NC DEPARTMENT OF HEALTH AND HUMAN SERVICES

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Date: 17 July 2024
To: North Carolina Clinicians
From: Erica Wilson, MD, Medical Epidemiologist
Subject: Annual Update on Diagnosis and Surveillance for Vector-borne Diseases

Introduction

In North Carolina, both endemic and travel-associated vector-borne diseases contribute to significant morbidity and mortality. In 2023, approximately 900 cases of mosquito- and tick-borne illnesses were reported throughout the state. Most locally acquired vector-borne infections occur between June and September, as warmer temperatures encourage increased outdoor activity. Over the past two years there has been an increase reported cases of dengue and local transmission of malaria in the US. Travel associated cases have increased in NC as well so we encourage clinicians to be prepared.

Actions for North Carolina Clinicians

- Report cases of vector-borne infections to your local health department as required within 7 days of a positive laboratory test, or within 24 hours for chikungunya or Zika virus infection.
- Encourage patients to be vigilant and to take preventive measures that include: recognizing and avoiding tick habitats; creating tick-safe zones in their yards; promptly checking for and removing attached ticks; showering immediately hiking, camping, and working in your yard; using CDC-recommended and EPA-registered insect repellents when outdoors; using permethrin treated clothing; and tipping/tossing any standing water in their yards that would promote mosquito development.
- Familiarize yourself with information in the reference table attached and from the CDC links provided.

Annual and quarterly surveillance data for North Carolina is available here.

Special Information Regarding Dengue and Malaria

	Dengue	Malaria
In NC	Local transmission of dengue in NC is unlikely as the primary vector (*Ae. agypti*) is not known to be present in our state. A secondary vector (*Ae. albopictus*) is ubiquitous throughout NC, but is rarely responsible for transmission.	Local transmission of malaria in NC is unlikely but possible. The mosquito vector (*Anopheles spp*.) is preset throughout our state Malaria is historically the most reported mosquito borne disease in NC. While transmission in NC was common until the 1940s, all cases in recent decades have been travel-associated.
Prevention	Provide a travel risk assessment and instruct patients on mosquito bite prevention	Provide a travel risk assessment and prophylactic regimen recommendation
Medical Managment	Familiarize yourself with the clinical features and medical management of dengue	Familiarize yourself with the clinical features and medical management of malaria
Vaccine	There are no currently available dengue vaccines in the US, so mosquito bite prevention and awareness of risk areas are essential	Existing malaria vaccines are **only** available to people living in malaria endemic areas and are not an option for travelers

North Carolina Vector-borne Disease Reference Tables

	Disease	**Signs & Symptoms** (Immunocompetent patient)	Actions/Notes for Clinicians	Testing
Tickborne Infections	**Ehrlichiosis**	- Symptom Onset: 5–14 days - Early: variable symptoms including fever, headache, malaise, myalgias, +/- GI upset, +/- rash - Can cause neurologic disease (meningitis, encephalitis, or acute flaccid myelitis)	- Endemic to NC - Report within 7 days - Many patients will not recall a tick bite - Common laboratory abnormalities: elevated hepatic transaminase levels, leukopenia, and thrombocytopenia	Quest NCSLPH PCR provides single specimen confirmation, use whole blood within 5 d of onset; serology requires acute and convalescent specimens collected 2-10 weeks apart
	Lyme disease	- Localized (>30 days): +/- Erythema migrans (EM) rash, fever, headache, fatigue, muscle/ joint aches, lymphadenopathy - Early (1–3 months): other EM rashes, joint pain/swelling, arrythmias (Lyme carditis), neurologic symptoms including meningitis - Late (> 3months): arthritis	- Endemic to western NC - Report within 7 days - Patient Communication: remain vigilant regarding tick prevention and prompt removal - Despite treatment, 5–10% of patients experience prolonged symptoms of fatigue and arthralgias	Mayo ARUP Modified Two Tier Testing is the preferred methodology
	Rocky Mountain spotted fever (RMSF)	- Symptom Onset: 3–12 days - Early (1–5 days): fever, headache, fatigue, myalgias, GI upset, photophobia, anorexia - Late (> 5 days): altered mental status, coma, acute respiratory distress syndrome, tissue necrosis and/or renal failure - Classic, petechial rash of RMSF does not typically appear until day 5 or 6 of illness, may involve the palms and soles, and is a sign of severe disease.	- Native to NC - Report within 7 days - Many patients will not recall a tick bite - Rapidly progressive disease that can be fatal (5–10% case fatality) within days without early administration of doxycycline. Every attempt should be made to treat before petechiae develop. - Risks for severe illness: treatment delay, patients aged < 10 years, G6PD deficiency	NCSLPH (form 3445) PCR provides single specimen confirmation, use whole blood within 5 d of onset; serology requires acute and convalescent specimens collected 2-10 weeks apart
	Other Spotted Fever Rickettsia	- Eschars develop ≤ 7days after bite from infected tick or mite. - Other symptoms start days after eschar forms and include fever, headache, rash (type dependent of species), myalgias, +/- fatigue	- Native to NC - Report within 7 days - Distinguishing from RMSF can be difficult during early stages of illness. Absence of an eschar should prompt suspicion of RMSF and empiric treatment with doxycycline should be initiated	NCSLPH (form 3445) PCR provides single specimen confirmation, use whole blood within 5 d of onset; serology requires acute and convalescent specimens collected 2-10 weeks apart

	Disease	Signs & Symptoms (Immunocompetent patient)	Actions/Notes for Clinicians	Testing
Mosquito-borne Infections	**Dengue**	- Symptomatic in approximately 25% of infections - Febrile (2–7 days, potentially biphasic): fever +/- headache, retro-orbital pain, myalgias, rash, minor hemorrhagic manifestations (petechia, ecchymosis, purpura, epistaxis, etc.), nausea - Critical (1–2 days after fever resolves): clinical improvement for most patients. Rapid onset of severe disease (pleural effusions, ascites, hypotension, shock, death) can develop in those with substantial plasma leakage	- Report within 7 days - With increasing global cases, NC may see higher incidence of travel-associated dengue. Providers are encouraged to keep dengue on differentials, particularly among those with recent international travel history to tropical and subtropical areas - Common laboratory findings: leukopenia, thrombocytopenia, elevated AST/ALT, normal ESR - If suspected, begin appropriate management without waiting for diagnostic test results	CDC Guidance 0-7 days after onset: NAAT and IgM Ab test OR NS1 and IgM Ab test Serum is preferred >7 days after onset IgM ELISA on serum NAAT and IgM available at NCSLPH. Use form 3445
	La Crosse encephalitis	- Symptom Onset: 5–15 days - Fever, headache, nausea/vomiting, lethargy - Can progress to encephalitis +/- symptoms (seizures, aphasia/dysarthria, paresis/paralysis, etc.), meningoencephalitis, or aseptic meningitis, but is *not* associated with acute flaccid paralysis	- Endemic to Western NC - Report within 7 days - Consider in any person with acute febrile or neurologic illness with recent exposure to mosquitoes - Most common in children aged < 16 years - Specimens collected within 8 days of illness onset may not have detectable antibodies. Consider second collection one week later.	NCSLPH IgM ELISA, serum or CSF. Use DHHS form 3445 for testing at SLPH
	West Nile virus (WNV)	- Symptom Onset: 2–14 days - 70–80% of infections are subclinical - Acute Illness: fever, headache, weakness, myalgias, arthralgias, GI symptoms, transient rash - < 1% of infected persons develop neuroinvasive disease: meningitis, encephalitis (fever, altered mental status, seizures, focal neurologic deficits, tremor), or acute flaccid myelitis (AFM)	- Native to NC -Report neuroinvasive disease & AFM within 7 days - WNV meningitis is clinically indistinguishable from viral meningitis due to other etiologies - WNV AFM is clinically and pathologically identical to poliovirus-associated poliomyelitis, and can progress to respiratory paralysis requiring mechanical ventilation - Specimens collected within 8 days of illness onset may not have detectable antibodies. Consider second collection one week later.	NCSLPH IgM ELISA, serum or CSF. Use DHHS form 3445 for testing at SLPH
	Malaria	- Symptom Onset: 1 week – 1 year - Uncomplicated infection: Fever, chills, headache, malaise, myalgias, cough, GI upset (nausea, vomiting, diarrhea) - Severe infections are complicated by organ failure, often after delays in diagnosis/treatment: seizures, severe anemia, DIC, coma, shock, death back pain, myalgia, chills, cough	- Report within 7 days - Consider in febrile persons with recent travel to endemic areas; rarely transmitted in CONUS - Within 24 hours of presentation, evaluate urgently; ensure prompt diagnosis and treatment - Treatment depends on infecting plasmodium species, potential drug resistance, patient's clinical status, and patient's prior antimalarial use	Ensure testing includes speciation