

# Mosquito Borne Disease in Michigan

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### Abstract

The impact of mosquitoes on the spread and distribution of disease throughout the world and Michigan is a problem that has been causing epidemics for literally centuries. Of the diseases spread by mosquitoes, the four most common in Michigan are: malaria, encephalitis, heartworm, and the West Nile virus. Mosquitoes bite their victim and allow parasites a means for entering the mammalian body. Through continued efforts by the Center for Disease Control and Prevention, contributing mosquito control facilities, and the Michigan Department of Agriculture, mosquito borne diseases have been drastically reduced in the past years.

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“...With tears and toiling breath, I find thy cunning seeds, O million-murdering death.”

This quote is one from Ronald Ross, a man who studied the mosquito species for many years and their impact of the spread of disease (Ross and the Discovery..., 2004). In Michigan there are about 60 different species of mosquitoes (Michigan Mosquito Manual, 2002). Many breed and feed in very different areas. No matter where you live in Michigan, you are at risk of contracting a deadly, mosquito borne disease. This paper will describe the mosquito, the common diseases it has been known to spread, the symptoms of each disease, as well as, the most common species to contract a certain mosquito borne disease, such as malaria, encephalitis, heart worm, and the West Nile virus.

Mosquitoes are known of as a pest in Michigan. They often breed in low lying areas where water stays stagnant for long periods of time, such as storm drains, ditches, old tires, and swamps (Michigan Mosquito Manual, 2002). Mosquitoes spread disease to humans by biting an infected host, such as a bird or squirrel, and then biting a person. By biting a human, they inadvertently inject the disease directly into our blood stream, or the blood stream of any other animal. Normally, a bite from a mosquito would only issue a slight irritation of the skin, some itching, and possibly a little discomfort, but when a mosquito contracts a disease from another animal, it has the power to start an epidemic of deaths. Since mosquitoes breed on such enormous scales, in just about every aquatic environment, they are impossible to eradicate. But with measures taken in the last 30 years to reduce the numbers of mosquitoes, numbers of disease infections have dropped drastically (Michigan Mosquito Manual, 2002).

The first disease that was identified as being a mosquito borne is malaria, which happens to be one of the most ancient diseases. This disease was prevalent as early as 2700 BCE and continued to cause drastic numbers of deaths for many years (History of Malaria, 2004). According to the *Michigan Mosquito Manual*, malaria infected over 600,000 people in the early 1900's. The manual also states that each year in the United States, there are a continuous report of hundreds of thousands of malaria cases. Although this may still seem like a large number, a much more vast amount of people in the United States would be effected if it were not for the improvements in water management, such was ditches, mosquito control, and case management.

Malaria is a disease which is injected into humans by mosquitoes. This disease often causes such symptoms as: nausea, fever, chills, sweats, as well as both head and body aches. Severity of cases can go from a mild 6-10 hour illness to a severely life-threatening disease (Malaria: Disease, 2009). The *Michigan Mosquito Manual* states that there are two different forms of the malarial disease: one which causes a fever to arise every other days, and one in which a fever develops every third day. Efforts taken by the Center for Disease Control have greatly minimized the frequency of both mild and severe malaria, but without continued efforts, this disease could easily multiply into another world epidemic (History of Malaria, 2004).

Another devastating mosquito borne disease is known as encephalitis. This disease consists in 4 major forms in Michigan: California encephalitis (CE), St. Louis encephalitis (SLE), Eastern Equine encephalitis, and LaCrosse encephalitis. Differences in these disease forms are quite vast in severity (Michigan Mosquito Manual, 2002).

For instance, the most severe of all these forms is the Eastern Equine encephalitis. Although this is not the most common of the four forms, this disease is the most destructive to

the neurological system. EEE affects the cerebrospinal fluid, as well as the nervous system and everything connected between the two. It often causes neurological disorders, mental retardation, facial edema, behavioral discrepancies, paralysis, and even death (Michigan Mosquito Manual, 2002). The most common mosquito vector for this disease is known as *Coquillettidia perturban* and exists primarily in cattails (Michigan Mosquito Manual, 2002).

While Eastern Equine encephalitis is the most destructive, California encephalitis is the least. According to the *Michigan Mosquito Manual*, CE so relatively mild in severity that it's likely that most cases go undiagnosed and unreported. This disease was reported to be in Michigan as early as 1963, but it wasn't until 1968 when the first human case revealed itself. According to the *Michigan Mosquito Manual*, the mosquito vector for this disease is known as *Coquillettidia perturban*.

Like the California encephalitis, the St. Louis encephalitis is less destructive than the EEE. The St. Louis encephalitis disease was the most common between the years of 1975 and 1984. In those 9 years, the SLE made up for 72 percent of all cases of encephalitis. But with the assistance of the Center for Disease Control, and supporting mosquito control facilities, there has not been a case of CE in Michigan since 1982 (Michigan Mosquito Manual, 2002). The known mosquito vector for this disease is the *Culex pipien*.

The last of the four most common forms of encephalitis is Michigan is LaCrosse encephalitis disease. The frequency of this disease has actually increased in the recent years. LaCrosse encephalitis, in many years, accounts for more cases than the Eastern Equine encephalitis disease, and the St. Louis encephalitis disease combined. According to the *Michigan Mosquito Manual*,

“The first reported case in Michigan was a four-month-old boy in St. Johns, Clinton County, who became ill during the summer of 1968...Lacrosse encephalitis is primarily a disease of children under the age of 15.”

The most common mosquito species to infect a person with LaCrosse encephalitis is known as *Ochlerotatus triseriatus*, and found mostly in tree holes containing organic debris and water for long periods of time (Michigan Mosquito Manual, 2002).

*Dirofilaria immitis* is a disease referred to as Heartworm, and has become a problem in the most recent years of Michigan (Michigan Mosquito Manual, 2002). This disease has a tendency to effect dogs, cats, horses, and on rare occasions, people. When a mosquito becomes infected with the heartworm disease and bites a dog, for instance, there is an incubation period of about five to six months where no symptoms would arise. As the worm grows, it attaches itself to the right side of the pulmonary arteries and begins to release microfilariae, which is the form of heartworm that is actually destructive to its host (Michigan Mosquito Manual, 2002).

According to *What is Heartworm?*, microfilariae cannot mature into adult heartworms without first passing through a mosquito. Thus, making the mosquito a primary factor in the spread of this disease that has reportedly been found in all 50 states. Heartworm can cause infected mammals to express signs of persistent cough, fatigue, reduced appetite, and weight loss (*What is Heartworm?*, 2007). According to the *Michigan Mosquito Manual*, over one-quarter of the mosquito species in Michigan are capable over delivering the heartworm parasite to mammals, ultimately causing disease.

Lastly, in the most recent years, the public has been surprisingly aware of a disease known as West Nile virus. This is also a mosquito borne disease that has many symptoms similar

to that of encephalitis. According to the *Michigan Mosquito Manual*, the West Nile virus was first detected in Michigan in avian hosts during 2001. In 2003, the first human case of West Nile was discovered towards the later part of September (History of West Nile Virus, 2007). Since then 1999, evidence of West Nile has been found in 47 states from coast to coast (History of West Nile Virus, 2007). It appeared, that with this newly found West Nile virus, that we were on the verge of another mosquito spread epidemic. But through solid disease prevention and pest elimination efforts, the West Nile virus has quieted large measures since 2007 (History of West Nile Virus, 2007).

Symptoms of the West Nile virus includes various severity levels of fever, both head and body aches, swollen lymph glands, mild rashes, and even death to some people. Although, certain cases have been known to express no symptoms of the disease at all. Measurements for the frequency of this disease in an area is done by testing dead blue jays and crows (Michigan Mosquito Manual, 2002). The more infected birds in a square mile can indicate an accurate estimate to the risk level for human infection (History of West Nile Virus, 2007). The most common mosquito responsible for carrying the West Nile virus is known as the *Culex* species, although the *Coquillettidia perturbans* have also been known to carry the virus (History of West Nile Virus, 2007).

### Conclusion

The four diseases I have previously identified are all infectious diseases that need to remain in control for mammals in Michigan to live healthy lives. Without the efforts put forth by agencies like the Center for Disease Control and Prevention, county mosquito control facilities, and the informing efforts of the Michigan Department of Agriculture, diseases like malaria,

encephalitis, heart worm, and the West Nile virus would likely form centuries of mosquito borne epidemics. By controlling the levels of mosquito populations in an area, we have the abilities to protect ourselves, as well as, other mammals from being infected by such devastating illnesses. Through this paper you have heard about the four most common mosquito borne diseases in Michigan, the symptoms of each disease, and which species of mosquito, if left unmanaged, is most likely to pass one of those diseases on to you, your pet, or your family.

## Work Cited

- History of Malaria, an Ancient Disease. (2004). In *Department of Health and Services Center for Disease Control and Prevention*. Retrieved July 28, 2009, from <http://www.cdc.gov/malaria/history/index.htm>
- History of West Nile Virus. (2007). In *Emerging Disease Issues: Diseases that may affect humans or animals*. Retrieved July 28, 2009, from <http://www.michigan.gov/emergingdisease/0,1607,7-186-25805-75265--,00.html>
- Malaria: Disease.(2009). In *Department of Health and Services Center for Disease Control and Prevention*. Retrieved September 25, 2009, from <http://www.cdc.gov/malaria/disease.htm>
- Michigan Department of Agriculture and the Michigan Mosquito Control Association. (2002, September). *Michigan Mosquito Manual*.
- Ross and the Discovery that Mosquitoes Transmit Malaria Parasites. (2004). In *Department of Health and Services Center for Disease Control and Prevention*. Retrieved July 28, 2009, from <http://www.cdc.gov/malaria/history/ross.htm>
- What is Heartworm Disease?, (2009). In *American Heartworm Society*. Retrieved July 28, 2009, from [http://www.heartwormsociety.org/article\\_1141.html](http://www.heartwormsociety.org/article_1141.html)