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WEST NILE VIRUS IN NORTHERN OHIO

The entire lifespan of a female mosquito (the only type of mosquito that feeds on blood) may only span a few weeks, but the female *Culex pipiens* mosquito can make the most of it. Feeding on the blood of humans and animals gives this common carrier of the West Nile virus the protein she needs to produce several hundred eggs every few days--eggs that evolve into biting adult mosquitoes that are looking for meals of their own. With each bite, an infected mosquito may transmit the West Nile virus (WNV).

Courtesy Leon County Mosquito Control

The West Nile virus is transmitted by the bite of an infected mosquito. It was first found in Africa in 1937, and was identified in the Western Hemisphere for the first time in 1999 in the New York City area. Since then, it has spread quickly throughout most of the United States. In 2000, it spread to all of the New England states and south to North Carolina. As of Dec. 3, 2002, 39 states and the District of Columbia had reported more than 3,700 human cases of West Nile virus infection in 2002, resulting in over 210 deaths. It has caused illness and mortality in humans, wildlife and domestic animals, especially birds and horses. In humans, it causes an influenza-like illness that may lead to aseptic meningitis, encephalitis, and death, especially in persons over 50 years of age. West Nile virus is important because it affects not only people, but also wildlife (including many game animals) and some domestic animals.

The West Nile Virus hit few places harder in the nation last year than Cuyahoga County, which recorded 216 cases and 9 deaths.

There have been 15 reported human cases of West Nile virus in Lorain County, according to the Ohio Department of Health Web site. Cuyahoga County reported 216 cases, Erie County reported two cases, and Huron County reported one case.

As of last fall, Ohio had 431 reported cases of West Nile virus and 24 deaths related to the virus, according to the Centers for Disease Control and Prevention (CDC).

Clearly the West Nile virus has had a strong impact on Northern Ohio and how we perceive outdoor activities for the future. This website was made to better inform those who want to know more about the disease, and the precautions to take, before heading out into the great outdoors (or even your backyard).

History

West Nile virus is a mosquito-borne virus that can cause encephalitis (inflammation of the brain) or meningitis (inflammation of the lining of the brain and spinal cord). Outbreaks of the West Nile virus have occurred before in Egypt, Asia, Israel, South Africa, and in some parts of Europe. West Nile virus was first found in the United States in New York City in the fall of 1999. During that outbreak, 61 people, including 46 residents of New York

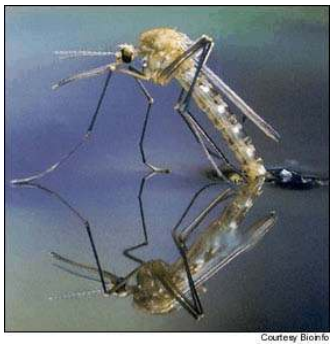
City, became ill. Seven people died of West Nile virus-related infections during this initial outbreak. While we are uncertain how West Nile virus arrived in the USA, the most likely explanation is that the virus was introduced by an infected bird that was imported or an infected human returning from a country where the virus is common, or a mosquito hitchhiking on an airplane.

Transmission Cycle

West Nile virus is spread to humans by the bite of an infected mosquito. When a mosquito bites a bird that carries the virus, the mosquito becomes infected. It is believed that people cannot get West Nile virus directly from another person, or animal, that has the disease. It is believed that this disease is only transmitted by mosquitoes.

Being bitten by an infected mosquito will not necessarily make you sick, since most people who are infected with West Nile virus either have no symptoms or experience mild illness. If illness were to occur, it would occur within 5 to 15 days of being bitten by an infected mosquito.

Symptoms in humans



Mild infections are common and include fever, headache, and body aches, often with skin rash and swollen lymph glands. Headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, and paralysis mark more severe infection. In some individuals, especially the elderly, West Nile virus can cause serious disease that affects brain tissue. At its most serious, it can cause permanent brain damage and can be fatal.
If you do get the infection, many will show little or no symptoms. A small number of them may have symptoms like those of the flu - like body aches and fever - and recover quickly to normal health.

Symptoms in horses

Clinical signs of West Nile virus infection in horses include: listlessness, stumbling, lack of coordination, ataxia, partial paralysis, and death. Horses with West Nile virus often do not have a fever. See The Ohio State University Veterinary web site for more details.

Diagnosis

Your physician will first take a medical history to assess your symptoms. People who live in or traveled to areas where West Nile virus activity has been identified are at risk of getting West Nile encephalitis. It is important to tell your doctor your recent travel history (the last 2 months). Persons older than 50 years of age have the highest risk of severe disease. If you are determined to be at high risk and have symptoms of West Nile encephalitis, your provider should draw two blood samples about two to three weeks apart and send them to a commercial or public health laboratory for confirmation.

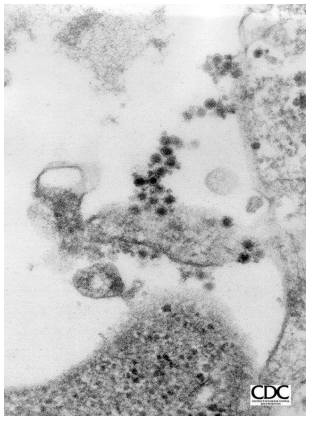
Any resident of an area where virus activity has been identified (all counties in Ohio) are at risk of getting West Nile encephalitis. Persons over 50 years of age have the highest risk of acquiring the severe forms of the disease. It is unknown if immunocompromised persons are at increased risk for West Nile virus disease.
Humans aren't the only ones who can get the West Nile virus however. The virus is a threat to some animals, too, especially to wild birds and horses. About 40 percent of he horses that developed encephalitis from the West Nile virus died during the 1999 outbreak that originated in New York City. The

West Nile virus has been shown to infect dogs, cats, bats, chipmunks, skunks, squirrels, and domestic birds and rabbits. To date, the virus has not often caused illnesses in these animals.
Pet owners should NOT use human repellants that contain DEET on animals. Some animals are more sensitive than people to direct application of DEET products, making their use potentially harmful.

Treatment

There is no specific therapy. In more severe cases, intensive supportive therapy is indicated, often involving hospitalization, intravenous fluids, airway management, respiratory support (ventilator), prevention of secondary infections (pneumonia, urinary tract, etc.), and good nursing care.
More than 300 drugs have bee screened to treat the disease, and 2 have shown potential for additional testing in animals, according to the National Institute of Allergy and Infectious Diseases. Also, a vaccine to protect people against the West Nile virus is scheduled to begin human trials in early 2003.

The West Nile Virus is one of a group of disease-causing viruses called flaviviruses, which are spread by insects, usually mosquitoes. Other flaviviruses include yellow fever, dengue, and St. Louis encephalitis viruses. The West Nile virus primarily circulates between infected birds and mosquitoes that bite them. Only female mosquitoes bite and feed on blood; males feed on nectar. The infected mosquitoes can transmit the virus when they bite other animals or people. More than 130 species of birds have been reported to be infected with the West Nile virus, according to the CDC. The virus also can infect horses and some other animals. Even where the West Nile virus is circulating, not all mosquitoes become infected with it, and human infection does not occur in all individuals exposed to mosquitoes.



Below is from the CDC:
Family: Flaviviridae
Genus: Flavivirus Japanese Encephalitis Antigenic Complex
Complex includes: Alfuy, Cacipacore, Japanese encephalitis, Koutango, Kunjin, Murray Valley encephalitis, St. Louis encephalitis, Rocio, Stratford, Usutu, West Nile, and Yaounde viruses.
Flaviviruses: share a common size (40-60nm), symmetry (enveloped, icosahedral nucleocapsid), nucleic acid (positive-sense, single stranded RNA approximately 10,000-11,000 bases), and appearance in the electron microscope. Therefore, images of West Nile virus are representative for this group of viruses.

PREVENTION

The **ONLY** way to control the spread of the West Nile virus in people today is by controlling the mosquitoes that carry the virus and taking precautions to avoid being bitten. Despite the risk of getting the West Nile virus through blood products, organs, and breast milk, these forms of transmission seem to be rare, according to the CDC. Bites from mosquitoes carrying the West Nile virus remain the most common means of transmission

Mosquito Larvae
Aquatic larval stages can be found in many sources of standing water.

Mosquitoes lay their eggs in standing water, which includes puddles, stagnant ditches, and containers such as old tires, buckets, cans, neglected swimming pools, etc. Storm sewers, culverts, and catch-basins, etc. provide an outdoor resting place for adult *Culex pipiens* mosquito (the common house mosquito) which is most commonly associated with West Nile virus. This mosquito often enters homes through unscreened windows or doors, or broken screens.

Follow the following tips to decrease your chances of acquiring the West Nile virus:

- Make sure that doors and windows have tight-fitting screens. Repair or replace all torn screens in your home.
- Remove all discarded tires from your property.
- Dispose of tin cans, plastic containers, ceramic pots, or similar water-holding containers.
- Make sure roof gutters drain properly. Clean clogged gutters in the spring and fall.
- Clean and chlorinate swimming pools, outdoor saunas and hot tubs. If not in use, keep empty and covered.
- Drain water from pool covers.
- Change the water in bird baths at least once a week.
- Turn over plastic wading pools, and wheelbarrows, etc. when not in use.
- Clean ditches of obstructions so they drain properly.
- Eliminate any standing water that collects on your property.
- Check trees for cavities that hold water and fill them with soil, gravel, or sand.
- Remind or help neighbors to eliminate breeding sites on their properties.

As mentioned previously, the most successful prevention strategy against the West Nile virus is to avoid mosquito bites.

If you will be outside during evening, nighttime and dawn hours, consider the use of an insect repellant containing 10% or less DEET (N, N-diethyl-methyl-meta-toluamide) for children and no more than 30% DEET for adults. DEET is effective for approximately four hours. Avoid prolonged or excessive use of DEET and use it sparingly to cover exposed skin and clothing. Do not use DEET on infants or pregnant women and do not apply DEET directly to children. Apply it to your own hands and then put it on the child. Always use DEET according to the manufacturer's instructions.

The U.S. Environmental Protection Agency (EPA) provides the following guidelines that should be observed when using DEET-containing products:

- Do not apply to infants under 2 months of age.
- Apply repellents only to exposed skin and/or clothing, but do not use under clothing. Applying repellant to clothing offers added protection with less potential for exposure.
- Do not apply to eyes and mouth, and apply sparingly around ears. When using sprays, do not spray directly onto face; spray on hands first, and then apply to face.
- Do not allow children to handle the products, and do not apply to children's hands. When using on children, apply to your own hands and then put it on the child.
- Do not spray in enclosed areas. Avoid breathing a repellant spray, and do not use it near food.
- Use just enough repellant to cover exposed skin and/or clothing. Heavy application and saturation is generally unnecessary for effectiveness.

- After returning indoors, wash treated skin with soap and water or bathe. This is particularly important when repellants are used repeatedly in a day or on consecutive days. Also, wash treated clothing before wearing again.
- If you suspect that you or your child are reacting to an insect repellant, discontinue use, wash treated skin, and then call your local poison control center.

Remember that Vitamin B, ultrasonic devices, incense and bug zappers have not been shown to be effective in preventing mosquito bites.

Mosquito Control with Pesticides

Larvicides can be used to control mosquitoes in the aquatic stage before they become biting adults. This type of control generally has the least effect on non-target species and the environment.

Microbial larvicides such as Bacillus thuringiensis var. israelensis and Bacillus sphaericus can be used successfully in a broad range of freshwater habitats.

Biochemical larvicides (insect growth regulators - IGRs) such as methoprene can also be used in a variety of habitats.

Mono-molecular surface film larvicides can be used in polluted or artificial habitats, but should not be used where non-target insects are important resources.

Mosquito adulticides should be considered the least desirable method of control and only used when isolations of virus and/or evidence of disease has been established. These materials have strengths and drawbacks that will influence which material is most appropriate for a given situation, and all must be applied according to label directions. Currently available adulticides include organophosphates, pyrethrins, and pyrethroid-based insecticides. These may be applied by hand-held, or backpack, foggers, or fixed-wing or rotary-wing aircraft.

Application of adulticides by truck-mounted foggers, fixed-wing or rotary-wing aircraft is usually done by government agencies or private contractors. Those who apply pesticides in these ways must be licensed, have their equipment properly calibrated, and adhere to the label directions.

BIRDS

Birds are the natural reservoir for West Nile virus. If a mosquito bites an infected bird and the virus is transmitted to the mosquito, it may then become a host itself. If the same mosquito then bites a human, it can pass the disease to the human. Because of this cycle, noticing dead birds could be the first sign of West Nile Virus in an area.

Wild bird surveillance

Blood samples can be taken from wild birds to see if they are infected with West Nile and other viruses. During 2001, the Ohio Department of Health Vector-borne Disease Program tested 1,848 wild birds. Six were positive for West Nile virus. No human cases were diagnosed in Ohio. The low percentage of positive birds suggested that Ohioans were at low risk. What happens in the future is

unknown, but surveillance is the best way to estimate risk

Dead bird surveillance

West Nile virus kills birds, and the most sensitive species in Ohio are American Crows and blue jays. They almost always die from infection with West Nile Virus. This is a new virus in the western hemisphere, but some studies have indicated that a dead crow rate of 1.5 per square mile per week is a prelude to human cases. Citizens should report dead crows and blue jays to their local health departments. Clusters of dead crows and blue jays may indicate increased risk of human disease. This is important to local health departments. Should they increase their prevention efforts or not? Citizens can help in this decision by reporting dead crows and blue jays to their local health department.

Depending on local resources, the local health department may send a person to inspect the dead bird, determine if it is a American Crow or blue jay, collect it, and send it in for West Nile virus testing. After two dead birds have been confirmed as infected with WNV in a calendar year, West Nile virus is considered to be present and active and there are infected mosquitoes present. No further birds need be sent for testing.

HORSES

Horses are known as a dead-end host of West Nile virus, that is, they can become ill with West Nile virus, but they do not maintain sufficient virus in the blood to infect either other mammals (including humans) or mosquitoes. Surveillance of horses has occurred in areas with a history of West Nile virus and in additional States on the eastern coast of the United States to monitor the possible spread of West Nile virus. This surveillance consists of investigating suspect cases in horses. Because horses are not known to play a role in transmission of West Nile virus, quarantines were never placed on any non-clinically ill horses in the outbreak area. However, some foreign countries have banned the importation of horses from New York.

The agriculture department recommends eliminating standing water where mosquitoes breed; put horses inside at dawn, dusk and night; use fans to create air movement over stabled horses; remove all birds that are in or close to stables; use insect repellant or fog stables with pesticides in the evening.

FREQUENTLY ASKED QUESTIONS

What do you know about the West Nile virus? Do you have questions about its transmission, treatment, and your pets? If so, this is the place to look for the answers.

Since the original "scare" over the West Nile virus last year here in Northern Ohio, many people have had questions about the virus that have gone unanswered. The links to the left side of this page attempt to answer most common questions (or FAQ -Frequently Asked Questions). The questions are organized according to subject matter (i.e. people, birds, wildlife, etc.). Please take your time to learn more about the virus by browsing the links to the left.

General FAQ

Can infected mammals be carriers for the West Nile virus and transmit the virus to humans?

West Nile virus is transmitted by infected mosquitoes. At this time, there is no documented evidence of animal-to-animal or animal-to-person transmission of the West Nile virus. Bird-to-bird transmission has been reported in laboratory studies; however, the significance of this under natural conditions in unknown.

How can a horse get the West Nile virus?

Horses become infected with the West Nile virus after being bitten by an infected mosquito. There is no evidence that horses can transmit West Nile virus to other horses, birds, or people.

Do birds infected with the West Nile virus die or become ill?

Large numbers of North American Crows and other birds have dies of West Nile virus infection.

What about ticks?

Some ticks in Europe and Asia have been found to be infected with the virus. Therefore, infected ticks could prove to be a carrier and transmitter of the virus in the future. The U.S. Centers for Disease Control and Prevention also tested ticks in the 1999 outbreak are, but none were infected.

Can a person contract the West Nile virus by eating infected game birds?

Proper cooking kills the West Nile virus. Consequently, there is no danger associated with eating well-cooked wild game that might be infected. Remember this the next time you are roasting a crow or a blue jay for dinner!

Where did the West Nile virus originate?

The West Nile virus was first isolated in Uganda, Africa in 1937 (thus the name West Nile-- after the Nile river). Since then it has spread through West Asia, Europe, and the Middle East. It made its first appearance in the Western Hemisphere in the New York City area in a 1999 outbreak.

Is it contagious? Can I get the West Nile virus from someone else?

No, the West Nile virus is not contagious. The main transmission of the virus is through infected female mosquitoes.

What areas are higher risk areas?

As of this date, this question is unclear. The cases in the U.S. show that there is a much more abundant volume of cases around the Midwest and Great Lakes region, but only time will tell where the virus will become abundant next year.

What is the rate of infection? Survival rate?

Even in areas where mosquitoes are more likely to be carrying the virus, it's very unlikely that a person will become sick from a mosquito bite. Only about 1% of the mosquitoes in a region affected by the West Nile virus are actually infected with the virus. And less than 1% of the people who do become infected with the West Nile virus become severely ill.
In other words:

- Less than 1% of those infected with the West Nile virus will develop severe symptoms
- Of this 1% group of severe symptom patients 3 to 15% will die.

So, in many ways it is very rare to die from this virus.

Mosquitoes

Do all mosquitoes bite humans?

No, only adult female mosquitoes bite humans. Male mosquitoes feed on nectar and plant juices only. Most female mosquitoes feed on humans, birds, and other animals to get sufficient blood to develop eggs.

Do all mosquitoes transmit West Nile virus?

While there are many species of mosquitoes, the adult *Culex pipiens* mosquito (the common house mosquito) is the one most commonly associated with the West Nile virus.

Why are some people bitten more than others?

There are many factors. Cologne, perfumes and scented body lotions can attract mosquitoes. Dark colored clothing is also more attractive to mosquitoes. During evenings, nighttime and dawn, mosquitoes are most active in searching for blood, so people outdoors during that time are more likely to be bitten. Finally, everyone's body is different, and some people produce odors more enticing for mosquitoes.

Where do mosquitoes live?

The *Culex pipiens* mosquito (the common house mosquito) lays its eggs in standing or slow-moving water. Weeds, tall grass, and bushes provide an outdoor home for the adult *Culex pipiens* mosquito.

How far can a mosquito travel?

Depending on the species, adult mosquitoes may fly several miles with help from the wind. *Culex pipiens*, the species most commonly associated with the West Nile virus, has a travel range of two to three miles.

How long do adult mosquitoes live?

Generally, adult female mosquitoes have a life span of 2 weeks to a month while adult male mosquitoes only live a week.

What is the life cycle of a mosquito?

A mosquito goes through four distinct stages: egg, larva, pupa, and adult. This life cycle, from birth to death, is about a month long.

What is the egg phase of a mosquito?

Eggs are laid in clusters and float on the surface of water. They can be stuck together in rafts of hundreds, or laid separately on water or flooded soil. Most eggs hatch into larvae within 48 hours.

What is the larval stage?

Mosquito larvae live in water from 4 to 14 days, depending on the water temperature. They come to the surface frequently to obtain oxygen. They feed on algae and small organisms living in the water. The larva sheds its skin four times while it grows. After the fourth time, the larva becomes a pupa, the stage before the mosquito becomes an adult.

What is the pupa stage?

The pupa stage is a resting, non-feeding stage. Mosquito pupae must live in water from 1 to 4 days, depending on the species and water temperature. When development is complete, the pupal skin splits and the mosquito emerges as an adult.

What is the adult stage?

The newly emerged adult mosquito rests on the surface of the water for a short time to dry and allow its parts to harden. If nothing eats or kills it, the female adult can live up to a month, the male only a week.

Why do mosquitoes make a buzzing noise?

Mosquitoes flutter their wings very fast, some as much as 250 times per second, producing a high-pitched buzz.

Virus & People

Do all mosquitoes carry West Nile virus?

No, mosquitoes are generally considered a nuisance pest, but they occasionally can transmit disease. Sixty-four different species of mosquitoes are known to occur in Ohio. While most cannot transmit West Nile virus, several mosquito species common to Ohio are known to be carriers of West Nile virus. Only female mosquitoes bite. They do this to get a blood meal for developing their eggs.

When are mosquitoes most active?

Many mosquitoes are most active two to three hours before and after dusk and again at dawn when the air is calm. This is the time when the females are most likely to bite. However, some species will feed at any time of the day.

When is the greatest risk of being exposed to an infected mosquito?

Most people have become infected in summer or early fall when mosquitoes are most numerous.

Can the virus survive the winter months?

Yes. During the winter months of 2000, health workers in New York City found over-wintering mosquitoes that contained evidence of West Nile virus.

Are crows and blue jays the only birds that can be infected?

No. During the last 3 years, the states reporting West Nile virus activity found many different bird species infected with West Nile virus. However crows and blue jays appear to be the most susceptible. This observation is not completely understood.

Can other animals also be infected?

Yes. Other animals have also been found to be infected and have died from West Nile virus. During the year 2000, reports from the Eastern states found West Nile virus infecting 58 horses, two bats, a domestic rabbit, a cat, gray squirrel, and a chipmunk.

Is it possible to get infected from an infected person or animal?

No. The virus is not spread by person to person contact, and there is no evidence that people can get the disease by handling infected animals.

What happens if a mosquito carrying the West Nile virus bites someone?

Most people who are bitten by an infected mosquito will demonstrate no signs or symptoms. However, some will experience a mild infection with a slight fever, headache, body aches, and sometimes a skin rash or swollen lymph glands. Symptoms generally occur five to 15 days after being bitten by an infected mosquito. A very small number of people will suffer from a severe infection that is marked by a rapid onset of a high fever, a severe headache, neck stiffness, nausea or vomiting, confusion, muscle weakness or paralysis, seizures, coma, and rarely, death.

Are some people more susceptible to the infection?

While everyone exposed to a mosquito that carries the West Nile virus is susceptible, people at greatest risk are those older than 50. Those who are immuno-compromised may also be at greater risk. During the outbreak in New York City in 1999, everyone who died from West Nile virus infection was 75 years of age or older. However, in 2001, 2 people in their 40s died from West Nile virus infection.

How is West Nile virus diagnosed?

Check out the symptoms page. To diagnose a West Nile virus infection, a doctor will need to test either blood or cerebrospinal fluid from a spinal tap for antibodies to the virus. A second blood test is required two to three weeks later to confirm the diagnosis.

Is there a treatment for West Nile virus encephalitis?

Check out the treatment page. No, there is no specific treatment for West Nile virus infection. While many people will not know that they have been exposed, nearly all of those with symptoms will fully recover. However, in some

severe cases, hospitalization may be needed. There is no vaccine for West Nile virus. There are no antibiotics or antiviral medications that can be used in the treatment of West Nile virus. All care is supportive.

Do mosquitoes in Ohio carry other diseases?

Yes. There are several other viruses circulating among mosquitoes in Ohio that can cause encephalitis. Although each of these viruses is somewhat different, prevention is basically the same--reduce the mosquito population and protect yourself from mosquito bites, especially during the summer and early fall.

How can I control mosquitoes around my home and neighborhood?

Check out the prevention page. You can reduce the number of mosquitoes around your home and neighborhood by eliminating places where they lay their eggs. Young mosquitoes are aquatic, and they must have standing water to develop from egg to adult.

How can I protect myself from West Nile virus?

Check out the prevention page. The best way is to avoid being bitten by mosquitoes. Use personal protection while outdoors when mosquitoes are present.

Virus& Birds

Why should I report a dead crow or blue jay?

As part of Ohio's surveillance plan for West Nile virus, the state departments of agriculture and health are monitoring dead crows and blue jays in Ohio. Crows and blue jays are related and are especially susceptible to the West Nile virus infection. A dead bird that shows no other sign of injury or reason for death may have died from a West Nile virus infection. Bird deaths have preceded outbreaks of this disease in other cities, so dead crows and blue jays can be an early warning that the West Nile virus is present.

What should I do if I find a dead crow?

If you find a dead crow or blue jay, contact your local health department.

What information do I need to give to the person I talk to?

You'll be asked for the specific location of the bird, including the address, county, and zip code, and when it was found. They will also want to know how many birds you have found dead, and if there are any signs of injury.

When will they pick up the bird?

Because of the number of birds that may need to be tested, not every bird that is reported will be picked up for testing.

What should you do if the bird isn't needed for testing?

If testing is not required, use a shovel or wear gloves and double bag the bird in two plastic bags and dispose of it in the trash.

Do I risk exposure to the West Nile virus by handing a dead bird?

There is no evidence that the West Nile virus is spread directly from dead birds to humans. However, health professionals advise that barehanded contact with dead animals should always be avoided. Use a shovel or wear gloves while handling any dead animal.

How long does it take to test a dead bird for West Nile virus?

Because birds will be tested based on a predetermined set of priorities, not the date received, it is unsure of how long this process can take.

Are crows the only birds affected by the West Nile virus?

No, but crows an their relatives (blue jays) are most likely to die. Large numbers of North American Crows or other birds were observed becoming ill and dying. Some exotic birds in the Bronx Zoo also died.

Can a dead bird pose a risk to my pet dog or cat?

To date, there is no evidence that a pet having any type of contact with a dead bird, including eating it, will develop West Nile virus.

LINKS

Below are various interesting links pertaining to the West Nile Virus for further study or general information.

AMCA - The American Mosquito Control Association's website on the West Nile Virus.
CDC - Centers for Disease Control and Prevention's website on the West Nile Virus.
MEDLINEplus's website on the West Nile Virus.
www.westnilefever.com

See also Internet Publications

Works Cited.

Included below, are the core websites I received my information from for the production of this website. Wherever possible in the text of this website, I listed the specific source I received the data/information from.

Current Status of West Nile Page. APHIS -- Animal and Plant Health Inspection Service.

10 April 2003 <http://www.aphis.usda.gov/lpa/issues/wnv/wnv.html>.

West Nile Virus Homepage. CDC -- Centers for Disease control and Prevention.

2 April 2003 <http://www.cdc.gov/ncidod/dvbid/westnile/>.

West Nile Virus Page. MEDLINEplus

8 April 2003 <http://www.nlm.nih.gov/medlineplus/westnilevirus.html>.

West Nile Virus Project Page. USGS -- National Wildlife Health Center.

19 February 2003. <http://www.nwhc.usgs.gov/research/west_nile/west_nile.html>.