INTRODUCTION
Typhoid caused by Salmonella enterica, serovar Typhi remains a major health problem. The organisms are non-capsulated, non-sporulating, facultative anaerobic bacilli. The outer membrane proteins (OMPs) of salmonella have been considered possible candidates for causing typhoid. A febrile condition, typhoid fever is a bacterial infection caused by salmonella serotypes including S. typhi, S. paratyphi A, S. paratyphi B and S. Sendai. Accurate diagnosis of typhoid fever at an early stage is not only important for etiological diagnosis but to identify and treat the potential carrier and prevent acute typhoid fever outbreaks.

INTENDED USE
Advantage Typhi IgM & IgG Card is a rapid solid phase immuno-chromatographic test for the qualitative differential and simultaneous detection of salmonella typhi (S. typhi) IgM and IgG antibodies in human serum / plasma. This test is for in vitro diagnostic use only and is intended as an aid in the earlier diagnosis of typhoid infection and in the determination of recent and past infection.

PRINCIPLE (ANTIGEN-ANTIBODY REACTION)
Advantage Typhi IgM & IgG Card is a lateral flow immunochromatographic assay. The test uses monoclonal anti-human IgM antibody (test line M) and monoclonal anti-human IgG (test line G) immobilised on a nitrocellulose strip. The conjugate contains colloidal gold conjugated to S. typhi antigen which is prepared from culture of micro-organisms. When a specimen followed by assay buffer is added to the sample well S. Typhi specific IgM &/or IgG antibodies if present, will bind to S. Typhi antigen gold conjugate making antigen antibodies complex. This complex migrates through nitrocellulose membrane by capillary action. When the complex meets the line of the corresponding immobilized monoclonal antibody (anti-human IgM &/or anti-human IgG) the complex is trapped forming a purplish pink band which confirm a reactive test result. Absence of a coloured band in the test region indicates a non reactive test result. A red procedural control line should always develop in the test device window to indicate that the test has been performed properly.

KIT CONTENTS
a) Advantage Typhi IgM & IgG Card  
 b) Assay Buffer  
 c) Sample Dropper  
 d) Instruction Manual

DESCRIPTION OF SYMBOLS USED
The following are graphical symbols used in or found on J. Mitra diagnostic products and packing. These symbols are the most common ones appearing on medical devices and their packing. They are explained in more detail in the British and European Standard BS EN 15223-1:2012.

CLASSIFICATION: These are modified immunological products/ Antisera & other blood fractions. Classified under chapter heading 30.02 of Central Excise Tariff. As held by Hon. Supreme Court judgement in our own case, Citation 2007(211) ELT 521(SC) / Civil appeal 1076 of 2002 SC. (Available at website of Hon. Supreme Court of India: “supremecourtofindia.nic.in”)

WARNING FOR USERS
CAUTION: ALL THE SAMPLES TO BE TESTED SHOULD BE HANDLED AS THOUGH CAPABLE OF TRANSMITTING INFECTION. NO TEST METHOD CAN OFFER COMPLETE ASSURANCE THAT HUMAN BLOOD PRODUCTS WILL NOT TRANSMIT INFECTION.

1. The use of disposable gloves and proper biohazardous clothing is STRONGLY RECOMMENDED while running the test.
2. In case there is a cut or wound in hand, DO NOT PERFORM THE TEST.
3. Do not smoke, drink or eat in areas where specimens or kit reagents are being handled.
4. Tests are for in vitro diagnostic use only and should be run by competent person only.
5. Do not pipette by mouth.
6. All materials used in the test and samples should be disposed off in accordance with established safety procedures/ guidelines.
7. Wash hands thoroughly with soap or any suitable detergent, after the use of the kit. Consult a physician immediately in case of accident or contact with eyes, in the event that contaminated material are ingested or come in contact with skin puncture or wounds.
8. Spills should be decontaminated promptly with Sodium Hypochlorite or any other suitable disinfectant.
9. Do not open the foil pouch to remove the product until it attains room temperature and you are ready to perform the test.

Optimal test performance requires strict adherence to the test procedure described in the insert.

PRECAUTION
1. For best results, strict adherence to test procedure is required.
2. All specimens should be handled as being potentially infectious.
3. Do not reuse test cards.
4. All test device, buffer and specimens must be at room temperature before running the test.
5. Do not use kit beyond the stated expiry date mentioned on the kit.
6. Do not mix components from different lot numbers.
7. The Assay Buffer contains low concentration of sodium azide as a preservative. Sodium azide is toxic and should be handled carefully to avoid ingestion and skin contact.

KIT STORAGE & STABILITY
The kit should be stored at 2-30°C in the coolest and driest area available. It has a shelf life of 18 months from the date of manufacturing. Advantage Typhi IgM & IgG Card should not be frozen and must be protected from exposure to humidity.

SPECIMEN COLLECTION AND PREPARATION
1. Advantage Typhi IgM & IgG Card test should be performed with human serum or plasma only immediately after collection.
2. If specimens cannot be tested immediately, they should be refrigerated at 2-8°C. For storage for more than 3 days, freeze the specimen at -20°C or below.
3. Repeated freezing and thawing of the specimen should be avoided.
4. Specimens containing precipitate or particulate matter may yield inconsistent test results. Such specimens must be centrifuged and the clear supernatant should only be used for testing.
5. The use of hemolytic, lipaemic, icteric or bacterially contaminated specimens should be avoided as it may lead to erroneous results.

TEST PROCEDURE
1. Bring the complete kit & sample to be tested to room temperature prior to testing. Once the test kit is opened, it should be used within one hour.
2. Remove the test card from the foil pouch prior to use.
3. Add 1 drop (35 µl) of serum / plasma sample using sample dropper into the sample well of the Test Card.
4. Add 2 drops of Assay Buffer to the sample well of the Test Card.
5. Allow reaction to occur during the next 20 minutes.
6. Read results at 20 minutes. Positive results may appear as early as 5-10 minutes. However, negative results must be confirmed only after 20 minutes.

**Important Note:** Do not read result after 20 minutes.

7. Discard the Advantage Typhi IgM & IgG Card immediately after reading result at 20 minutes, considering it to be potentially infectious.

### INTERPRETATION OF THE TEST

**IgM & IgG REACTIVE**

As shown in (Fig. a) appearance of red coloured line in the control region ‘C’ and Test region; IgG region ‘G’ and IgM region ‘M’ indicates that the sample is reactive for both S. typhi IgM & IgG antibodies.

**IgG REACTIVE**

As shown in (Fig. b) appearance of red coloured line in the control region ‘C’ and Test region; IgG region ‘G’ indicates that the sample is reactive for S. typhi IgG antibodies.

**IgM REACTIVE**

As shown in (Fig. c), appearance of red coloured line in the control region ‘C’ and Test region; IgM region ‘M’ indicates that the sample is reactive for S. typhi IgM antibodies.

**NON-REACTIVE**

As shown in (Fig. d), appearance of one distinct red coloured line in the control region ‘C’ only (with no line in the IgM region ‘M’ & IgG region ‘G’) indicates that the sample is non-reactive for S. typhi antibodies.

**INVALID**

When neither control line nor the M / G line appears as shown in (Fig. e) the test should be treated as Invalid which may be because of following reasons:

(a) Improper storage at temperature other than the recommended temperature.
(b) Wrong Procedure
(c) Long atmospheric exposure of the test device after opening the pouch.

The test should be repeated using a new device and sample.

### LIMITATIONS OF THE TEST

1. The test is for **in vitro** diagnostic use only.
2. This test detects the presence of S. typhi IgM & IgG antibodies to S. typhi antigen in the specimen and should not be used as the sole criteria for the diagnosis of typhoid infection.
3. In early infections and some secondary infections, detectable levels of IgM antibodies may be low. Some patients may not produce detectable levels of antibody within the first seven to ten days after infection. Where symptoms persist, patients should be re-tested 3-5 days after the first testing date.
4. High titre of Rheumetoid arthritis antibodies, SLE antibodies may show cross-reactivity.
5. As with all diagnostic tests, all results must be correlated with other clinical findings. If the test result is negative and clinical symptoms persist, additional follow-up testing using other clinical methods is recommended. A negative result at any time does not preclude the possibility of an early infection of typhoid bacteria.

### PERFORMANCE CHARACTERISTICS

The kit has been evaluated with the known panel of fresh as well as frozen S. typhi IgM & IgG antibody positive and negative samples and results are compared with licensed commercially available test. The samples included cross-reacting samples; Rheumetoid factor, anti-nuclear antibodies etc. Following is the in-house evaluation:

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>No. of Samples tested</th>
<th>Result of licensed test</th>
<th>Advantage Typhi IgM &amp; IgG Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative for Ab to S. typhi</td>
<td>500</td>
<td>500</td>
<td>499</td>
</tr>
<tr>
<td>S. typhi IgM Positive</td>
<td>85</td>
<td>85</td>
<td>82</td>
</tr>
<tr>
<td>S. typhi IgG Positive</td>
<td>55</td>
<td>55</td>
<td>544</td>
</tr>
</tbody>
</table>

**Adv. Typhi IgM antibodies**:

- **Sensitivity**: 93.18%
- **Specificity**: 99.6%

**Adv. Typhi IgG antibodies**:

- **Sensitivity**: 96.4%
- **Specificity**: 99.6%

**Precision**: Within run (Intra assay) & between run (Interassay) precision have been determined by testing 10 replicates of five samples - one negative, three S. typhi IgM positive and one S. typhi IgG Positive. The C.V. (%) of all the five samples were within 10% of the time.

### NOTICe:

Every effort is made to supply ordered consignment as per the sample submitted but due to continuous development, the company reserves the right to improve/change any specifications/ components without prior information/notice to the buyer.

### LIMITED EXPRESSED WARRANTY DISCLAIMER

The manufacturer limits the warranty to the test kit, as much as that the test kit will function as an **in vitro** diagnostic assay within the limitations and specifications as described in the product instruction manual, when used strictly in accordance with the instructions contained therein. The manufacturer disclaims any warranty expressed or implied including such expressed or implied warranty with respect to merchantability, fitness for use or implied utility for any purpose. The manufacturer’s liability is limited to either replacement of the product or refund of the purchase price of the product and in no case liable to claim of any kind for any damage or loss claimed. The manufacturer shall not be liable to the purchaser or third parties for any injury, damage or economic loss, however caused by the product in the use or in the application thereof.

### BIBLIOGRAPHY