

Epidemiology Update

Vector-borne Disease: Tick and Mosquito-Transmitted Diseases

Vector-borne Diseases in Hennepin County Key Findings

- ◆ Lyme disease is the most common tick-transmitted disease reported in Hennepin County residents, followed by human anaplasmosis and babesiosis.
- ◆ Lyme disease case counts in Hennepin County residents peaked in 2004 with 152 cases (128 cases reported in 2006).
- ◆ The majority of Hennepin County residents infected with tick-borne disease reported exposures in tick endemic regions of east central Minnesota and western Wisconsin.
- ◆ West Nile virus is the most common mosquito-transmitted disease reported in Hennepin County residents (4 cases reported in 2006).
- ◆ Personal protective measures, such as using insect repellent, wearing long-sleeved shirts and long pants while outdoors, and avoiding tick and mosquito habitat, reduce the risk of vector-borne diseases.

Introduction

This *Epidemiology Update* summarizes vector-borne disease cases and trends in Hennepin County. This issue is one in a series of reports available from Hennepin County Human Services and Public Health Department – Epidemiology.

Background

Most tick-borne diseases in Minnesota are transmitted by the deer tick (*Ixodes scapularis*, also called the black-legged tick). Common tick-borne diseases found in Minnesota include Lyme disease, human anaplasmosis (formerly human granulocytic ehrlichiosis), and babesiosis. Infrequent cases of Rocky Mountain spotted fever (RMSF) have been reported in southern parts of the state; this disease is transmitted by the bite of the common wood tick (*Dermacentor variabilis*).¹

Mosquito-transmitted diseases are also a public health concern in Minnesota. The most common mosquito-borne disease affecting Hennepin County residents and Minnesotans is West Nile virus (WNV), which in Minnesota is primarily transmitted by the bite of an infected *Culex tarsalis* mosquito. Each year a few cases of LaCrosse Encephalitis (LAC), another mosquito-transmitted virus, are reported in southern parts of Minnesota where the greatest concentrations of the LaCrosse Encephalitis mosquito vector (*Ochlerotatus triseriatus* or Eastern Tree Hole mosquito) are found.² Western equine encephalitis (WEE), Eastern equine encephalitis (EEE), and St. Louis encephalitis (SLE) are rarely reported in Minnesota residents. While the risk of local transmission of malaria (*Plasmodium* spp.) in Minnesota is extremely low, healthcare providers may see cases in travelers who recently visited countries where malaria is endemic.

Hennepin County Vector-borne Disease Trends

Tick-Transmitted Diseases

Hennepin County is not considered one of Minnesota's high risk counties for exposure to tick-borne diseases; however, the county is located near areas considered to be high risk, such as Anoka County, Washington County, and parts of Sherburne and Ramsey Counties (**Figure 1**). The majority of Hennepin County cases of tick-borne disease reported exposures in tick endemic regions of east-central Minnesota, the Saint Croix and Mississippi River valleys of eastern and southeastern Minnesota, or western Wisconsin.³ Recent research conducted by the Minnesota Department of Health (MDH) has suggested that the area for high risk exposures to tick-borne diseases has expanded, demonstrating a northward and westward expansion of disease risk.⁴

The high-risk season for tick-borne diseases occurs mid-May through mid-July. Because they are so small, deer ticks often feed undetected long enough to transmit disease. In order for an infected tick to pass disease to a human, it must be attached for 24 to 48 hours. The chance of disease transmission increases the longer an infected tick is attached.

Hennepin County is not endemic for tick-transmitted diseases; therefore, healthcare providers may not suspect them. A physical examination, thorough travel history, history of tick exposure, and appropriate laboratory tests should be considered if a patient develops the following symptoms:

- Distinctive bull's eye rash
- Chills
- Muscle pains
- Fatigue
- Fever
- Headache
- Joint pains

Table 1. Tick-Transmitted Disease Cases, Minnesota and Hennepin County, 2000-2006

Tick-Transmitted Disease	MN Cases	Hennepin Co. Resident Cases	Cases Reporting Exposures in Hennepin Co.
Babesiosis	51	7	0
Human Anaplasmosis	899	95	0
Lyme Disease	5125	718	3

Lyme Disease

As shown in **Table 1**, 5125 cases of Lyme disease (*Borrelia burgdorferi*, a bacterium) were reported for the state between 2000 and 2006. Hennepin County cases accounted for 14% of all Minnesota Lyme disease cases. Only 3 of these cases (0.1%) reported Hennepin County as the area for their primary exposure to deer ticks or deer tick habitat. Most cases reported primary exposures in historically endemic areas, such as Crow Wing, Cass, and Pine Counties, and Wisconsin (Figure 1). ***It is important for Hennepin County residents to remember to use tick prevention measures when recreating in endemic areas.***

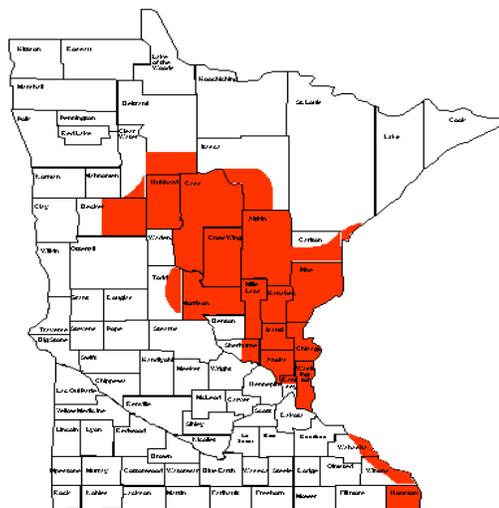


Figure 1. Lyme disease in Minnesota: Areas of Highest Risk¹

Hennepin County Lyme disease cases, shown in **Table 2**, peaked in 2004 with 152 cases. One hundred twenty-seven cases were reported in 2006; a 16% decrease from the peak number of cases in 2004, but still 23% greater than the median number of cases reported between 2000 and 2005 (median, 98 cases, range 68 to 152).

Table 2. Lyme Disease Cases, Minnesota and Hennepin County, 2000-2006

Year	MN Cases	Hennepin Co. Cases
2000	465	68
2001	463	70
2002	866	118
2003	475	66
2004	1023	152
2005	918	116
2006	914	127

Human Anaplasmosis

Cases of human anaplasmosis (*Anaplasma phagocytophilum*, a bacterium) have been increasing in Minnesota and Hennepin County since 2000, with the highest number of cases reported in 2005. Hennepin County reported 95 cases during 2000-2006 (6 to 23 cases per year; 23 cases in 2005, 19 cases in 2006). None of the Hennepin County resident cases reported deer tick or tick habitat exposures in Hennepin County. The distribution of exposures is similar to that of Lyme disease (Figure 1), with the majority of human anaplasmosis cases reporting exposures in Aitkin, Cass, Crow Wing, and Pine Counties, and in Wisconsin.

Babesiosis

As shown in **Table 1**, seven cases of babesiosis (*Babesia microti*, a protozoan) were reported in Hennepin County residents between 2000 and 2006. Once again, none of the Hennepin County resident cases reported exposures to deer ticks or deer tick habitat in Hennepin County. The areas of highest risk for babesiosis are similar to those for Lyme disease and human anaplasmosis (Figure 1). Approximately 20% of patients diagnosed with babesiosis are also co-infected with Lyme disease from the same deer tick bite. Disease may be self-limiting; however some cases are severe, especially in immuno-compromised, splenectomized, or elderly patients.

Mosquito-Transmitted Diseases

West Nile Virus

While many WNV exposures occur in Western or Central MN, surveillance data has shown that the virus is established throughout Minnesota. Human exposure risk to mosquito-transmitted disease is greatest from mid-July through early September.

Only a very small percentage of mosquitoes are infected with WNV. Most people bitten by a mosquito infected with WNV are asymptomatic or have mild flu-like symptoms; thus many WNV cases are unreported. Approximately 20% of those infected will develop West Nile fever (fever usually greater than 102°F, severe headache, nausea/vomiting, fatigue, joint/muscle pain).⁵ Less than 1% of cases bitten by an infected mosquito will develop West Nile encephalitis. West Nile encephalitis involves severe neurological symptoms consistent with encephalitis or meningitis. Approximately 10% of West Nile encephalitis cases are fatal; most severe cases occur in elderly persons. West Nile encephalitis may last several weeks and the neurological sequelae may be permanent.

Table 3. Mosquito-Transmitted Disease Cases, Minnesota and Hennepin County, 2002-2006

Year	West Nile Virus		LAC	
	MN Cases	Hennepin Co. Cases	MN Cases	Hennepin Co. Cases
2002	48	4	13	5
2003	148	11	3	0
2004	34	0	2	0
2005	45	2	2	0
2006	65	4	1	0

WNV cases in Minnesota and Hennepin County are shown in **Table 3** (WNV was first discovered in MN in 2002). In 2002, all four of the Hennepin County cases had West Nile fever; in 2003 three cases had West Nile fever, while the other eight cases had West Nile encephalitis. Although there were no cases of West Nile fever reported in Hennepin County in 2005, there were two cases of West Nile encephalitis, with one of these being fatal. In 2006, one Hennepin resident case reported West Nile fever, two cases had West Nile meningitis, and there was one fatal case of West Nile encephalitis. Overall, 3% of WNV cases reported mosquito exposures in Hennepin County. Hennepin County resident cases make up 6% of total Minnesota WNV cases.

LaCrosse Encephalitis

LaCrosse encephalitis is endemic in southeastern Minnesota (along the Mississippi River valley and from the Iowa border north through the western Twin Cities metro area); however field studies conducted by the MDH have shown that the LAC exposure area is extending westward, now including Brown and Faribault counties.⁴ In Hennepin County, there is an increased risk for exposure to mosquitoes infected with LAC in the Lake Minnetonka area.

The LAC vector (Eastern Tree Hole mosquito), feeds during the day and is found in wooded or shaded areas, usually not flying more than 200 yards from where it was produced. This type of mosquito reproduces in water-holding trees and other containers that catch rainwater; therefore to prevent exposure to mosquitoes potentially infected with LAC, it is important to eliminate mosquito breeding sites around your home by regularly emptying bird baths, buckets, cans, etc.

Most people infected with LAC are asymptomatic or develop flu-like symptoms (headache, fever, nausea, lethargy). A small percentage of those infected, usually children, can develop encephalitis. Approximately 1-3% of these encephalitis cases are fatal and 15% of encephalitis cases have long-term nervous system complications. Each year, Minnesota reports one to thirteen cases of LAC (Table 3); median case age of six years. No cases in Hennepin County have been reported since 2002. Despite the few cases reported in Hennepin County, Hennepin residents should take preventative measure to avoid mosquito bites and remove mosquito breeding sites around their homes.

Resources

Minnesota Department of Health:
www.health.state.mn.us, then search for "tick-transmitted disease" and "mosquito-transmitted disease"

Centers for Disease Control and Prevention (CDC),
Division of Vector-borne Disease:
<http://www.cdc.gov/ncidod/dvbid/>
Mosquito Prevention:
http://www.cdc.gov/ncidod/dvbid/westnile/prevention_info.htm

Metropolitan Mosquito Control District:
www.mmcd.org

Preventing Tick-Transmitted Disease

- ◆ Avoid activities in deer tick habitat (wooded, brushy areas)
- ◆ Use insect repellents containing DEET or Permethrin when outdoors in tick habitat for extended periods of time
- ◆ Wear long-sleeved shirts and long pants when outdoors (ticks may be easier to notice when wearing light colored clothing)
- ◆ Check for ticks after outdoor activities (behind the ears, hairline, behind the knees, etc.)
- ◆ If you find a tick, remove it promptly using a pair of tweezers

Preventing Mosquito-Transmitted Disease

- ◆ Avoid outdoor activities during peak mosquito feeding times (dawn and dusk)
- ◆ Use insect repellents containing DEET (up to 30% for adults and 10% for children)
- ◆ Wear long-sleeved shirts and long pants when outdoors
- ◆ Eliminate mosquito breeding sites around your home (empty water-holding containers such as buckets, tires, etc.)

References

- 1 MDH. Tick-Transmitted Diseases. Accessed on April 12, 2007 at: <http://www.health.state.mn.us/divs/idepc/dtopics/tickborne/diseases.html>
- 2 MDH. Mosquito-Transmitted Diseases. Accessed on April 12, 2007 at: <http://www.health.state.mn.us/divs/idepc/dtopics/mosquitoborne/index.html>
- 3 MDH. Disease Control Newsletter. May/June 2005;33(3).
- 4 MDH. Disease Control Newsletter. March/April 2006;34(2).
- 5 CDC. Division of Vector-Borne Infectious Diseases. West Nile Virus. Accessed on April 12, 2007 at: <http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>

For more information about this report call Hennepin County Human Services and Public Health Department – Epidemiology, 612-543-5230.

For more documents please visit our website at:
<http://www.co.hennepin.mn.us/>