

# Areta®

## Strep A Swab Test

Cat. No.: ARST-100S

### INTENDED USE

Areta Strep A Swab Test is a chromatographic immunoassay for the qualitative detection of Strep A antigen from throat swab specimens of symptomatic patients to aid in the diagnosis of Group A Streptococcal Infection. All negative test results should be confirmed by bacterial culture because negative results do not preclude Group A Strep infection and should not be used as the sole basis for treatment.

For *in vitro* diagnostic use.

### SUMMARY

Beta-hemolytic group A streptococcus is a common cause of upper respiratory infection in humans, most commonly resulting in pharyngitis. The highest rate of infection is found in children. The infection can lead to serious complications including rheumatic fever and acute glomerulonephritis. Rapid diagnosis and appropriate antibiotic therapy appear to be the best means of preventing these complications. The traditional means of detecting group A streptococcal infection involves 24-48 hour culture of throat swab specimens or other exudates, confirming beta-hemolysis, and showing susceptibility to bacitracin. Accurate rapid diagnosis aids physicians in administering the correct therapy. Areta Strep A Swab Test only needs 12 minutes to get the result after collecting the specimen.

### PRINCIPLE

Areta Strep A Swab Test utilizes double antibodies sandwich immunoassay for the detection of Group A Streptococcal antigen. The test strip has been pre-coated with rabbit anti- Strep A antibody on the test region and goat anti-rabbit antibody on the control region. When the strip is immersed into the specimen, the specimen is absorbed into the strip by capillary action, mixes with the antibody-dye conjugate, and flows across the pre-coated membrane.

When the group A streptococcal antigen level in the specimens is at or above the target cutoff (the detection limit of the test), the antigen binds to the antibody-dye conjugate and is captured by rabbit anti- Strep A antibody immobilized in the test region of the strip. This produces the colored band and indicates the positive result.

When the group A streptococcal antigen levels are zero or below the target cut off, there is no visible colored band in the test region of the strip. This indicates the negative result.

To serve as a procedure control, a colored line will appear at the control region if the test has been performed properly.

### PRECAUTIONS

1. This kit is for *in vitro* diagnostic use only. Do not swallow.
2. Do not interchange contents of different lot of kits.
3. Do not interchange caps of reagents.
4. Do not interchange caps of control solution bottles.
5. Do not use the test kit beyond the expiration date.
6. Do not use the test kit if the pouch is punctured or not well sealed.
7. Discard after use. The test kit cannot be used more than once.
8. The extraction tube and swab are for single use. Do not re-use.
9. Reagent A and B are caustic. Avoid contact with eyes, sensitive mucous membranes, cuts, and abrasions etc. If these reagents come in contact with the skin or eyes, flush with a large volume of water.
10. The control solutions contain sodium azide, which, on contact with lead or copper plumbing, may react to form explosive metal azides. Use the large volume of water to flush reagents on disposal.
11. Do not eat, drink or smoke in the area where the specimens and kits are handled.
12. All specimens should be treated as potentially infectious diseases specimens. Protection glove should be worn when handling the specimen. Wash hands thoroughly afterwards.
13. DISPOSAL OF THE DIAGNOSTIC: The used strip, swab and extraction tube have infectious risk. The process of disposing the diagnostic must follow the local infectious disposal law or laboratory rule.

### MATERIAL

#### Material Provided

1. Each pouch contains one test strip and one desiccant (The desiccant is for storage purpose only, and should not be used in the test procedure.)
2. One extraction tube per test
3. One throat swab per test
4. One extraction reagent A (7mL): 2.0 M sodium nitrite solution (Warning: R25 Toxic if swallowed)
5. One extraction reagent B (7mL): 0.4 M acetic acid solution
6. Two standard controls
  - Positive Control (1mL): Extracted (non-infective) group A streptococcus antigen in phosphate buffer containing 0.1% NaN<sub>3</sub>. (Warning: R22 Harmful if swallowed)
  - Negative Control (1mL): Phosphate buffer containing 0.1% NaN<sub>3</sub>. (Warning: R22 Harmful if swallowed)
7. One instruction for use
8. One procedure card

#### Material Required But Not Provided

- Timer

### STORAGE AND STABILITY

1. Store at 40°F~86°F (4°C ~ 30°C) in the sealed pouch up to the expiration date.
2. Keep away from sunlight, moisture and heat.
3. DO NOT FREEZE.

### SPECIMEN COLLECTION AND PREPARATION

1. Collect the throat swab specimen with the throat swab that is provided in the kit. Transport swabs containing modified Stuart's or Amies medium can also be used with this product.

Swab the posterior pharynx, tonsils and other inflamed areas. Avoid touching the tongue, cheeks and teeth with the swab.

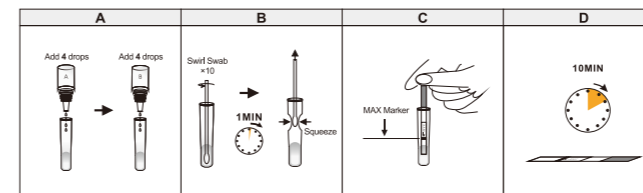
2. Testing should ideally be performed immediately after the specimens have been collected. Swab specimens may be stored at room temperature for up to four hours prior to testing. Note: A second swab may be collected for bacterial culture. Culture should only be conducted by laboratories that are appropriately certified and in accordance with established procedures and practices.

Procedure: If a single swab is collected, culture may be performed first by lightly rolling the swab tip onto a Group A selective (GAS) blood agar plate before using the swab for Areta Strep A Swab Test.

### TEST PROCEDURE

Allow the test strip and extraction reagents to equilibrate to room temperature 10°C ~30°C(50°F ~86°F) prior to testing.

1. Hold the Reagent A bottle upright and add 4 full drops (approximately 200 µL) to an extraction test tube. Hold the Reagent B bottle upright and add 4 full drops (approximately 200 µL) to the tube. Tap the bottom of the tube gently to mix the liquid.
2. Place the specimen throat swab into the tube. Swirl the swab for 10 times. Leave the swab in the tube for 1 minute. Then remove the swab while squeezing the swab tip against the inside of the extraction tube as remove it to expunge as much liquid as possible from the swab. Discard the swab. Mix contents of the tube by gently swirling. **The extraction specimen must be tested immediately.**
3. Remove the test strip from the sealed foil pouch by tearing at the notch. Immerse the strip into the extraction tube with the arrow pointing towards the specimen. **IMPORTANT:** Do not allow the specimen level to exceed the MAX Marker Line, otherwise the test will not perform correctly. Take the strip out after at least 5 seconds and lay the strip flat on a clean, dry, non-absorbent surface.
4. Wait for 10 minutes and read the results. Do not read results after 20 minutes.



### INTERPRETATION OF RESULTS

#### Positive (+)

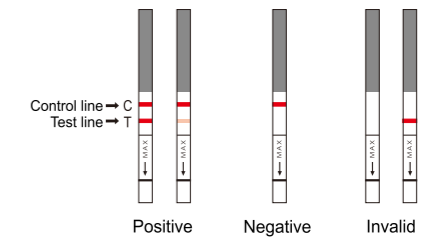
Colored bands are visible in both the control region and the test region. It indicates the positive result for Strep A antigen.

#### Negative (-)

A colored band is visible only in the control region. No color band appears in the test region. It indicates that the concentration of strep A antigen in specimen tested is zero or below the detection limit of the test.

#### Invalid

No visible band at all, or there is a visible band only in the test region but not in the control region. Repeat with a new test strip. If test still fails, please contact the distributor for technical assistance.



**Note:** There is no meaning attributed to line color, intensity, or width.

### QUALITY CONTROL

#### Internal Procedural Control

There is an internal procedural control line built in the strip. The appearance of this control band verifies that the test strip is intact and that the sufficient volume of specimen has migrated to the test reaction area. The internal control does not ensure that the strip is working correctly with patient specimen.

#### External Positive and Negative Controls

Good laboratory practice suggests the use of positive and negative controls to ensure that test reagents are working and the test is correctly performed, including the antigen extraction. Areta Strep A Swab Test Kit contains 1 positive control and 1 negative control. Run these controls:

- with each new test kit opened
- with each new operator

The positive control will produce the moderate positive result (two bands- one in the test region and the other in the control region) when the test has been performed correctly and the test strip is functioning properly. The negative control will yield the negative result (one band in control region only) when the test has been performed correctly and the test strip is functioning properly.

#### Procedure for External Quality Control Testing

Allow the strip, extraction reagents and controls to equilibrate to room temperature 50°F~86°F (10°C ~ 30°C) prior to testing.

1. Add 4 drops of extraction reagent A and 4 drops of extraction reagent B respectively into the extraction tube and fully mix.
2. After thoroughly mixing the control, add 3 drops of positive or negative control into this tube. Mix contents by gently swirling.
3. Continue with step 3 to step 5 of **Test Procedure**.

The use of positive and negative controls from other commercial strep A test kits has not been validated with Areta Strep A Swab Test.

## LIMITATIONS OF PROCEDURE

- This test is developed for testing throat swab specimen only. The performance of this test using other type of specimens has not been substantiated.
- This test is the qualitative screening assay. It is not designed to determine the quantitative concentration of group A streptococcal antigen in specimen.
- Pharyngitis can be caused by organisms other than group A streptococcus. This test does not provide any further information about pharyngitis other than the possibility of Strep A infection. If clinical signs and symptoms are not consistent with laboratory results, the follow-up throat culture and grouping procedure should be performed.
- The accuracy of the test depends on the quality of the throat swab sample. Avoid touching the tongue, cheeks, and teeth and any bleeding areas of the mouth with the swab when collecting samples.
- The negative result may be obtained due to poor sample collection, or at the onset of the disease due to the low antigen level below the detection limit of the test. If symptoms persist or intensify, re-test with newly collected specimen is recommended.
- As with other diagnostic tests, all results must be interpreted together with other clinical information available to the physician.
- This test detects both viable and non-viable Group A Streptococci and may yield the positive result in the absence of living organisms.
- This test does not differentiate between carriers and infected individuals.
- As recommended by the American Academy of Pediatrics, patients with symptoms but the test result is negative should have a follow-up culture test to rule out.
- The use of antibiotics or over-the-counter medications may suppress the growth of Group A Streptococcus in culture despite the presence of organisms detectable by rapid antigen tests.

## EXPECTED VALUES

Group A Streptococcus bacteria are responsible for about 19% of all upper respiratory tract infections. Infection is most prevalent in winter and early spring, with most cases arising in patients living in highly populated areas. In the multi-center clinical study conducted in 2011 ~2012, 28.9% (101/349) of the patients presenting with pharyngitis were found to be culture positive for Strep A.

## PERFORMANCE CHARACTERISTICS

### Sensitivity and Specificity

The clinical performance of Areta Strep A Swab Test was established in a multicenter, prospective clinical study conducted in 2011 ~2012 at six geographically diverse physician offices, clinics, and emergency departments in the United States. A total of 349 throat swab specimens were evaluated by comparing Areta Strep A Swab Test to culture method. Of the 349 total specimens, 248 were found to be negative by culture and 101 were found to be positive by culture.

Areta Strep A Swab Test Results	Culture Results		
	Positive	Negative	Total
Positive	96	4	100
Negative	5	244	249
Total	101	248	349

**Sensitivity:** (96/101) **95.0%** (95% confidence interval: 88.9~97.9%)

**Specificity:** (244/248) **98.4%** (95% confidence interval: 95.9% ~99.4%)

### Cross Reactivity

To confirm the analytical specificity (cross-reactivity) of Areta Strep A Swab Test, organisms

likely to be found in the respiratory tract, as listed below, were tested at 1 x 10<sup>8</sup> organisms per test and were all found to be negative when tested with Areta Strep A Swab Test.

Streptococcus Group B	Candida albicans	Neisseria meningitides
Streptococcus Group C	Corynebacterium diphtheriae	Neisseria mucosa
Streptococcus Group F	Enterococcus faecalis	Neisseria sicca
Streptococcus Group G	Enterococcus faecium	Neisseria subflava
Streptococcus salivarius	Escherichia coli	Proteus vulgaris
Streptococcus anginosus	Fusobacterium necrophorum	Pseudomonas aeruginosa
Streptococcus mitis	Haemophilus parahaemolyticus	Serratia marcescens
Streptococcus mutans	Haemophilus parainfluenzae	Staphylococcus marcescens
Streptococcus oralis	Haemophilus influenzae	Staphylococcus aureus
Streptococcus pneumoniae	Klebsiella pneumoniae	Staphylococcus epidermidis
Streptococcus sanguis	Moraxella catarrhalis	Staphylococcus haemolyticus
Arcanobacterium haemolyticum	Moraxella lacunata	Yersinia enterocolitica
Bordetella pertussis	Neisseria gonorrhoeae	Lactobacillus sp (Lactobacillus casei)
Branhamella catarrhalis	Neisseria lactamica	Mycobacterium tuberculosis avirulent
Streptococcus sp. (bovis II)	Enterovirus (VR-28 Human)	Human metapneumovirus (HMPV-27 A2)
Group D	Coxsackievirus	Adenovirus Type II
Cytomegalovirus	Adenovirus Type I	Epstein Barr Virus
HSV Type 1 (HF)	Human coronavirus OC43	Human parainfluenza (Types 1-4)
Mumps	Measles	Respiratory Syncytial virus
	Rhinovirus	VR-26

### Analytical Sensitivity

The minimum detection limit of the test is 1.5 x 10<sup>5</sup> organisms/mL. This was established by testing inactivated Streptococcus pyogenes with a known number of organisms, ATCC 20159. The organisms were serially diluted and tested by Areta Strep A Swab Test.

### Reproducibility Study

To investigate the reproducibility of Areta Strep A Swab Test, three lots of tests were utilized in this evaluation. This study was conducted two runs per day on 5 different days at three different sites by testing 4 blind samples. The 4 samples consisted of a true negative samples (diluent only), a moderate positive sample (2.3x10<sup>6</sup> organisms /mL), a cut-off sample (1.5x10<sup>5</sup> organisms /mL, C<sub>95</sub> concentration, approximately positive 95% of the time), and a low negative sample (0.4x10<sup>5</sup> organisms /mL). Six experienced professional operators who didn't know the sample number code participated in the study, for two operators at each testing site. Each operator tested two runs per day at each concentration sample with three lots of Areta Strep A Swab Test. A total of 30 determinations by each operator, at each concentration, were made. There was no significant difference to test results of Areta Strep A Swab Test by different users in different sites on different days.

### CLIA Waiver Studies

Areta Strep A Swab Test was further evaluated during 2014 at four additional geographically diverse clinical sites representative of the CLIA Waived environment. A total of 553 fresh, prospectively-collected specimens were evaluated with 30 intended users in comparison to bacterial culture. There were no invalid results during these trials. Of the 553 total specimens, 401 were found to be negative by culture and 152 were found to be positive by culture. The clinical study results are shown in the table below.

Areta Strep A Swab Test Results	Culture Results		
	Positive	Negative	Total
Positive	144	6	150
Negative	8	395	403
Total	152	401	553

**Sensitivity:** (144/152) **94.7%** (95% confidence interval: 90.0~97.3%)

**Specificity:** (395/401) **98.5%** (95% confidence interval: 96.8% ~99.3%)

A study was conducted to demonstrate that untrained intended users could perform the test consistently and accurately using panels of simulated samples, including one weak positive (C<sub>95</sub> - a concentration at the assay cutoff) and one weak negative (C<sub>5</sub> - a concentration just below the assay cutoff). The study was conducted at three sites representative of a CLIA Waived environment by 13 intended use operators. All samples were blinded labeled and randomized prior to even distribution amongst the three sites. Samples at each site were evenly distributed amongst the operators. The results of these studies are summarized in the table below.

Studies Near the Cut-Off	
Sample Type	% Detection (detected/total)
High Negative (C <sub>5</sub> )	4.4% (3/68)
Low Positive (C <sub>95</sub> )	97.0% (65/67)

## TECHNICAL SUPPORT

If you encounter technical problems or need technical support, please call us at 1-855-822-6999.

Email: [service@healthcare-manager.com](mailto:service@healthcare-manager.com)

## BIBLIOGRAPHY OF SUGGESTED READING

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- Shea, Y.R.** 1992. Specimen Collection and Transport, In Clinical Microbiology Procedures Handbook, Isenberg, HD., American Society of Microbiology, Washington, D.C., 1.1.1-1.1.30.
- Lauer BA, Reller LB and Mirrell S.** Effect of atmosphere and duration of incubation on primary isolation of group A streptococci from throat cultures. J. Clin. Microb. 17:338-340 (1983).

## INDEX OF SYMBOLS

	See instruction for use		Store between 40~86°F (4~30°C)		Do not reuse
	For in vitro diagnostic use only		Keep away from sunlight		Keep dry

Manufactured for **Easy Healthcare Corporation**

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**Any questions, please call toll-free 1-855-822-6999**

**M-F 9 a.m.-5 p.m. Central Time**

**CLIA WAIVED**

Version: 2021/12/01