INTENDED USE

For in vitro diagnostic use only
For use with the ID-Micro Typing System™ Anti-IgG Card
For Indirect Antiglobulin Test

The Anti-S reagent (Anti-MNS3) is for the qualitative in vitro detection of human S positive red blood cells by the indirect antiglobulin test.
The Anti-s reagent (Anti-MNS4) is for the qualitative in vitro detection of human s positive red blood cells by the indirect antiglobulin test.

SUMMARY AND EXPLANATION

The MNS system is a complex system where the genes are located on chromosome 4. The gene for M and N is GYPA and for S and s it is GYPB. The loci are closely linked between M, N and S, s due to this gene location. These are inherited as a haplotype for examples MS, NS etc.¹

The Ss antigens are carried on a glycophorin molecule, glycophorin B (GYB), where they are characterized by a single amino acid substitution at position 29; methionine is responsible for S antigen expression, and threonine for s antigen expression.² ³

The Ss antigens are generally destroyed when the red blood cells are exposed to papain, bromelin and ficin. Trypsin generally has no adverse effect.² ³

Complexities within the MNS system also produce a number of phenotypes in which S/s expression may have been modified.¹

PRINCIPLES OF PROCEDURE

When used by the recommended technique, the reagents will cause agglutination (clumping) of red blood cells carrying the S or s antigen. Lack of agglutination of the red blood cells demonstrates the absence of the S or s antigen.

REAGENTS

Anti-S (Monoclonal) (IgG) and Anti-s (Monoclonal) (IgG) are supplied as two separate reagents.

Anti-S is supplied as one reagent.
• 1 vial containing 5 mL of human monoclonal antibodies of type IgG (cell line P3S13JS123) containing <0.1% (w/v) sodium azide, potentiators and bovine material (i.e., bovine serum albumin, fetal bovine serum).

Anti-s is supplied as one reagent.
• 1 vial containing 5 mL of human monoclonal antibodies of type IgG (cell line P3YAN3) containing <0.1% (w/v) sodium azide, potentiators and bovine material (i.e., bovine albumin serum, fetal bovine serum).

Any bovine material used in the manufacture of these products is sourced from USDA approved facilities.

No preparation of the reagent(s) is required. Use directly from the vial. Do not dilute.

STORAGE REQUIREMENTS

Store at 2–8 °C.
Do not freeze.
Do not use beyond expiration date. The format of the expiration date is expressed as YYYY-MM-DD (year-month-day).
May be at 18–25 °C while in use.
Replace cap when not in use.

SPECIMEN COLLECTION

No special preparation of the patient/donor is required prior to specimen collection.
• Specimens should be collected by aseptic technique with an anticoagulant.
• The specimen should be tested as soon as possible after collection. If testing is delayed, the specimen should be stored at 2–8 °C.
• Do not use collection tubes that contain plasma/cell separation media.
• Samples collected in EDTA should be tested within seven days from collection.
INSTRUCTIONS FOR USE

- Donor blood collected in ACD, CPD, CP2D, CPDA-1 and CP2D with AS-3 may be tested until the expiration date of the donation.
- Clotted, hemolyzed, grossly icteric or contaminated blood specimens should not be used.
- Grossly lipemic samples containing particulates that clog the gel, as indicated by diffuse blotches of red blood cells in the microtube, may be clarified by centrifugation or filtration and retested.
- Specimens should not be exposed to extreme heat.

Precautions

- Do not use if turbid.
- Do not dilute.
- Do not freeze.
- Do not use beyond the expiration date.
- The S reagent contains <0.1% (w/v) sodium azide.
- The s reagent contains <0.1% (w/v) sodium azide.

CAUTION: Sodium azide may be toxic if ingested and may react with lead and copper plumbing to form explosive compounds. If discarded into sink, flush with a large volume of water to prevent azide buildup.

CAUTION: Source material from which this product is derived was found non-reactive for HBsAg, Anti-HIV 1/2 and Anti-HCV. No known test methods can offer complete assurance that products derived from human blood will not transmit infectious disease. Appropriate care should be taken in the use and disposal of this product. Source materials may include human components and antibody producing cells that are used in the manufacture of polyclonal and monoclonal products.

Procedure

Materials Provided

- ORTHO™ Sera Anti-S
- ORTHO™ Sera Anti-s

Materials Required but not Provided

- Isotonic saline
- Reagent red blood cells suitable for the control of Anti-S
- Reagent red blood cells suitable for the control of Anti-s
- MTS™ Anti-Human Globulin Anti-IgG Card
  
  NOTE: Store cards upright at 2–25 °C.

CAUTION: Inspect the condition of the card before use.

- Do not use gel cards that have not been shipped in an upright position.
- Do not use cards beyond expiration date.
- Do not freeze or expose cards to excessive heat.
- Use reagents as furnished.

- Micropipetters for delivery of 25 µL and 50 µL
- Pipet tips
- Marking pen
- MTS™ Centrifuge and MTS™ Incubator
  - or ORTHO™ Workstation
  - or ORTHO VISION® Analyzer
  - or ORTHO VISION® Max Analyzer
Test Procedure

NOTE:
The reagents have been standardized for use by the technique described below.

The indirect antiglobulin test procedure listed below is for manual testing only. When using instruments (see Materials Required but not Provided), follow the procedures that are contained in the operator’s manual provided by the device manufacturer.

Indirect Antiglobulin Test
1. Prepare an approximate 0.8% red blood cell suspension from patient or donor cells, using isotonic saline.
2. Allow the card and the reagent(s) to come to 18–25 °C before use. A clear liquid layer should appear on top of the opaque gel in each microtube.
3. Visually inspect gel cards before use.
   CAUTION: Do not use gel cards if the gel matrix is absent or the liquid level in the microtube is at or below the top of the gel matrix. Do not use gel cards that show signs of drying, discoloration, bubbles, crystals, or other artifacts. Do not use cards if foil seals appear damaged or opened.
   NOTE: Refer to the ID-Micro Typing System™ Interpretation Guide 4 for additional information related to the visual inspection of gel cards before use.
4. Label the card appropriately with a sample identifier.
5. Remove the foil seal from the MTS™ Anti-IgG Card or from the individual microtubes to be used for testing.
   CAUTION: Do not remove card foil seal until ready to use. Foil should be removed immediately before testing or within 1 hour of testing. Once opened, the gel may begin to dry out which could affect test results (refer to Limitations of the Procedure). After removing the foil, visually inspect all gel cards to ensure that residual film does not block the opening of any microtube.
6. Add 25 μL of the reagent to the appropriate reaction chamber(s) of the opened card.
   CAUTION: Do not touch the pipet to the side of the reaction chamber. If this occurs, change the pipet tip before proceeding to the next chamber.
7. Add 50 μL of 0.8% red blood cell suspension to the appropriate reaction chamber(s) of the card.
   CAUTION: Do not touch the pipet to the side of the reaction chamber. If this occurs, change the pipet tip before proceeding to the next chamber.
8. Observe that the contents of the reaction chamber(s) are combined. If necessary tap gently.
   NOTE: Assure that the reagents remain in the reaction chamber. There should be no mixing of reactants with reagents in the column prior to centrifugation.
9. Incubate at 37 °C ± 2 °C for 15 minutes.
10. Centrifuge the card at the preset conditions, as installed by the instrument manufacturer.
11. Read the front and back of the individual columns for macroscopic agglutination or hemolysis upon test completion.
12. Record the reaction strength.
Interpretation of Results

Negative Result = No agglutination and no hemolysis of the red blood cells is a negative test result. A complete sedimentation of all red blood cells is present in the bottom of the microtube.

Positive Result = Agglutination of the red blood cells is a positive test result. Red blood cells may remain suspended on the top of the gel or are dispersed throughout the gel in varying degrees. A few red blood cells may form a button in the bottom of the microtube in some positive reactions.

<table>
<thead>
<tr>
<th>Reaction Grading Guide (Use in conjunction with Diagram 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0 Negative</strong></td>
</tr>
<tr>
<td><strong>1+ Reaction</strong></td>
</tr>
<tr>
<td><strong>2+ Reaction</strong></td>
</tr>
<tr>
<td><strong>3+ Reaction</strong></td>
</tr>
<tr>
<td><strong>4+ Reaction</strong></td>
</tr>
<tr>
<td><strong>Mixed Field</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Caution must be taken in interpreting a reaction as mixed field. Additional patient history and testing will be necessary for resolution. However, not all mixed cell situations have a sufficient minor population to be detected.

**CAUTION:** Clots, particulates or other artifacts may cause some red blood cells to be entrapped at the top of the gel that may cause an anomalous result in a negative test (refer to Limitations of the Procedure, item 6.)

Diagram 1: Examples of Reaction Grades

**NOTE:** Refer to ID-Micro Typing System™ Interpretation Guide for additional information.

Stability of Reaction

For best results, it is recommended that reactions should be read immediately following centrifugation.
Quality Control

Quality Control (QC) of reagents is required. Quality Control should be performed on each lot of reagent on each day of use according to standard operating procedures.

Reagent red blood cells may be used direct from the vial as control cells in ORTHO Sera tests, including 0.8% Resolve® Panel A, 0.8% Resolve® Panel B, 0.8% Resolve® Panel C (Untreated Only), 0.8% Selectogen® and 0.8% Surgiscreen®.

Limitations of the Procedure

1. Strict adherence to the procedures and use of recommended equipment is essential.

3. Proper centrifuge calibration is particularly important to the performance of the MTS™ Anti-IgG Card. The MTS™ Centrifuge and ORTHO™ Workstation have been exclusively designed to provide the correct parameters for time and temperature.

5. Suppressed or weak expression of blood group antigens may give rise to false-negative reactions.

6. Anomalous results may be caused by the following:
   - Fibrin or particulate matter.
   - Red blood cells sticking to the sides of the reaction chamber.
   - Red blood cell samples from patients with Sickle Cell Disease and patients with Malignancy, where there may be a history of previous transfusion when using ORTHO™ Sera Anti-S.
   - DAT positive red blood cells.
   - Do not use cards that appear damaged (i.e., break in foil seal or break, crack or bubble in the column), exhibit drying (i.e., liquid level is at or below the top of the gel matrix) or exhibit discoloration (due to bacterial contamination, which can cause false reactions).
   - Loss of fluid in the card column may cause (weak) false positive results.
   - J reactions may occasionally be observed with high red blood cell concentrations. J reactions may also be observed if during centrifugation the cards is not seated properly in the holder or not allowed to spin at a 90° angle.
   - False positive or false negative test results can occur from bacterial or chemical contamination of test materials, inadequate incubation time or temperature, improper centrifugation, improper storage of materials, or omission of test samples.

7. Tests with these or other anomalous results should be repeated.

8. Erroneous results could occur if final reactions are not read upon completion of centrifugation.

9. Mixed cell populations may be encountered as a result of, for example, transfusion, fetal maternal hemorrhage, or transplantation. Consult patient history when results of this nature are encountered before assigning an antigen type.

10. Donor/Patient red blood cells must be diluted with isotonic saline, before adding the red blood cells to the microtube.

Performance Characteristics

Comparator Study Results

During comparator studies (data on file at Alba Bioscience Limited), blood samples were tested with ORTHO™ Sera Anti-S (Monoclonal) (IgG) and ORTHO™ Sera Anti-s (Monoclonal) (IgG) by ID-Micro Typing System™ Column Agglutination Technology (CAT) as follows:

Including all samples:

<table>
<thead>
<tr>
<th>Test</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% Agreement*</td>
</tr>
<tr>
<td>Anti-S</td>
<td>581</td>
<td>100.0</td>
</tr>
<tr>
<td>Anti-s</td>
<td>988</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Excluding DAT positive samples:

<table>
<thead>
<tr>
<th>Test</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% Agreement*</td>
</tr>
<tr>
<td>Anti-S</td>
<td>581</td>
<td>100.0</td>
</tr>
<tr>
<td>Anti-s</td>
<td>988</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* % Agreement between the ORTHO™ Sera Anti-S (Monoclonal) (IgG) or ORTHO™ Sera Anti-s (Monoclonal) (IgG) and comparator reagents only and does not indicate which reagents gave the correct results.

**Anti-S**

In performance evaluation studies, 1118 samples were tested with ORTHO™ Sera Anti-S (Monoclonal) (IgG) using the MTS™ Incubator and MTS™ Centrifuge. The one-sided exact 95% LCL of positive percent agreement was ≥99% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 97.3% for agglutination tests based on a comparison of interpreted results. The NPA did not meet the acceptance criteria due to eight discrepant results (see sample classification and comments in the summary table below).

The discordance between the trial and the comparator reagent could be attributed in six cases to the influence of the sample itself having a positive DAT result. Two discrepant samples which confirmed the initial result on repeat testing have no rational explanation that can be attributed to the discrepant results. For these remaining two samples, both are included in the classification ‘Sickle Cell Disease and patients with Malignancy’.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number of Discrepancies</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAT Positive</td>
<td>6</td>
<td>Reagents which use an IAT method are not recommended for testing of samples with a positive DAT.</td>
</tr>
<tr>
<td>Sickle Cell Disease and patients with Malignancy</td>
<td>2</td>
<td>Care should be taken when interpreting results, particularly where there may be a history of previous transfusion.</td>
</tr>
</tbody>
</table>

**Anti-s**

In performance evaluation studies, 1118 samples were tested with ORTHO™ Sera Anti-s (Monoclonal) (IgG) using the MTS™ Incubator and MTS™ Centrifuge. The one-sided exact 95% LCL of positive percent agreement was ≥99% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 95.2% for agglutination tests based on a comparison of interpreted results. The NPA did not meet the acceptance criteria due to two discrepant results (see sample classification and comments in the summary table below).

The discordance between the trial and the comparator reagent could be attributed in one instance to the influence of the sample itself having a positive DAT result and in one instance, where a change from the initial test outcome was noted, to a possible error with the comparator reagent test.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number of Discrepancies</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAT Positive</td>
<td>1</td>
<td>Reagents which use an IAT method are not recommended for testing of samples with a positive DAT.</td>
</tr>
<tr>
<td>Possible test error</td>
<td>1</td>
<td>ORTHO™ Sera Anti-s reagent and comparator reagent gave a concordant reaction on repeat testing.</td>
</tr>
</tbody>
</table>

Results were evaluated against comparable FDA approved products using the appropriate methods for the comparators.

Migration studies have been performed using the ORTHO™ Workstation and results were as follows:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Number of samples tested</th>
<th>Concordance*</th>
<th>Positive Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Frequency (%)</td>
<td>N</td>
</tr>
<tr>
<td>Anti-S</td>
<td>100</td>
<td>100%</td>
<td>45</td>
</tr>
<tr>
<td>Anti-s</td>
<td>100</td>
<td>100%</td>
<td>93</td>
</tr>
</tbody>
</table>

* Concordance indicates agreement between the ORTHO™ Workstation and the MTS™ Incubator/MTS™ Centrifuge only and does not indicate which systems gave the correct results.
Further migration studies have been performed for the ORTHO VISION® and ORTHO VISION® Max Analyzer. Comparator studies were performed using random samples and a screening test method was used to identify additional random samples of low antigen frequency. The performance of total samples is reported in the following paragraphs, as the unscreened and screened random sample totals show similar performance.

The results of the migration studies performed using the ORTHO VISION® Analyzer were as follows:

<table>
<thead>
<tr>
<th>Test</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% Agreement*</td>
</tr>
<tr>
<td>Anti-S</td>
<td>620</td>
<td>100.0</td>
</tr>
<tr>
<td>Anti-s</td>
<td>653</td>
<td>100.0</td>
</tr>
</tbody>
</table>

LCL: lower confidence limit
* Concordance indicates agreement between the ORTHO™ Workstation and the ORTHO VISION® Analyzer only and does not indicate which system gave the correct results.

**Anti-S**

In these migration studies, 1258 samples were tested with ORTHO™ Sera Anti-S (Monoclonal) (IgG) using the ORTHO™ Workstation and the ORTHO VISION® Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.5% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 98.6% for agglutination tests based on a comparison of interpreted results.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number of Discrepancies</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAT Positive</td>
<td>4</td>
<td>DAT positive following investigation. Small agglutinates may be present above the cell button resulting in a false positive result when graded by the ORTHO VISION® Analyzer.</td>
</tr>
</tbody>
</table>

**Anti-s**

In these migration studies, 961 samples were tested with ORTHO™ Sera Anti-s (Monoclonal) (IgG) using the ORTHO™ Workstation and the ORTHO VISION® Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.6% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 99.0% for agglutination tests based on a comparison of interpreted results.

The results of the migration studies performed using the ORTHO VISION® Max Analyzer were as follows:

<table>
<thead>
<tr>
<th>Test</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% Agreement*</td>
</tr>
<tr>
<td>Anti-S</td>
<td>618</td>
<td>100.0</td>
</tr>
<tr>
<td>Anti-s</td>
<td>675</td>
<td>100.0</td>
</tr>
</tbody>
</table>

LCL: lower confidence limit
* Concordance indicates agreement between the ORTHO VISION® Analyzer and the ORTHO VISION® Max Analyzer only and does not indicate which system gave the correct results.

**Anti-S**

In these migration studies, 1229 samples were tested with ORTHO™ Sera Anti-S (Monoclonal) (IgG) using the ORTHO VISION® Analyzer and the ORTHO VISION® Max Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.5% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 99.0% for agglutination tests based on a comparison of interpreted results.

**Anti-s**

In these migration studies, 975 samples were tested with ORTHO™ Sera Anti-s (Monoclonal) (IgG) using the ORTHO VISION® Analyzer and the ORTHO VISION® Max Analyzer. The one-sided exact 95% LCL of positive percent agreement was 99.6% for agglutination tests based on a comparison of interpreted results. The one-sided exact 95% LCL of negative percent agreement (NPA) was 99.0% for agglutination tests based on a comparison of interpreted results.
Precision Study Results
As part of the performance evaluation, precision and lot to lot studies were performed using multiple operators, days and runs to confirm repeatability and reproducibility of test results in the same run, day and with the same operator and between runs, days and operators. The study took account of variables such as days of the week, times of day and supplementary reagents used in the testing. There were no discordant results; all expected positive test outcomes generated unequivocal positive reactions and all expected negative test outcomes generated unequivocal negative reactions.

Specific Performance Characteristics
Prior to release, each lot of ORTHO™ Sera Anti-S (Monoclonal) (IgG) and ORTHO™ Sera Anti-s (Monoclonal) (IgG) are tested in alignment with FDA recommendations against a panel of antigen-positive and antigen-negative red blood cells to ensure suitable reactivity.

ORTHO™ Sera Anti-S (Monoclonal) (IgG) and ORTHO™ Sera Anti-s (Monoclonal) (IgG) Blood Grouping Reagents have been tested using the ID-Micro Typing System™ and when stored and used according to the recommended instructions for use, found to specifically agglutinate human red blood cells with the corresponding antigen.

The ORTHO™ Sera Anti-S (Monoclonal) (IgG) reagent reacts with cells expressing the S antigen and meets FDA potency requirements.
The ORTHO™ Sera Anti-s (Monoclonal) (IgG) reagent reacts with cells expressing the s antigen and meets FDA potency requirements.

For additional information or technical support, contact Ortho Care™ Technical Solutions Center at 1-800-421-3311.

Bibliography

Glossary of Symbols
The following symbols may have been used in the labeling of this product.
### Summary of Revisions

<table>
<thead>
<tr>
<th>Date of Revision</th>
<th>Version</th>
<th>Section</th>
<th>Description of Technical Changes*</th>
</tr>
</thead>
</table>
| 2020-08-26       | 5.0     | Specimen Collection | - Addition of CP2D with A3-3 to list of anticoagulant/additive solutions that can be used for the collection of donor blood.  
- Removal of "NOTE" that ORTHO™ Sera Anti-S (Monoclonal) (IgG) has not been validated with CP2D with A3-3 and should not be used with this anticoagulant/additive solution. |
| 2019-07-26       | 4.0     | Materials Required but not Provided  
Performance Characteristics | Added statement for migration study performed on ORTHO VISION® and ORTHO VISION® Max Analyzer.  
- Updated statement for migration study data for ORTHO VISION® Analyzer.  
- Addition of migration study data for ORTHO VISION® Max Analyzer. |
| 2019-01-30       | 3.0     | Specimen Collection  
Materials Required but not Provided | Removal of CP2D with A3-3 from statement: Donor blood collected in ACD, CPD, CP2D and CPDA-1 may be tested until the expiration date of the donation.  
- Addition of ORTHO VISION® Analyzer.  
- Changed agglutination to antiglobulin in first sentence.  
- Updated statement regarding using instruments.  
- Changed limitation #10: Donor/Patient red blood cells must be diluted with isotonic saline, before adding the red blood cells to the microtube.  
- Changed ORTHO ID-Micro Typing System™ to ID-Micro Typing System™.  
- Addition of migration study data for ORTHO VISION® Analyzer. |
| 2018-08-01       | 2.0     | Front page | Added Intended for Use in the United States to the header and US to the footer of the document.  
- Specific Performance Characteristics: Changed OCD Customer Technical Support to Ortho Care™ Technical Solutions Center.  
- Bibliography: Removed 'J' from Interpretation Guide publication number.  
- Glossary of Symbols: Serious Health Hazards and Caution symbols removed. |
| 2015-07-20       | 1.0     | Back page | Initial version of Instructions for Use. |

* The change bars indicate the position of a technical amendment to the text with respect to the previous version of the document.