TruQuick™ DENG IgG/IgM/NS1 25T

A rapid test for a qualitative detection of NS1 antigen, IgG and IgM antibodies of dengue virus in whole blood, serum or plasma.

REF **TQ2025** IVD **Rx Only**

INTENDED USE

TruQuick DENG IgG/IgM/NS1 is a rapid chromatographic immunoassay for the qualitative detection of NS1 antigen and IgG and IgM antibodies of Dengue virus in whole blood, serum, or plasma as an aid in the diagnosis of Dengue infections. Any positive reactions with TruQuick DENG IgG/IgM, NS1 should be confirmed with alternative testing and clinical findings.

SUMMARY AND EXPLANATION OF THE TEST

Dengue is a flavivirus, transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes. It is widely distributed throughout the tropical and subtropical areas of the world,[1] and causes up to 100 million infections annually.[2] Classic Dengue infection is characterized by a sudden onset of fever, intense headache, myalgia, arthralgia and rash.

Primary Dengue infection causes IgM antibodies to increase to a detectable level in three to five days after the onset of fever. IgM antibodies generally persist for 30 to 90 days.[3] Most Dengue patients in endemic regions have secondary infections,[4] resulting in high levels of specific IgG antibodies prior to or simultaneous with IgM response.[5] Therefore, the detection of specific anti-Dengue IgM and IgG antibodies can also help to distinguish between primary and secondary infections.

NS1 is one of seven Dengue Virus nonstructural proteins which are thought to be involved in viral replication. NS1 exists as a monomer in its immature form but is rapidly processed in the endoplasmic reticulum to form a stable dimer. A small amount of NS1 remains associated with intracellular organelles where it is thought to be involved in viral replication. The rest of NS1 is found either associated with the plasma membrane or secreted as a soluble hexadimer. NS1 is essential for viral viability but its precise biological function is unknown. Antibodies raised in response to NS1 in viral infection can cross react with cell surface antigens on epithelial cells and platelets and this has been implicated in the development of Dengue Hemorrhagic fever.

The IgG/IgM component is a rapid test that utilizes a combination of Dengue antigen-coated colored particles for the detection of IgG and IgM Dengue antibodies in whole blood, serum, or plasma.

The NS1 component utilizes a combination of Dengue antibody-coated colored particles for the detection of Dengue NS1 antigen in whole blood, serum, or plasma.

BIOLOGICAL PRINCIPLES

TruQuick DENG IgG and IgM component of this combination test consists of two components, an IgG component and an IgM component. In the IgG component, anti-human IgG is coated in IgG test line region. During testing, the specimen reacts with Dengue antigen-coated particles in the Test Cassette. The mixture then migrates upward on the membrane by capillary action and reacts with the anti-human IgG in IgG test line region. If the specimen contains IgG antibodies to Dengue, a colored line will appear in IgG test line region. In the IgM component, anti-human IgM is coated in IgM test line region. During testing, the specimen reacts with anti-human IgM. Dengue IgM antibodies, if present in the specimen, react with the anti-human IgM and the Dengue antigen-coated particles in the Test Cassette, and this complex is captured by the anti-human IgM, forming a colored line in IgM test line region. Therefore, if the specimen contains Dengue IgG antibodies, a colored line will appear in IgG test line region. If the specimen contains Dengue IgM antibodies, a colored line will appear in IgM test line region. If the specimen does not contain Dengue antibodies, no colored line will appear in either of the test line regions, indicating a negative result. To serve as a procedural control, a colored line will always appear in the control line region, indicating that the proper volume of specimen has been added and membrane wicking has occurred.

The NS1 component has anti-NS1 antibodies at the test line. During testing, the specimen reacts with Dengue antibody-conjugate in the Test Cassette. The gold antibody conjugate will bind to Dengue antigen in the specimen sample which in turn will bind with Anti-Dengue NS1 coated on the membrane. As the reagent moves across the membrane, the Dengue NS1 antibody on the membrane will bind the antibody-antigen complex causing pale or dark pink line to form at the test line region of the test membrane. The intensity of the lines will vary depending upon the amount of antigen present in the sample. The appearance of pink line in the test region should be considered as positive result.

REAGENTS/MATERIALS PROVIDED

The maximum number of tests obtained from this test kit is listed on the outer box.

- Test Cassettes: Each Test Cassette carries two immunochromatographic membranes. The TruQuick DENG IgG/IgM/NS1 contains Dengue antigen conjugated to gold colloidal particles, anti-human IgM, anti-human IgG coated on the membrane. The TruQuick Dengue NS1 contains anti-Dengue antigen conjugated colloid particles, anti-Dengue antigen coated on the membrane.
- Buffer: A buffered solution containing Proclin as a preservative. The Buffer is supplied in a dropper vial ready for use.
- Droppers: 5 µL and 25 µL
- Package insert

MATERIALS NOT PROVIDED

- Specimen collection containers
- Centrifuge (for plasma only)
- Micropipette
- Timer
- Lancets (for fingerstick whole blood only)

PRECAUTIONS

1. For in vitro diagnostic use only. Do not use after expiration date.
2. Do not eat, drink or smoke in the area where the specimens or kits are handled.
3. Handle all specimens as if they contain infectious agents. Observe established precautions against microbiological hazards throughout the procedure and follow the standard procedures for proper disposal of specimens.
4. Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are assayed.
5. Humidity and temperature can adversely affect results.

HAZARD and PRECAUTIONARY STATEMENTS

Refer to the SDS, available at www.meridianbioscience.com for Hazard and Precautionary Statements.

SHELF LIFE AND STORAGE

The kit can be stored at room temperature or refrigerated (2-30 C). The Test Cassette is stable through the expiration date printed on the sealed pouch. The Test Cassette must remain in the sealed pouch until use. DO NOT FREEZE. Do not use beyond the expiration date.

SPECIMEN COLLECTION AND PREPARATION

1. TruQuick DENG IgG/IgM/NS1 can be performed using whole blood, serum, or plasma. Collect and prepare whole blood, serum and plasma specimens according to standard laboratory methods.
2. To collect Fingerstick Whole Blood Specimens:
   - Wash the patient's hand with soap and warm water or clean with an alcohol swab. Allow to dry.
   - Massage the hand without touching the puncture site by rubbing down the hand towards the fingertip of the middle or ring finger.
   - Puncture the skin with a sterile lancet. Wipe away the first sign of blood.
   - Gently rub the hand from wrist to palm to finger to form a rounded drop of blood over the puncture site.

   Add the Fingerstick Whole Blood specimen to the Test Cassette by using a 5 µL dropper or micropipette measuring 5 µL and a 25 µL dropper or micropipette measuring 25 µL. The 5 µL or 25 µL droppers provided with the test dispense approximately 5 µL or 25 µL in one drop even if more blood is aspirated in the dropper.
3. Separate serum or plasma from blood as soon as possible to avoid hemolysis. Use only clear, non-hemolyzed specimens.
4. Testing should be performed immediately after specimen collection. Do not leave the specimens at room temperature for prolonged periods. Serum and plasma specimens may be stored at 2-8 C for up to three days. For long-term storage, specimens should be kept below -20 C. Whole blood collected by venipuncture should be stored at 2-8 C if the test is to be run within two days of collection. Do not freeze whole blood specimens. Whole blood collected by fingerstick should be tested immediately.
5. Bring specimens to room temperature prior to testing. Frozen specimens must be completely thawed and mixed well prior to testing. Specimens should not be frozen and thawed repeatedly.
6. If specimens are to be shipped, they should be packed in compliance with federal regulations for transportation of etiologic agents.

TEST PROCEDURE

Allow the Test Cassette, Buffer specimen, and/or controls to reach room temperature (15-30 C) prior to testing.

1. Bring the pouch to room temperature before opening it. Remove the Test Cassette from the sealed pouch and use it within 1 hour.
2. Place the cassette on a clean and level surface.

3.a. For <u>Serum or Plasma</u> specimen:

<u>For NS1:</u>

- Hold the dropper vertically and transfer 3 drops of serum or plasma (approximately 75 µL) to the specimen area, and start the timer. See illustration below.

<u>For IgG/IgM:</u>

- **To use a dropper:** Hold the dropper vertically, draw the specimen up to the Fill Line (approximately 5 µL) and transfer the specimen to the specimen well of the Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer. Avoid trapping air bubbles in the specimen well.
- **To use a micropipette:** Pipette and dispense 5 µL of serum or plasma to the specimen well of the Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer.

3.b. For <u>Whole Blood (Venipuncture/Fingerstick)</u> specimen:

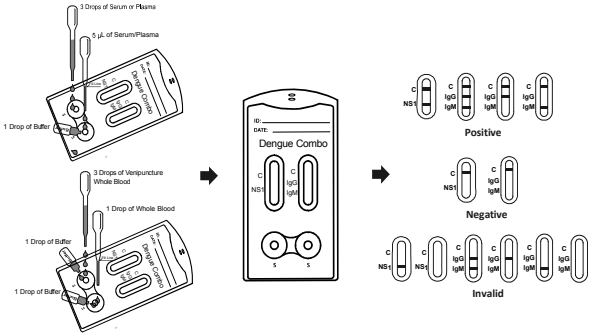
<u>For NS1:</u>

- To use a dropper: Hold the dropper vertically and transfer 3 drops of whole blood (approximately 75 µL) to the specimen area, then add 1 drop of Buffer (approximately 40 µL) and start the timer. See illustration below.
- To use a capillary tube: Fill the capillary tube and transfer approximately 75 µL of fingerstick whole blood specimen to the specimen area of Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer. See illustration below.
- To use hanging drops: Allow 3 hanging drops of fingerstick whole blood specimen (approximately 75 µL) to fall into the specimen area of Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer. See illustration below.

<u>For IgG/IgM:</u>

- To use a dropper: Hold the dropper vertically, draw the specimen above 1 cm above the Fill Line, and transfer 1 drop of whole blood (approximately 10 µL) to the specimen well of the Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer. See illustration below.
- To use a micropipette: Pipette and dispense 10 µL of whole blood to the specimen well of the Test Cassette, then add 1 drop of Buffer (approximately 40 µL) and start the timer. See illustration below.

4. Read the results at 10 minutes, do not interpret the results after 20 minutes.



INTERPRETATION OF RESULTS

(Please refer to the illustration above.)

NS1 POSITIVE:* Two distinct colored lines appear. One colored line should be in the control region (C) and another colored line should be in the test region (T).

IgG and IgM POSITIVE:* Three lines appear. One colored line should be in the control line region (C), and two colored lines should appear one in the IgG test line region and one in the IgM test line region. The color intensities of the lines do not have to match. The result is positive for IgG & IgM antibodies which indicates end stage of primary Dengue infection and early stage of secondary Dengue infection.

IgG POSITIVE:* Two lines appear. One colored line should be in the control line region (C) and a colored line appears in IgG test line region. The result is positive for Dengue virus specific-IgG and is probably indicative of secondary Dengue infection.

IgM POSITIVE:* Two lines appear. One colored line should be in the control line region (C) and a colored line appears in IgM test line region. The result is positive for Dengue virus specific-IgM antibodies and is indicative of primary Dengue infection.

***NOTE:** The intensity of the color in the test line region NS1 and/or IgG and/or IgM will vary depending on the concentration of Dengue NS1 antigen and/or IgG and/or IgG present in the specimen. Therefore, any shade of red in the test region should be considered positive.

NEGATIVE: One colored line appears in the control region (C). No apparent red or pink line appears in the test region (T).

INVALID: Control line fails to appear. Insufficient specimen volume or incorrect procedural techniques are the most likely reasons for control line failure. Review the procedure and repeat the test with a new Test Cassette. If the problem persists, discontinue using the test kit immediately and contact Meridian's Technical Services Department at 800-343-3858 or your local distributor.

QUALITY CONTROL

This test should be performed per applicable local, state, or federal regulations or accrediting agencies.

Internal procedural controls are included in the test. A colored line appearing in the control region (C) is an internal positive procedural control. It confirms sufficient specimen volume and correct procedural technique.

External controls standards are not supplied with this kit; however, it is recommended that positive and negative external controls be tested as a good laboratory practice to confirm the test procedure and to verify proper test performance.

If the expected control reactions are not observed, repeat the control tests as the first step in determining the root cause of the failure. If control failures are repeated please contact Meridian's Technical Services Department at 1-800-343-3858 (US) or your local distributor.

EXPECTED VALUES

TruQuick Dengue NS1 component was compared with a leading commercial Dengue Ag EIA test. The correlation between these two systems is 96.0%. Primary Dengue infection is characterized by the presence of detectable IgM antibodies three to five days after the onset of infection. Secondary Dengue infection is characterized by the elevation of Dengue-specific IgG. In the majority of the cases, this is accompanied by elevated levels of IgM. TruQuick DENG IgG/IgM/NS1 has been compared with a leading commercial Dengue ELISA test, demonstrating sensitivity of 83.3% for IgM in primary infection and 98.4% for IgG in secondary infection.

LIMITATIONS OF THE PROCEDURE

1. TruQuick DENG IgG/IgM/NS1 will only indicate the presence of Dengue NS1 antigen and Dengue antibodies in the specimen and should not be used as the sole criteria for the diagnosis of Dengue.
2. The TEST PROCEDURE and the INTERPRETATION OF RESULTS sections must be followed closely when testing for the presence of dengue antigen in serum or plasma from individual subjects. Failure to follow the procedure may give inaccurate results.
3. A negative test result for Dengue NS1 does not preclude the possibility of exposure to or infection with dengue viruses.
4. A negative result for Dengue NS1 can occur if the quantity of dengue antigen present in the specimen is below the detection limits of the assay, or the dengue antigen that are detected are not present during the stage of disease in which a sample is collected.
5. Some specimens containing unusually high titer of heterophile antibodies or rheumatoid factor may affect expected results.

6. If the symptoms persist, while the result from TruQuick Dengue NS1 is negative or nonreactive, it is recommended to resample the patient few days later and test with an alternative test device such as PCR or ELISA.
7. The results obtained with this test should only be interpreted in conjunction with other diagnostic procedures and clinical findings.
8. In the early onset of fever, anti-Dengue IgM concentrations may be below detectable levels. For primary infection, an IgM antibody-capture enzyme-linked immune sorbent assay (MACELISA) showed that 80% of the Dengue patients tested exhibited detectable levels of IgM antibody by the fifth day after infection, and 99% of the patients tested IgM positive by day 10. It is recommended that patients be tested within this time. For the secondary infection, a low molar fraction of anti-Dengue IgM and a high molar fraction of IgG that is broadly reactive to flaviviruses characterize the antibodies.[5] The IgM signal may be faint and cross reaction in the region of IgG line may appear.
9. Reactivity across the flavivirus group (Dengue 1, 2, 3 & 4, St. Louis encephalitis, West Nile virus, Japanese encephalitis and yellow fever viruses) is common.[6-8] Positive results should be confirmed by other means.
10. The continued presence or absence of antibodies cannot be used to determine the success or failure of therapy.
11. Results from immunosuppressed patients should be interpreted with caution.
12. As with all diagnostic tests, all results must be interpreted together with other clinical information available to the physician.
13. If the test result is negative and clinical symptoms persist, additional testing using other clinical methods is recommended. A negative result does not at any time preclude the possibility of Dengue infection.

SPECIFIC PERFORMANCE CHARACTERISTICS

Sensitivity and Specificity

TruQuick DENG IgG/IgM/NS1 was tested with a seroconversion panel in comparison with a leading commercial Dengue Antigen EIA test using clinical specimens for Dengue NS1. It also was evaluated with specimens obtained from a population of symptomatic and asymptomatic individuals. Results were confirmed by a leading commercial Dengue ELISA test for IgG and IgM. The results show that the relative sensitivity of TruQuick Dengue NS1 is 95.8%, and the relative specificity is 96.1%. The overall relative sensitivity for the primary and secondary infection of the TruQuick DENG IgG/IgM/NS1 is 94.3%, and the relative specificity is 99.1%, and the relative correlation is 98.3%.

Dengue IgG/IgM

Dengue Primary Infection for IgM/IgG test results

Method			ELISA		
TruQuick DENG IgG/IgM/NS1	Results		Positive		Negative
			IgM	IgG	
	Positive	IgM	20	0	0
		IgG	4	0	0
	Negative		0	0	0
Relative Sensitivity			83.3%	/	/

Dengue Secondary Infection for IgM/IgG test results

Method			ELISA		
TruQuick DENG IgG/IgM/NS1	Results		Positive		Negative
			IgM	IgG	
	Positive	IgM	46	1	0
		IgG	18	63	0
	Negative		0	0	0
Relative Sensitivity			71.9%	98.4%	/

Non-Dengue Infection for IgM/IgG test results

Method			ELISA		
TruQuick DENG IgG/IgM/NS1	Results		Positive		Negative
			IgM	IgG	
	Positive	IgM	0	0	1
		IgG	0	0	3
	Negative		0	0	429
Relative Specificity			/	/	99.1%

Sensitivity: (20+63)/(24+64) = 94.3% (95% CI*: 87.2%~98.1%);
Specificity: 429/433 = 99.1% (95% CI*: 97.7%~99.7%);
Correlation: (20+63+429)/ (24+64+433) = 98.3% (95% CI*: 96.7%~99.2%). *Confidence Intervals

Dengue NS1

Method		Dengue Ag EIA Test		Total Result
TruQuick Dengue NS1	Results	Positive	Negative	
	Positive	137	8	145
	Negative	6	200	206
Total Result		143	208	351

Sensitivity: 137/143*100% = 95.8% (95% CI*: 91.1%~98.4%);
Specificity: 200/208*100% = 96.1% (95% CI*: 92.6%~98.4%);
Correlation: (137+200)/(137+6+8+200)*100% = 96.0%(95% CI*: 93.4%~97.8%)
*Confidence Intervals

ANALYTICAL SENSITIVITY

TruQuick DENG IgG/IgM/NS1 was tested with dilutions of NS1 antigen in plasma. The Limit of Detection was determined to be 250 ng/mL of antigen.

REPRODUCIBILITY

Intra-Assay Precision

Within-run precision was determined by using 15 replicates of serum and plasma of seven specimen types: negative, IgG middle positive, IgM middle positive, dual IgG/IgM positive, NS1 low positive, NS1 middle positive and NS1 high positive. The specimens were correctly identified > 99% of the time.

Inter-Assay Precision

Between-run precision has been determined by 15 independent assays on the same seven specimen types: negative, IgG middle positive, IgM middle positive, dual IgG/IgM positive, NS1 low positive, NS1 middle positive and NS1 high positive. Three different lots of TruQuick DENG IgG/IgM/NS1 were tested using these specimens. The specimens were correctly identified > 99% of the time.

CROSSREACTIVITY

TruQuick DENG IgG/IgM/NS1 was tested with specimens from patients diagnosed with HAMA, RF, HBsAg, HBsAb, HBeAg, HBeAb, HBcAb, HCV, *H. pylori,* Syphilis, HIV, Mononucleosis, CMV, Rubella and Toxoplasmosis. The results showed no crossreactivity.

TESTS FOR INTERFERING SUBSTANCES

The following potentially interfering substances were added to Dengue negative and positive specimens.

Acetaminophen 20 mg/dL	Acetylsalicylic Acid 20 mg/dL	Ascorbic Acid 2000 mg/dL
Bilirubin 1 g/dL	Creatine 200 mg/dL	Caffeine 20 mg/dL
Gentisic Acid 20 mg/dL	Hemoglobin 1000 mg/dL	Albumin 2 g/dL
Oxalic Acid 60 mg/dL		

None of the substances interfered in the assay at the concentration tested.

REFERENCES

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SYMBOL USAGE

You may see one or more of these symbols on the labeling/packaging of this product:

Key guide to symbols

	Use By	CONTROL +	Positive control
LOT	Batch Code	CONTROL −	Negative control
IVD	In vitro diagnostic medical device	EC REP	Authorized Representative in the European Community
CE	This product fulfills the requirements of Directive 98/79/EC on in vitro diagnostic medical devices	SMP PREP DIL SPE	Sample Preparation Apparatus containing Sample Diluent
REF	Catalogue number		Do not freeze
	Consult Instructions for Use	BUF RXN	Reaction Buffer
	Manufacturer		For IVD Performance Evaluation Only
Σ	Contains sufficient for <n> tests	SOLN STOP	Stopping Solution
	Temperature limitation	CONJ ENZ	Enzyme Conjugate
SN	Serial number	CONTROL	Assay Control
TEST	Test Device	REAG	Reagent
	Date of manufacture	BUF WASH	Wash Buffer
BUF	Buffer		Warning
CONJ	Conjugate	DIL SPE	Specimen Diluent (or Sample Diluent)
SUBS	Substrate	BUF WASH 20X	Wash Buffer Concentration: 20X
RUO	Research Use Only	DET REAG	Detection Reagent
IUO	Investigational Use Only	Rx Only	Prescription Use Only
	Do not use if package is damaged		

For technical assistance, call Technical Support Services at 800-343-3858 between the hours of 8AM and 6PM, USA Eastern Standard Time. To place an order, call Customer Service Department at 800-543-1980.