Rapid Response™

Typhoid Test Cassette
(Whole Blood/Serum/Plasma)

REF TYP-13C40
TYP-13C25

Product Insert

A rapid test for the qualitative detection of IgG and IgM antibodies to *Salmonella* typhi (*S.* typhi) in human's whole blood serum, or plasma specimen.

For professional *in vitro* diagnostic use only.

Intended Use

The Rapid Response™ Typhoid Test Cassette is a rapid chromatographic immunoassay for the simultaneous detection and differentiation of IgG and IgM types of antibodies, against *Salmonella* typhi (*S.* typhi), in human whole blood, serum, or plasma. It is intended to be used as a screening test as an aid in the diagnosis of infection with *S.* typhi. Any reactive specimen with the Rapid Response™ Typhoid test cassette must be confirmed with an alternative testing method.

Introduction

Typhoid fever is caused by *S.* typhi, a Gram-negative bacterium. An estimated 17 million cases and 600,000 associated deaths occur annually world-wide[1]. Patients who are infected with HIV are at significantly increased risk of clinical infection with *S.* typhi[2]. Evidence of *H. pylori* infection also presents an increased risk of acquiring typhoid fever. 1-5% of patients become chronic carriers harboring *S.* typhi in the gallbladder.

The clinical diagnosis of typhoid fever depends on the isolation of *S.* typhi from blood, bone marrow, or a specific anatomic lesion. In facilities that cannot afford to perform this complicated and time-consuming procedure, the Widal test (also referred as Weil-Felix Test) is used to facilitate the diagnosis. However, many limitations lead to difficulties in the interpretation of the Widal test[3, 4].

In contrast, the Rapid Response™ Typhoid Test Cassette is a simple and rapid laboratory test. The test simultaneously detects and differentiates the IgG and the IgM antibodies to *S.* typhi specific antigen[5] in whole blood, serum or plasma, thus aiding in the determination of current or previous exposure the *S.* typhi.

Principle

The Rapid Response™ Typhoid Test Cassette is a qualitative, membrane-based immunoassay for the detection of antibodies (IgG and IgM) to *Salmonella* typhi (*S.* typhi) in human whole blood, serum, or plasma. The diagnostic test cassette consists of two components: an IgG component and an IgM component. The IgG line region is pre-coated with reagents for the detection of anti-*S.* typhi (IgG). The IgM line region is pre-coated with monoclonal anti-human IgM for detection of anti-*S.* typhi (IgM).

During testing, specimen dispensed into the sample well of the test cassette binds with Typhoid conjugates impregnated in the reagent area, if the specimen contains anti-Typhoid antibodies. The immunocomplex formed migrates by capillary action. If the present antibodies in specimen are of IgG types, the immunocomplex is then captured by the pre-coated reagents on the membrane, forming a colored IgG line, indicating a *S.* typhi IgG positive test result. If the present antibodies in the specimen are of IgM type, the immunocomplex would be captured on the membrane by the pre-coated anti- human IgM antibody, forming a colored IgM line, indicating a *S.* typhi IgM positive test result.

Absence of any T lines (IgM and IgG) indicates a negative result. A colored control line (C) should always appear in case of a positive or a negative result. Its absence indicates invalid test results.

Reagents

The test contains mouse anti-human IgM, mouse anti-human IgG and Typhoid antigen. A goat antibody is employed in the control line system.

Precautions

- For *in vitro* diagnostic use only. Do not use after the expiration date.
- Do not smoke, drink, or eat in areas where specimens or kits reagents are handled.
- Dispose of all specimens and materials used to perform the test as biohazardous waste.
- This package insert must be read completely before performing the test.
- Bring all reagents to room temperature (59°F-86°F; 15°C-30°C) before use.
- Do not interchange the buffer and test cassettes of different lots.
- Do not use hemolyzed blood specimens for testing.

Materials

Materials provided

- Individually packed test cassettes
- Droppers
- Buffer
- Product insert

Materials required but not provided

- Specimen collection container
- Centrifuge
- Heparinized capillary tubes and dispensing bulb
- Timer
- Lancets

Storage and Stability

- Store as packaged in the sealed pouch at room temperature or under refrigeration (35.6-86°F; 2-30°C). The test is stable up to the expiration date printed on the sealed pouch.
- The test must remain in the sealed pouch until use.
- **Do not freeze.**
- Do not use beyond the expiration date.

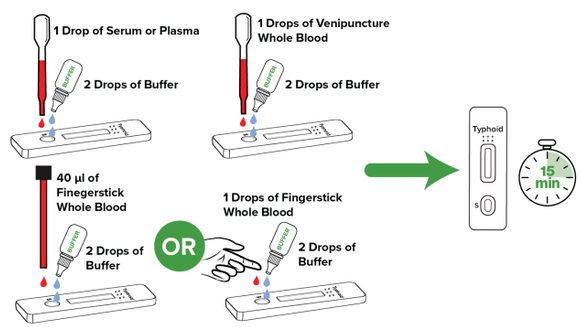
Collection and Storage of Specimens

- The Rapid Response™ Typhoid Test Cassette (Whole Blood/Serum/Plasma) can be performed using whole blood (from venipuncture or fingerstick), serum or plasma.
- **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 by using a capillary tube:**
  - Touch the end of the capillary tube to the blood until filled to approximately 40 µL. Avoid air bubbles.
  - Place the bulb onto the top end of the capillary tube, then squeeze the bulb to dispense the whole blood to the specimen area of the test cassette.
- **Add the Fingerstick Whole Blood specimen to the test by using hanging drops:**
  - Position the patient's finger so that the drop of blood is just above the specimen area of the test cassette.
  - Allow 1 hanging drop of fingerstick whole blood to fall into the center of the specimen area on the test cassette or move the patient's finger so that the hanging drop touches the center of the specimen area. Avoid touching the finger directly to the specimen area.
- Separate the serum or plasma from blood as soon as possible to avoid hemolysis. Only clear, non-hemolyzed specimens can be used.
- Testing should be performed immediately after the specimens have been collected. Do not leave the specimens at room temperature for prolonged periods. Serum and plasma specimens may be stored at 35.6-46.4°F (2-8°C) for up to 3 days. For long term storage, specimens should be kept below -4°F (20°C). Whole blood collected by venipuncture should be stored at 35.6-46.4°F (2-8°C) if the test is to be run within 2 days of collection. Do not freeze whole blood specimens. Whole blood collected by fingerstick should be tested immediately.
- 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.
- If specimens are to be shipped, they should be packed in compliance with federal regulations for transportation of etiologic agents.

Test Procedure

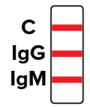
Allow test cassette, specimen, and/or controls to equilibrate to room temperature (59-86°F; 15-30°C) prior to testing.

1. Bring the pouch to room temperature before opening it. Remove the test cassette from the sealed pouch and use it as soon as possible. Best results will be obtained if the assay is performed within one hour.
2. Place the cassette on a clean and level surface.
   a) **For Serum or Plasma specimen:** Hold the dropper vertically and transfer 1 drop of serum or plasma (approximately 40 µL) to the specimen area, then add 2 drops of buffer (approximately 80 µL) and start the timer, see illustration below.
   b) **For Venipuncture Whole Blood specimen:** Hold the dropper vertically and transfer 1 drop of whole blood (approximately 40 µL) to the specimen area, then add 2 drops of buffer (approximately 80 µL) and start the timer. See illustration below.
   c) **For Fingerstick Whole Blood specimen:**
      - To use a capillary tube: Fill the capillary tube and transfer approximately 40 µL of fingerstick whole blood specimen to the specimen area of test cassette, then add 2 drops of buffer (approximately 80 µL) and start the timer. See illustration below.
      - To use hanging drops: Allow 1 hanging drop of fingerstick whole blood specimen (approximately 40 µL) to fall into the specimen area of test cassette, then add 2 drops of buffer (approximately 80 µL) and start the timer. See illustration below.
3. Wait for the colored line(s) to appear. The test result should be read at **15 minutes**. Do not interpret the result after 20 minutes.



Document Number: INS002_00TYP-13C(11-2022)
Effective Date: 2022-11-11

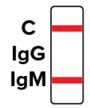
Results Interpretation



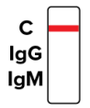
POSITIVE:* Two or three lines appear. One colored line should always appear in the control line region (C) and another one or two apparent colored line(s) should be in the test line region(s) (IgM and/or IgG).

IgM Positive: Along with a line in Control region (C), a line appears in IgM region. It indicates a positive test result for antibodies to *S.* typhi (Isotype IgM)

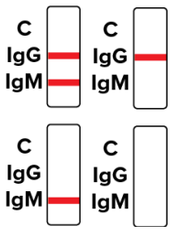
IgG Positive: Along with a line in Control region (C), a line appears in IgG region. It indicates a positive test result for antibodies to *S.* typhi (Isotype IgG)



***NOTE:** The intensity of the color in the test line regions (IgM and IgG) may vary depending on the concentration of Typhoid antibodies present in the specimen. Therefore, any shade of color in the test line region (IgM and/or IgG) should be considered positive.



NEGATIVE: One colored line appears in the control line region (C). No line appears in the test line regions (IgM and IgG).



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. If the problem persists, discontinue use of the test kit immediately and contact your local distributor.

Quality Control

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.

Limitations

1. The assay procedure and the test result interpretation must be followed closely when performing the assay. Failure to follow the procedure may give inaccurate results.
2. The Rapid Response™ Typhoid Test Cassette is for the qualitative detection of antibodies to *S.* typhi in human whole blood, serum, or plasma. The intensity of the test band has no linear correlation with the antibody titer in the specimen.
3. A negative result only indicates absence of anti-*S.* typhi antibodies above detectable levels. A negative test result does not preclude the possibility of exposure to *S.* typhi as a negative result can occur if the quantity of anti-*S* typhi antibodies present in the specimen is below the detection limit of the assay, or the antibodies that are detected are not present during the stage of disease in which a sample is collected.
4. Specimens containing unusually high titer of heterophile antibodies or rheumatoid factor may affect expected results.
5. The results obtained with this test should only be interpreted in conjunction with other diagnostic procedures and clinical findings.

Expected Values

The Rapid Response™ Typhoid Test Cassette (Whole Blood/Serum/Plasma) has been compared with a leading commercial Typhoid ELISA test. The correlation between these two systems is over 99%.

Performance Characteristics

Sensitivity and Specificity

A clinical evaluation was conducted comparing the results obtained using the Rapid Response™ Typhoid Test Cassette to Typhoid IgG/IgM ELISA Testing. The study included 314 IgG specimens and 334 IgM specimens, and about the IgG specimen both assays identified 298 negative and 13 positive results, about the IgM specimen both assays identified 298 negative and 31 positive results.

IgM Results

Method		*S. typhi* EIA (IgM)		Total Results
Rapid Response™ Typhoid Test Cassette for IgM	**Results**	Positive	Negative	
	Positive	31	3	34
	Negative	2	298	300
Total Results		33	301	334

Sensitivity: 93.9% (95%CI*: 79.8%~99.2%)
Specificity: 99.0% (95%CI*: 97.1%~99.8%)
Accuracy: 98.5% (95%CI*: 96.5%~99.5%) *Confidence Intervals

Precision

Intra-Assay

Within-run precision has been determined by using 10 replicates of three specimens: a negative, a low positive, and a high positive. The negative, low positive, and high positive values were correctly identified >99% of the time.

Inter-Assay

Between-run precision has been determined by 10 independent assays on the same three specimens: a negative, a low positive, and a high positive. Three different lots of the Rapid Response™ Typhoid Test cassette (Whole Blood/Serum/Plasma) have been tested over a 3-day period using negative, low positive, and high positive specimens. The specimens were correctly identified >99% of the time.

Cross-reactivity

The Rapid Response™ Typhoid Test Cassette (Whole Blood/Serum/Plasma) has been tested for HBsAg, HBsAb, HbeAg, HBeAb, HBcAb, HCV, HIV, *Syphilis*, *H. Pylori*, CMV, Rubella and Toxo positive specimens. The results showed no cross-reactivity.

Interfering Substances

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

Acetaminophen: 20 mg/dL	Caffeine: 20 mg/dL
Acetylsalicylic Acid: 20 mg/dL	Gentisic Acid: 20 mg/dL
Ascorbic Acid: 2 g/dL	Albumin: 2 g/dL
Bilirubin: 1 g/dL	Oxalic Acid: 600 mg/dL

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

Bibliography

1. Ivanoff BN, Leivne MM, and Lambert PH. Vaccination against typhoid fever: Present status. Bulletin of the World Health Organization 1994; 72:957-71
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3. Clegg A, Passey M, Omena MK,et al. Re-evaluation of the Widal agglutination test in response to the changing pattern of typhoid fever in the highlands of Papua New Guinea. Acta Tropica 1994;57:255- 63
4. Pang T. False positive Wiadal test I non-typhoid Salmonella infection. Southeast Asian Journal of Tropical Medicine and Public Health 1989;20:163-4
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Glossary of Symbols


Consult instructions for use


Test per Kit

Authorized Representative

Store between 35.6°F to 86°F (2°C to 30°C)


Use by


Do Not Reuse

Lot Number

For *in vitro* diagnostic use only

Catalogue #

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Document Number: INS002_00TYP-13C(11-2022)
Effective Date: 2022-11-11