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1. Summary of reported invasive Haemophilus influenzae disease and serotype distribution, Wisconsin, 2002-2011

Haemophilus influenzae is a Gram-negative coccobacillus with the potential to cause serious invasive bacterial infections. This bacterium is exclusively a human pathogen, generally recovered from the upper respiratory tract and, rarely, from the genital tract. Transmission of *H. influenzae* occurs via direct contact with nasal and throat secretions. The incubation period is unknown, but probably short (2-4 days). National data suggest that *H. influenzae* infections have a bimodal seasonal pattern, with peak incidences occurring from March through May and from September to December.

*Haemophilus influenzae* is classified into serotypes based on its polysaccharide capsule. Encapsulated strains include serotypes a through f, and unencapsulated strains are referred to as “non-typeable.” Invasive disease caused by *H. influenzae* (all serotypes) occurs when the bacterium infects a normally sterile site (e.g., blood, cerebrospinal fluid [CSF], pleural, pericardial or joint fluids). While nasopharyngeal carriage of serotype b strains is uncommon (<1% in vaccinated populations and 2-4% in unvaccinated populations), colonization without illness by non-typeable strains is more prevalent (30-80%).

*Haemophilus influenzae* serotype b (Hib) is the most pathogenic strain. Before Hib vaccines were available, Hib was the leading cause of meningitis and sepsis among children aged less than 5 years. Hib infection is generally associated with meningitis, occult febrile bacteremia, pneumonia, epiglottitis, septic arthritis, and also with less serious infections, such as otitis media and conjunctivitis. The introduction of the Hib conjugate vaccine as a routinely administered childhood vaccine in developed countries has led to a greater than 95% decline in the incidence of invasive Hib disease. Figure 1 below shows the reported number of laboratory-confirmed cases of invasive Hib in Wisconsin since 1986.
Because Hib vaccines provide no protection against other serotypes, the occurrence of invasive diseases caused by types a, c-f, and non-typeable strains has not decreased. Non-b encapsulated strains and non-typeable unencapsulated strains can cause invasive diseases similar to those caused by Hib, but generally occur among the elderly or adults with underlying medical conditions. Nationally, the incidence of disease caused by non-b and non-typeable strains is highest among infants aged less than 1 year and decreases with increasing age, but a substantial increase occurs after age 50 years.6-7

In Wisconsin, invasive H. influenzae disease became reportable in 2001. During 2002-2011, the mean annual incidence of Hib was highest among infants aged less than 1 year (0.9 per 100,000: 6 cases). The mean annual reported incidence of invasive diseases caused by non-b and non-typeable serotypes was 5.5 cases per 100,000 among infants aged less than 1 year and dipped to less than 1 case per 100,000 among persons aged 5 to 49 years (Figure 2). The reported incidence continued to increase with increasing age among adults aged greater than 50 years.

![Figure 2. Mean annual reported incidence of invasive Haemophilus influenzae disease by age group and serotype, Wisconsin, 2002-2011 (n=661).](chart)

In Wisconsin, during 2002-2011, 83 cases of Haemophilus influenzae invasive disease were reported among children aged less than 5 years (Figure 3). There were 10 cases of Hib invasive disease among children in this age group. Only two of the 10 children with Hib invasive disease had received the Hib vaccine. Both children were up-to-date on their Hib series; the 3-month-old patient had received one dose of the Hib vaccine, and the 5-month-old had received 2 doses. The majority of H. influenzae invasive disease was caused by non-typeable (37 [45%] cases) and non-b strains (28 [34%] cases). The non-b serotypes causing invasive disease included: serotype f (11 cases), serotype a (9), serotype e (6), serotype c (1), and serotype d (1).

![Figure 3. Reported cases of laboratory-confirmed invasive Haemophilus influenzae disease by serotype, children aged < 5 years, Wisconsin, 2002-2011 (n=83).](chart)
Among 83 children aged < 5 years with invasive disease, sites of isolation of *H. influenzae* included blood, 62 (75%) patients; cerebrospinal fluid (CSF), 13 (16%) patients; blood and CSF, 4 (5%) patients; and 4 (5%) other sites (peritoneal fluid, joint fluid, brain and lung tissue: 1 patient each). Ten (12%) of the patients died, including 3 children with Hib invasive disease.

In Wisconsin, during 2002-2011, 453 cases of *H. influenzae* invasive disease were reported among persons aged ≥ 50 years (Figure 4). There were 11 cases of Hib invasive disease within this age group. The majority of *H. influenzae* invasive disease among persons aged ≥ 50 years was caused by non-typeable (243 [54%] cases) and non-b strains (137 [30%] cases). The non-b serotypes causing invasive disease included: serotype f (76 cases), serotype e (29), serotype a (13), serotype c (11), and serotype d (8).

**Figure 4. Reported cases of laboratory-confirmed invasive *Haemophilus influenzae* disease by serotype, adults aged ≥ 50 years, Wisconsin, 2002-2011 (n=453).**

![Figure 4](image_url)

During 2002-2011, among 453 persons aged ≥ 50 years with invasive disease, sites of isolation of *H. influenzae* included blood, 431 (95%) patients; cerebrospinal fluid (CSF), 11 (2%) patients; blood and CSF, 4 (1%) patients; and 7 (2%) other sites (vitreous fluid, peritoneal fluid, and joint fluid: 2 patients each, and bone tissue: 1 patient). Forty-one (9%) of the patients died, and the survival status of 73 patients was not reported. Of the 73 patients whose survival status was unknown, the serotypes of *H. influenzae* causing illness in 7 patients were also unknown. No deaths were reported among the 11 patients aged ≥ 50 years with Hib invasive disease.

Since the Hib conjugate vaccine was introduced as part of routine childhood immunizations nationally, the incidence of Hib disease has declined over 95%. However, because Hib vaccines do not protect against non-b serotypes and non-typeable strains, non-b *H. influenzae* invasive disease remains a burden, particularly among the older population and children aged less than 1 year.

***Please note:** For the management of confirmed or suspected cases of invasive *Haemophilus influenzae*, please refer to the protocol available in the Provider Resources section of the CDES website: [http://www.dhs.wisconsin.gov/communicable/resources/HaemInflu/HfluProtocol.pdf](http://www.dhs.wisconsin.gov/communicable/resources/HaemInflu/HfluProtocol.pdf).

References:
2. Are you ready for the 2012 vector-borne disease season?

The 2012 vector-borne disease season has already begun. The mild Wisconsin winter may result in expanded tick and mosquito populations, which can increase the spread of vector-borne diseases.

The Wisconsin Division of Public Health (WDPH) coordinates statewide human case surveillance for arboviral and tickborne infections. Arboviruses that can be transmitted by mosquitoes in Wisconsin include California serogroup viruses (California encephalitis [CAV], La Crosse encephalitis virus [LACV], and Jamestown Canyon virus [JCV]), Eastern equine encephalitis virus (EEEV), St. Louis encephalitis virus (SLEV), Western equine encephalitis virus (WEEV), and West Nile virus (WNV). Powassan virus (POWV) is the only known arbovirus in Wisconsin transmitted by ticks. It is a Flavivirus transmitted in Wisconsin by the Ixodes species I. scapularis, commonly known as “blacklegged” or “deer” ticks. This is the same tick that transmits the bacterial agents that cause Lyme disease, anaplasmosis, ehrlichiosis, and babesiosis.

The zoonotic transmission cycle of each arbovirus includes a wildlife host (avian or mammalian) and an arthropod vector. There is considerable annual variation in reported disease incidence. Some of the arboviruses (WNV, EEEV) are carried by infected migratory birds that transmit the viruses to mosquitoes feeding on avian blood. Humans are exposed when an infected mosquito bites them. Each arbovirus can cause aseptic meningitis or encephalitis and serious infections can include focal paralysis, seizures, coma and death. However, the majority of persons infected are either asymptomatic or experience non-specific constitutional symptoms such as a fever and headache.

We encourage clinicians to consider a broader range of pathogens when patients present with clinical signs and symptoms consistent with arboviral or tickborne illnesses. This should include use of arboviral or tickborne disease diagnostic panel testing to rule in or rule out related diseases, determine treatment plans and respond to patient questions and concerns. A systematic approach to diagnostic panel testing may assist in the detection of co-infections, an emerging concern in Wisconsin. To prepare for the 2012 vector-borne disease season, we encourage clinicians to check with their clinical laboratory regarding how to request arboviral or tickborne disease panel testing.

Arboviral Diseases

During 2011, the WDPH adopted an active, enhanced surveillance approach to improve the identification of arboviral diseases in Wisconsin. All arboviral IgG or IgM antibody positive reports were investigated to determine onset of illness and clinical signs and symptoms. All samples from patients with compatible clinical symptoms were requested for additional testing at the WSLH, to determine whether illness may have been caused by another arbovirus known to occur in Wisconsin. Because different arboviral diseases cause similar signs and symptoms, and they all typically occur during the warm weather months, it is important to consider the possibility of infection caused by any of the arboviruses when requesting diagnostic testing. In 2012, the WDPH will continue active surveillance by investigating all positive arboviral reports and performing arboviral panel tests on all positive specimens. For fee-exempt confirmatory testing, please contact the vector-borne surveillance epidemiologist for approval.

During 2011, WDPH identified 18 confirmed and probable cases of arboviral disease among Wisconsin residents, including 3 WNV, 8 LACV/CAV, 2 JCV, 1 EEEV, and 4 POWV infections (Figure 1). Arboviral disease is reported from all regions in Wisconsin (Figure 2).
The first reported West Nile virus infections among Wisconsin residents occurred in 2002, and WNV is now considered endemic in the state. Cumulative data demonstrates Culex species are the main vector for WNV transmission. Symptoms of illness usually occur 3 to 14 days after a bite from an infected mosquito. Approximately 80% of people infected by WNV never experience symptoms. Most of the remaining 20% will experience relatively mild illness, with symptoms such as fever, headache, muscle pains, a skin rash, swollen lymph nodes, and photophobia. Less than one percent (approximately 0.7%) of those infected with WNV become seriously ill. Severe symptoms include sudden onset of a high fever, neck stiffness, extreme muscle weakness, tremors, convulsions, and disorientation. During 2011, the three WNV case-patients with encephalitis/meningoencephalitis syndromes had illness onsets during August -September. Their age range was 44-65 years.

People infected with the CA serogroup viruses (LACV and JCV) may have no apparent symptoms. Those with symptoms generally have illness onsets 5 to 15 days after the bite of an infected mosquito. Initial symptoms may include fever, headache, nausea, vomiting, and tiredness. Patients with illnesses progressing to encephalitis or meningitis may experience seizures, coma, and paralysis.
LACV, the most common CA serogroup virus, was first isolated in 1963 from a child in La Crosse, Wisconsin. LACV infections occur in the Midwestern, mid-Atlantic, and southeastern states. LACV is carried by several of the Ochlerotatus (tree hole) mosquito species native to Wisconsin and the virus is transovarially transmitted and maintained during the winter in mosquito eggs. During 2011, the eight LACV/CAV case-patients had illness onsets during May through October. Patient ages ranged from 5 to 84 years (median= 27yrs). While most reported cases of LACV disease historically have occurred in children aged <16 years, during 2011, 50% of Wisconsin residents with reported LACV disease were aged >44 years old.

JCV was first noted to cause human illness in 1980 and is found throughout temperate regions of North America. JCV infections have been rarely reported in Wisconsin, but because of the non-availability of a commercial test to detect JCV, the infection may be unrecognized and under-reported. During 2011, the 2 case-patients (ages 54 and 59 years) with reported JCV disease had illness onsets during April and June. One patient had a dual infection with Powassan virus. Three of 53 archived mosquito (A. punctipennis) pools collected in Milwaukee County and tested by the UW-Madison, Department of Entomology, were positive for JCV, demonstrating that we have a vector in Wisconsin capable of transmitting JCV.

EEEV is transmitted by Culiseta and Aedes mosquito species and infects birds, horses, and humans. Most people infected with EEEV do not become ill. Symptoms of illness generally occur 4 to 10 days after a bite of an infected mosquito; illness can range from mild fever and headache to coma. Other symptoms include high fever, fatigue, muscle aches, neck stiffness, tremors, or confusion. Severe neurologic EEEV disease, including encephalitis, has a 33% case fatality rate. Human EEEV infection in Wisconsin is rare. Before 2011, only one case had been reported in 1984. However during 2011, a second case occurred in an adult patient with illness onset in October. The patient’s illness included fever, chills, headache, muscle aches, stiff neck, nausea and vomiting, disorientation, confusion, memory deficit, and meningoencephalitis syndrome. The patient died several months after illness onset.

Powassan virus is a rare and emerging tickborne arboviral infection in Wisconsin. The initial case detected in a Wisconsin resident was reported in 2003 and 11 cases of POWV disease were reported to the WDPH during 2003-2011. The transmission cycle for POWV includes mammalian hosts (e.g., white-footed mice, woodchucks, and skunks) and several tick species (Ixodes spp., Dermacentor andersoni) as vectors. In Wisconsin, the likely POWV vector is Ixodes scapularis. During 2011, the four Wisconsin residents with POWV disease had illness onsets during May and June. Patient ages ranged from 2 to 66 years. None of the four patients reported travel outside of their county of residence during the 30 days prior to illness onset. One case-patient had a dual infection with JCV.

Non-arboviral tickborne diseases
Statewide tickborne disease surveillance case numbers for 2011 are preliminary. Following review of reports received by the WDPH during 2011 and application of case definitions, the following data include confirmed and probable cases: 3,313 cases of Lyme disease, 682 cases of anaplasmosis, 17 cases of ehrlichiosis (including 10 cases of ehrlichiosis caused by a newly recognized Ehrlichia muris-like species first identified in Wisconsin and Minnesota in 2009), and 80 cases of babesiosis.

Lyme disease is by far the most frequently reported tickborne illness in Wisconsin. Lyme disease is caused by the bacterium, Borrelia burgdorferi. Signs and symptoms of Lyme disease typically occur 3 to 30 days after a bite of an infected tick. The illness often begins as a roughly, circular, reddish rash (called erythema migrans or EM rash) around or near the site of the tick bite. Multiple skin lesions may appear. The rash typically expands in size during a period of days or weeks, and may have a bull's eye appearance. During the EM rash stage, other signs
and symptoms such as fever, headache, fatigue, stiff neck, muscle or joint pain and swelling may occur and can last for several weeks. Complications of untreated Lyme disease include meningitis, facial palsy, heart abnormalities, and arthritis and typically occur within a few weeks to months after initial onset of symptoms.

The reported occurrences of anaplasmosis and ehrlichiosis are rapidly increasing. Anaplasmosis is an illness caused by the bacterium *Anaplasma phagocytophilum*, and was previously known as human granulocytic ehrlichiosis (HGE). Illness occurs within 1-3 weeks after the bite of an infected tick. Anaplasmosis is the second most frequently reported tickborne disease in Wisconsin. Ehrlichiosis, previously known as human monocytic ehrlichiosis (HME), is an illness caused by several species of *Ehrlichia* (*E. chaffeensis, E. ewingii* and *Ehrlichia muris*-like). Symptoms of anaplasmosis and ehrlichiosis can include fever, chills, muscle pain, severe headache, and fatigue. Clinical laboratory findings may include thrombocytopenia, lymphopenia, leucopenia, and elevated hepatic transaminases. Ehrlichiosis can be more severe than anaplasmosis; illnesses may involve the central nervous system and be associated with life-threatening complications.

In Wisconsin, testing for multiple tickborne agents including *B. burgdorferi, A. phagocytophilum, Babesia*, and *Ehrlichia* may be appropriate for diagnosis, particularly because a single tick can be coinfected with multiple pathogens. Polymerase chain reaction (PCR) testing is now considered the gold standard for the detection of *Anaplasma* and *Ehrlichia* because it is more sensitive and specific than serologic assays. However, serologic tests, particularly indirect fluorescent antibody (IFA) tests, are still the most commonly used commercial tests in Wisconsin. *E. muris*-like organisms can be detected in EDTA-preserved whole blood using the multiplex PCR test; no serologic tests for this agent are currently available. PCR testing for *Anaplasma* and *Ehrlichia* is most effective when the specimens are obtained during the first week of illness. A negative PCR assay for *Anaplasma* or *Ehrlichia* should be followed up with an IFA serologic test if clinical suspicion warrants.

For vector-borne disease surveillance and testing questions, please contact the Vector-borne Surveillance Coordinator, Diep (Zip) Hoang Johnson at the Wisconsin Division of Public Health at 608-267-0249, email: diep.hoangjohnson@wisconsin.gov

Information regarding the identification, control and prevention of tickborne diseases is available on the Wisconsin Division of Public Health website: http://dhs.wisconsin.gov/communicable/TickBorne/index.htm

For WNV information in Wisconsin, please go to http://www.dhs.wisconsin.gov/communicable/westNilevirus/

References:


3. Upcoming Meetings, Trainings & Important Dates

- April 21-28, 2012 National Infant Immunization Week
- April 24, 2012 World Meningitis Day
- May 2012 Lyme Disease Awareness Month
- May 2012 Hepatitis Awareness Month
BCDER Spring Seminars 2012

Three 1-day regional seminars will be held in May.

- Tuesday, May 8 in Appleton register by 4/24/12
- Wednesday, May 9 in Eau Claire register by 4/25/12
- Friday, May 11 in Oconomowoc register by 4/27/12

The seminar is intended primarily for local, tribal, and regional public health officials who are working in communicable disease surveillance, control and prevention. Infection control professionals are also encouraged to attend. There is no fee to attend. However, pre-registration using the TRAIN program is required. More information, including presentation topics and venues, are found at http://uat.dhs.wisconsin.gov/communicable/_unlinkedfiles.xyz/SpringSems2012.htm.

Reminder: Many of our past seminars have been recorded and are accessible at the DHS media site for viewing on demand. The catalog of available webcasts is found at http://dhsmedia.wi.gov/main/Catalog/catalogs/default.aspx

Frequently requested webcasts include:

- Rabies 101: Overview of disease  Presented in August, 2009  
  http://dhsmedia.wi.gov/main/Viewer/?peid=0b6ff844119d4f869e741958bfb76026
- Rabies 201: Focus on the Laboratory  Presented in May, 2010  
  http://dhsmedia.wi.gov/main/Viewer/?peid=ea002e8c9a6442b1887b64e2476f44bb

Webcasts of vector-borne presentations are found at the catalog site http://dhsmedia.wi.gov/main/Catalog/catalogs/default.aspx and searching by “Hoang”

- Tickborne Diseases in Wisconsin  Presented in August, 2011
- Vectorborne Training: Rickettsial Diseases Ehrlichiosis and Anaplasmosis  Presented in July, 2010
- Vectorborne Training: Lyme Disease  Presented in July, 2010
- Vectorborne Training: Arboviruses  Presented in July, 2010

The slides used in the vectorborne presentations are available for download and future reference at: http://www.dhs.wisconsin.gov/communicable/resources/consumer.htm