile Virus in the course of conducting research. Both cases involved microbiologists. One was infected from an accidental needle puncture in the finger while working with live virus while the other was infected through an accidental scalpel cut while performing a necropsy on a dead Blue Jay (CDC Morbidity and Mortality Weekly Review, 20 December 2002).

It is best to assume that any specimen could be infectious and to take proper precautions at all times. Specifically:

- Neither refrigeration nor freezing will kill the virus. Ornithologists working with thawed tissue or specimens should assume that this material contains live virus.
- Ornithologists preparing specimens or working with tissue from fresh (never frozen) birds should be aware that the virus will remain viable in dead birds for several days.

- Ornithologists preparing specimens should take care to avoid scalpel cuts and punctures. If they occur, cleanse the area promptly and thoroughly, apply antiseptic, and report the incident to a supervisor. If signs of illness occur within two weeks of exposure, prompt medical evaluation and consultation with public health authorities should be sought.

- Standard measures to minimize exposure to fluids or tissues during handling of potentially infected tissue comprise standard droplet and contact precautions. These include barrier protections such as gloves, masks, and eyewear; proper use and disposal of needles, scalpels, and other sharp instruments; and minimizing the generation of aerosols (such as vigorous spraying of water on carcasses or work surfaces). While wearing gloves, be careful not to handle anything but the materials involved in the procedure. Touching equipment, phones, wastebaskets or other surfaces may cause contamination. Be aware of touching the face, hair, and clothing as well. Researchers who use gloves must learn the proper way to remove and dispose of gloves and must avoid touching unprotected skin with the gloved hand. Consult your safety officer or safety manual. Typical instructions say to remove the first glove by grasping the cuff – being careful to avoid touching the bare skin of the wrist or arm - and peeling the glove off the hand so that the glove is inside out. Repeat this process with the second hand, touching the inside of the glove cuff, rather than the outside. Wash hands immediately with soap and water.

- Although WNV is classified as a Biosafety Level 3 agent, it is considered acceptable practice to work with most specimens in a Biosafety Level 2 laboratory under Level 3 conditions. See *Biosafety in Microbiological and Biomedical Laboratories 4th ed.* [http://bmbl.od.nih.gov] for details.

In the field

Although there are no documented cases of ornithologists or bird banders contracting WNV from handling living or dead birds, it is also the case that there has been no surveillance of ornithologists or bird banders to determine the presence/absence or prevalence of the disease.

Even if such surveillance were to be implemented, it would be difficult to know if the disease had been contracted through contact with bird feces or saliva or if it had been contracted from an insect bite – at the research site or elsewhere.

It has been confirmed that WNV may be shed from the cloacal and oral cavities (Komar et al. 2002). Therefore, contact with droppings, dropping-contaminated feathers, or the cloaca may result in exposure to WNV.

- Be sure to have antispectic (not antibacterial or antimicrobial) available for handwashing and first aid for cuts or punctures sustained while handling birds.

- Reasonable precautions include the use of antiseptic wipes. This will protect both the researcher and the birds subsequently handled by the researcher.

- Avoid contact with bird feces.

- If bitten by a bird, wash hands (when possible) or use antiseptic (not antibacterial or antimicrobial) wipes or even a small amount of fresh bleach.

- Since ornithologists often use needles to take blood samples, extra care should be taken to avoid needle sticks.

- Public health officials consider gloves to be an appropriate precaution but ornithologists rarely wear gloves when handling birds, particularly in the field. If gloves are worn, they should be changed or decontaminated with 70% ethanol or other appropriate substance after handling each bird to avoid transmission from one bird to another. Again, be familiar with proper glove removal and disposal. Other barrier protections such as goggles and masks are standard precautions against inadvertent exposure to droplets and fluids.

- Ornithologists and bird banders should take the same reasonable precautions to minimize risks – of various diseases - posed by mosquito bites. Reasonable measures include protective clothing (long sleeves, long pants, socks) and the use of DEET or other insect repellants – with repeated applications over time. For detailed information about the proper use of DEET and summary of a recent assessment of the efficacy and safety of DEET, see the appendix.

Precautions against transmission to birds and other wildlife

- Ornithologists and bird banders should not re-use contaminated bags, boxes or other holding/carrying devices and other devices used to restrain birds during processing. The North American Banding Council manual states, “Launder bird bags frequently, as they must be kept clean,” and “If a diseased bird is caught, it is extremely important to put that bag aside until it has been washed and disinfected.” However, as it is not possible to determine if a bird is shedding virus, the better practice would be to carry an ample supply of bags or other holding/carrying devices so that no bag or other holding device is used more than once before laundering.

- When preparing specimens in the field, place waste material in a biosafety bag, seal it, and burn it, or carry it out with you.

- Never re-use needles or scalpel blades unless decontaminated with a fresh 10% bleach solution.

REFERENCES

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Nash D., Mostashari F., Fine A., Miller J., O'Leary D., Murray K., et al. 2001. The outbreak of West Nile virus infection in the New York City area in 1999. New England Journal of Medicine 344:1807-1814.

This publication was reviewed by scientific experts under the auspices of the Ornithological Council. You may contact the Council for further information.

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APPENDIX:
THE PROPER USE OF DEET AND AN ASSESSMENT OF THE RISKS OF THE USE OF DEET

To determine the relative efficacy of DEET versus other insect repellants, Fraidin et al. tested the relative efficacy of seven botanical insect repellents; four products containing *N,N*-diethyl-*m*-toluamide, now called *N,N*-diethyl-3-methylbenzamide (DEET); a repellent containing IR3535 (ethyl butylacetylaminopropionate); three repellent-impregnated wristbands; and a moisturizer that is commonly claimed to have repellent effects. These products were tested in a controlled laboratory environment in which the species of the mosquitoes, their age, their degree of hunger, the humidity, the temperature, and the light–dark cycle were all kept constant.

They found that DEET-based products provided complete protection for the longest duration. Higher concentrations of DEET provided longer-lasting protection. A formulation containing 23.8 percent DEET had a mean complete-protection time of 301.5 minutes. A soybean-oil–based repellent protected against mosquito bites for an average of 94.6 minutes. The IR3535-based repellent protected for an average of 22.9 minutes. All other botanical repellents they tested provided protection for a mean duration of less than 20 minutes. Repellent-impregnated wristbands offered no protection.

They concluded that currently available non-DEET repellents do not provide protection for durations similar to those of DEET-based repellents and cannot be relied on to provide prolonged protection in environments where mosquito-borne diseases are a substantial threat.

Depending on the time in the field, the temperature, exposure to water, perspiration, or concentration of DEET in the product, you may need to re-apply. This study found that a product containing 23.8% DEET provided an average of 5 hours of protection against mosquito bites. A product containing 20% DEET provided almost 4 hours of protection, and a product with 6.65% DEET provided almost 2 hours of protection. DEET may be washed off by perspiration or rain, and its efficacy decreases dramatically with rising outdoor temperatures.

Much has been said about the safety of DEET usage. The Fraidin paper addressed this issue:

> Despite the substantial attention paid by the lay press every year to the safety of DEET, this repellent has been subjected to more scientific and toxicologic scrutiny than any other repellent substance. The extensive accumulated toxicologic data on DEET have been reviewed elsewhere. DEET has a remarkable safety profile after 40 years of use and nearly 8 billion human applications. Fewer than 50 cases of serious toxic effects have been documented in the medical literature since 1960, and three quarters of them resolved without sequelae. Many of these cases of toxic effects involved long-term, heavy, frequent, or whole-body application of DEET. No correlation has been found between the concentration of DEET used and the risk of toxic effects. As part of the Reregistration Eligibility Decision on DEET, released in 1998, the Environmental Protection Agency reviewed the accumulated data on the toxicity of DEET and concluded that "normal use of DEET does not present a health concern to the general U.S. population." When applied with common sense, DEET-based repellents can be expected to provide a safe as well as a long-lasting repellent effect. Until a better repellent becomes available, DEET-based repellents remain the gold standard of protection under circumstances in which it is crucial to be protected against arthropod bites that might transmit disease.

Fradin, M.D., Mark S. and John F. Day, Ph.D. 2002. *Comparative Efficacy of Insect Repellents Against Mosquito Bites.* New England Journal of Medicine 347: 13-18; available online at <http://content.nejm.org/cgi/content/full/347/1/13>.