MAYO CLINIC LABORATORIES

Test Definition: WNCSF

West Nile Virus, RNA, PCR, Molecular Detection, Spinal Fluid

Overview

Useful For

Rapid testing for West Nile virus (WNV) RNA (lineage 1 and lineage 2) using cerebrospinal fluid specimens

An adjunctive test to serology for detection of early WNV infection (ie, first few days after symptom onset)

This assay **should not be used** for screening asymptomatic individuals, including blood, bone marrow, birth tissue, and solid organ donors, and should only be used to test patients with signs and symptoms of WNV disease.

Testing Algorithm

For more information see:
-Meningitis/Encephalitis Panel Algorithm
-Mosquito-borne Disease Laboratory Testing

Special Instructions

- Meningitis/Encephalitis Panel Algorithm
- Mosquito-borne Disease Laboratory Testing

Method Name

Real-Time Polymerase Chain Reaction (PCR)

NY State Available

Yes

Specimen

Specimen Type

CSF

Specimen Required

Collection Container/Tube:
Preferred: Vial number 2
Acceptable: Any vial number
Submission Container/Tube: Sterile screw cap vial
Specimen Volume: 0.5 mL
Collection Instructions: Do not centrifuge or heat inactivate.

Forms

If not ordering electronically, complete, print, and send a Microbiology Test Request (T244) with the specimen.

Specimen Minimum Volume

0.3 mL

Reject Due To

Heat-inactivated specimen	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
CSF	Refrigerated (preferred)	7 days	
	Frozen	7 days	

Clinical & Interpretive

Clinical Information

West Nile virus (WNV) is a mosquito-borne flavivirus (single-stranded RNA virus) that primarily infects birds but occasionally infects horses and humans.(1,2,3) Until the virus was recognized in 1999 in infected birds in New York City, WNV had been detected only in the Eastern hemisphere with a wide distribution in Africa, Asia, the Middle East, and Europe. There are 2 distinct lineages of WNV: lineage 1 has the broadest distribution worldwide, including North America and Europe, whereas lineage 2 is found only in Africa and parts of Europe.

Most people who are infected with WNV do not experience symptoms. It is estimated that about 20% of those who become infected will develop West Nile fever with mild symptoms, including headache, myalgia, and, occasionally, a skin rash on the trunk of the body. About 1 of 150 WNV infections (<1%) results in meningitis or encephalitis. Fatality rates among patients hospitalized during recent outbreaks have ranged from 4% to 14%. Advanced age is the most important risk factor for death, and patients older than 70 years are at particularly high risk.

Laboratory diagnosis is best achieved by demonstration of specific IgG- and IgM-class antibodies in serum specimens. However, polymerase chain reaction (PCR) testing can be used to detect WNV RNA in serum, whole blood, and urine specimens from patients with recent WNV infection (ie, 3-5 days following infection) when specific antibodies to the virus are not yet present. It may also be useful for patients who are immunocompromised when an antibody response is minimal or absent. Finally, PCR can be useful for supporting a serologic diagnosis, given the known cross-reactivity of WNV serology with other flaviviruses.

Studies indicate that whole blood testing by PCR may provide higher sensitivity when testing patients with acute WNV disease (up to 87%) compared to serum, plasma, urine, and cerebrospinal fluid testing.(4) However, viral RNA may be detected for a longer period of time (> or =10 days after symptom onset) in urine than in other sources.(5) Serum testing offers lower sensitivity (26%) but may be used when it is the only specimen type available.

Reference Values

Negative
Reference values apply to all ages.

Interpretation
A positive result indicates the presence of West Nile virus RNA and is consistent with early infection.

Cautions
The sensitivity of the assay is very dependent upon the time of illness onset in which the specimen is collected. Polymerase chain reaction testing has the greatest utility when used within the first few days of symptom onset.

A negative test does not exclude infection with West Nile virus. Therefore, the results obtained should be used in conjunction with clinical findings and serologic test results to make an accurate diagnosis.

This assay detects both viable and nonviable virus. Test performance depends on viral load in the specimen and may not correlate with cell culture performed on the same specimen.

Supportive Data
The following validation data supports the use of this assay for clinical testing.

Accuracy/Diagnostic Sensitivity and Specificity:
Accuracy studies were performed by testing negative clinical specimens with whole viral genomic RNA for lineages 1 and 2 near the limit of detection (LOD) and yielded greater than or equal to 97% sensitivity and specificity.

Analytical Sensitivity/LOD:
The lower LOD of this assay is 1 to 5 target copies/mcL of RNA extract for serum, urine, and spinal fluid, and 27 to 60 copies/mcL for EDTA whole blood.

Precision:
Inter-assay and intra-assay precisions are 100%.

Specificity:
A panel of 42 organisms that can be found in the specimen types acceptable for this assay, as well as closely-related viruses (eg, dengue types 1-4, Japanese encephalitis virus, hepatitis E virus, Murray Valley encephalitis virus, St. Louis encephalitis virus, tick-borne encephalitis virus, yellow fever virus, Zika virus) and those that can cause a similar clinical syndrome were tested by this assay. No cross-reacting positive results were noted.

Reportable Range:
This is a qualitative assay, and the results are reported as either negative or positive for targeted West Nile virus.

Clinical Reference
1. Petersen LR, Brault AC, Nasci RS. West Nile virus: review of the literature. JAMA. 2013;310(3):308-315
2. Colpitts TM, Conway MJ, Montgomery RR, Fikrig E. West Nile virus: Biology, transmission, and human infection. Clin Microbiol Rev. 2012;25(4):635-648
3. Centers for Disease Control and Prevention (CDC), National Center for Emerging and Zoonotic Infectious Disease (NCEZID), Division of Vector-Borne Diseases (DVBD): West Nile Virus. CDC; Accessed January 21, 2025. Available at

https://www.cdc.gov/west-nile-virus/
4. Lustig Y, Mannasse B, Koren R, et al. Superiority of West Nile virus RNA detection in whole blood for diagnosis of acute infection. J Clin Microbiol. 2016;54(9):2294-2297
5. Barzon L, Pacenti M, Franchin E, et al. Excretion of West Nile virus in urine during acute Infection. J Infect Dis. 2013;208(7):1086-1092

Performance

Method Description
This real-time reverse transcription polymerase chain reaction (RT-PCR) assay provides qualitative detection of lineages 1 and 2 of West Nile virus (WNV). Viral RNA is first extracted from cerebrospinal fluid on an automated platform. The extract is then used for subsequent RT-PCR. An initial reverse transcription step is employed to convert viral RNA to cDNA. The viral cDNA target is then amplified on the Roche LightCycler 480 using specific primers and detected via Taqman probe technology. An internal control is also included with each reaction. Analysis of the PCR amplification is accomplished through the use of LightCycler software.(Package insert: RealStar WNV RT-PCR Kit 2.0. Altona Diagnostics; 03/2020)

PDF Report
No

Day(s) Performed
Monday through Sunday

Report Available
Same day/1 to 5 days

Specimen Retention Time
1 week

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA

requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

87798

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
WNCSF	West Nile Virus RNA, PCR, CSF	34461-4

Result ID	Test Result Name	Result LOINC® Value
608435	West Nile Virus RNA, PCR, CSF	34461-4