Strep A Rapid Test Device (Swab)

REF **STA-S23001F20**

For *in vitro diagnose* use only

INTENDED USE

The Strep A Rapid Test Device (Swab)is a rapid visual immunoassay for the qualitative, presumptive detection of Group A *Streptococcus* antigens in human throat swab specimens. This kit is intended for use as an aid in the diagnosis of Strep A infection. It is for point of care use only.

INTRODUCTION

Beta-hemolytic Group A Streptococcus is a major cause of upper respiratory infections such as tonsillitis, pharyngitis, and scarlet fever. Early diagnosis and treatment of Group A Streptococcal pharyngitis has been shown to reduce the severity of symptoms and further complications, such as rheumatic fever and glomerulonephritis.

Conventional methods for detecting Strep A infection are dependent on isolation and subsequent identification of the organism, and often require 24-48 hours. Recent development of immunological techniques to detect Group A Streptococcal antigen directly from throat swabs allow physicians to diagnose and administer therapy immediately.

PRINCIPLE

The Strep A Rapid Test Device (Swab) detects Group A *Streptococcus* antigens through visual interpretation of color development on the internal strip. Anti-Strep A antibodies are immobilized on the test region of the membrane. During the test, the specimen reacts with polyclonal anti-Strep A antibodies conjugated to colored particles and precoated onto the sample pad of the test. The mixture then migrates through the membrane by capillary action and interacts with reagents on the membrane. If there is sufficient Strep A antigen in the specimen, a colored band will form at the test region of the membrane. The presence of this colored band indicates a positive result, while its absence indicates a negative result. The appearance of a colored band at the control region serves as a procedural control, indicating that proper volume of specimen has been added and membrane wicking has occurred.

MATERIALS

Materials Provided

• 20 Individually packed test devices	Each test contains colored conjugates and reactive reagents precoated at the corresponding regions.
• 1 bottle of Reagent 1	1.0 M sodium nitrite
• 1 bottle of Reagent 2	0.4 M acetic acid
• 20 Sterilized swabs	For specimen collection
• 20 Nozzle with filter	For adding specimens
• 20 Extraction tubes	For specimen preparation
• 1 tube stand	Place the Extraction tubes
• 1 Package insert	For operating instructions
• 1 Positive control	Non-viable Strep A; 0.09% sodium azide;PBS
• 1 Negative control	Not contain Group A Streptococcal;0.09% sodium azide;PBS

Materials Required but Not provided

- Timer

PRECAUTIONS

- For *in vitro* diagnostic use only.
- Do not use after the expiration date indicated on the package. Do not use the test if the foil pouch is damaged. Do not reuse tests.
- This kit contains products of animal origin. Certified knowledge of the origin and/or sanitary state of the animals does not completely guarantee the absence of transmissible pathogenic agents. It is therefore recommended that these products be treated as potentially infectious, and handled by observing usual safety precautions (e.g., do not ingest or inhale).
- Avoid cross-contamination of specimens by using a new extraction tube for each specimen obtained.
- Read the entire procedure carefully prior to testing.
- Do not eat, drink or smoke in any area where specimens and kits are handled. Handle all specimens as if they contain infectious agents. Observe established precautions against microbiological hazards throughout the procedure and follow standard procedures for the proper disposal of specimens. Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are assayed.
- Do not interchange or mix reagents from different lots. Do not mix solution bottle caps.
- Reagents 1 & 2 are slightly caustic. Avoid contact with eyes or mucous membranes. In the event of accidental contact, wash thoroughly with water.
- The positive control contains sodium azide, which may react with lead or copper plumbing to form potentially explosive metal azides. When disposing of these solutions always flush with copious amounts of water to prevent azide buildup.
- Humidity and temperature can adversely affect results.
- Used testing materials should be discarded according to local regulations.

STORAGE AND STABILITY

- The kit should be stored at 2-30°C until the expiry date printed on the sealed pouch.
- The test must remain in the sealed pouch until use.
- **Do not freeze.**
- Care should be taken to protect components in this kit from contamination. Do not use if there is evidence of microbial contamination or precipitation. Biological contamination of dispensing equipment, containers or reagents can lead to false results.

SPECIMEN COLLECTION AND STORAGE

Collect throat swab

- Instruct patient to open mouth as wide as possible.
- Direct the tip toward the tonsillar area. DO NOT touch the swab tip to any other area of the mouth, including the tongue.
- Rub the swab tip quickly and firmly over tonsillar area to obtain a throat swab.Remove swab from mouth (without touching any surface)

Storage

- It is recommended that swab specimens be processed as soon as possible after collection. If swabs are not processed immediately, they should be placed in a sterile, dry, tightly capped tube or bottle and refrigerated. Do not freeze. Swabs can be stored at room temperature (15-30℃) up to 4 hours, or refrigerated (2-8℃) up to 48 hours. All specimens should be allowed to reach room temperature (15-30℃) before testing.
- If a bacteria culture is desired, lightly roll the swab on a 5% sheep blood agar plate before using it in the test. The extraction reagents in the test will kill bacteria on the swabs and make them impossible to culture.

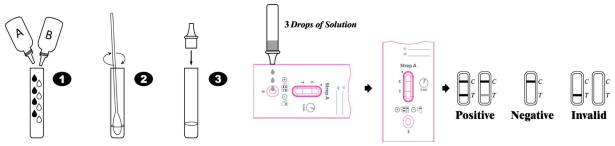
PROCEDURE

Bring tests, specimens, and/or controls to room temperature (15-30°C) before use.

1. Prepare swab specimens:
   - Place a clean extraction tube in the designated area of the tube stand. Add 4 drops of reagent 1 to the extraction tube, and then add 4 drops of reagent 2. Mix the solution by gently swirling the extraction tube.
   - Immediately immerse the swab into the extraction tube. Use a circular motion to roll the swab against the side of the extraction tube so that the liquid is expressed from the swab and can reabsorb.
   - Let stand for 1-2 minutes at room temperature, and then squeeze the swab firmly against the tube to expel as much liquid as possible from the swab. Discard the swab following guidelines for handling infectious agents.Attach the nozzle onto the extraction tube.
2. Remove the test from its sealed pouch, and place it on a clean, level surface. Label the device with patient or control identification. For best results, the assay should be performed within one hour.
3. Add 3 drops (approximately 120 µL) of extracted solution onto the sample well on the test device.

   Avoid trapping air bubbles in the specimen well (S), and do not add any solution to the observation window.

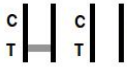
   As the test begins to work, color will migrate across the membrane.
4. Wait for the colored band(s) to appear. The result should be read at 5 minutes. Do not interpret the result after 10 minutes.



INTERPRETATION OF RESULTS

POSITIVE: Two colored bands appear on the membrane. One band appears in the control region (C) and another band appears in the test region (T).

NEGATIVE: Only one colored band appears, in the control region (C). No apparent colored band appears in the test region (T).



INVALID: Control band fails to appear. Results from any test which has not produced a control band at the specified read time must be discarded. Please review the procedure and repeat with a new test. If the problem persists, discontinue using the kit immediately and contact your local distributor.

NOTE:

1. The intensity of color in the test region (T) may vary depending on the concentration of analytes present in the specimen. Therefore, any shade of color in the test region should be considered positive. Note that this is a qualitative test only, and cannot determine the concentration of analytes in the specimen.
2. Insufficient specimen volume, incorrect operating procedure or expired tests are the most likely reasons for control band failure.

QUALITY CONTROL

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

  Operating Procedure for External Quality Control Testing

  a) Add 4 drops of reagent 1 and 4 drops of reagent 2 to an extraction tube.

  b) Thoroughly mix the control by shaking the bottle vigorously. Add 1 drop of positive control to the extraction tube.

  c) Place a clean sterile swab into the tube and swirl. Leave the swab in the extraction tube for 1 minute. Then express the liquid from the swab head by rolling the swab against the inside of the extraction tube and squeezing the extraction tube as the swab is withdrawn. Discard the swab.

  d) Continue as described from Step 2 of the Procedure section, above.
- If controls do not yield expected results, do not use the test. Repeat the test or contact your distributor.

LIMITATIONS OF THE TEST

1. The Strep A Rapid Test Device (Swab) is for *in vitro* diagnostic use, and should only be used for the qualitative detection of Group A *Streptococcus*. No meaning should be inferred from the color intensity or width of any apparent bands.
2. The accuracy of the test depends on the quality of the swab specimen. False negatives may result from improper specimen collection or storage. A negative result may also be obtained from patients at the onset of the disease due to low antigen concentration.
3. The test does not differentiate asymptomatic carriers of Group A *Streptococcus* from those with symptomatic infection. If clinical signs and symptoms are not consistent with laboratory test results, a follow-up throat culture is recommended.
4. Respiratory infections, including pharyngitis, can be caused by streptococci from serogroups other than Group A, as well as other pathogens.
5. As with all diagnostic tests, a definitive clinical diagnosis should not be based on the results of a single test, but should only be made by the physician after all clinical and laboratory findings have been evaluated.

PERFORMANCE CHARACTERISTICS

Clinical Performance:

The clinical performance of the Strep A Rapid Test Device (Swab) was established in a multicenter prospective clinical study in 2019.02 – 2019.12 at three geographically diverse sites. A total of 329 throat swabs were collected from patients exhibiting symptoms of pharyngitis. Each swab was rolled onto a sheep blood agar plate for culture tests, and then tested by the Strep A Rapid Test Device(. Of the 329 total specimens, 156 were found to be positive (+) by culture and 173 were found to be negative (-) by culture. These test results are summarized in the following tables.

Clinical Summary of Strep A Rapid Test Device

		Culture tests		Total
		+	-	
Strep A Rapid Test Device	+	152	1	153
	-	4	172	176
	Total	156	173	329

Diagnostic Sensitivity: 97.4% (93.6% ~ 99.0%)
Diagnostic Specificity: 99.4% (96.8% ~ 99.9%)
Overall Agreement: 98.5% (96.5% ~ 99.3%)

Analytical Sensitivity (Limit of Detection)

Inactivated S. pyogenes was diluted in this negative clinical matrix pool to generate various dilutions for testing

The Limit of Detection (LoD) of the Strep A Rapid Test Device (Swab) was determined using limiting dilutions of the *S. pyogenes*. Throat swabs from healthy donors were collected and eluted with PBS. The swab eluates were combined and mixed thoroughly to create a negative clinical matrix pool to be used as the diluent. Inactivated *S. pyogenes* was diluted in this negative clinical matrix pool to generate virus dilutions for testing. The contrived throat swab samples were prepared and 10 µL of each dilution was spiked onto the swab. The contrived swab samples were processed and tested according to the package insert.

The assay sensitivity of the device was determined to be 1.0×10^5organisms/mL.

Cross-reactivity Study

All microorganisms in the following table (virus $1.0\times10^5$$TCID_{50}$/ml except that Epstein Barr Virus was tested at 1.0×10^6 copies/mL and bacteria 1.0×10^7cfu/mL) were tested using the Strep A rapid test device, and the results showed no cross-reaction.

Bordetella pertussis	*Neisseria meningitidis*
Candida albicans	*Pseudomonas aeruginosa*
Corynebacterium diphtheriae	*Staphylococcus aureus*
Enterococcus faecalis	*Staphylococcus epidermidis*
Escherichia coli	*Streptococcus agalactiae*
Fusobacterium necrophorum	*Streptococcus anginosus*
Haemophilus influenzae	*Streptococcus mitis*
Haemophilus parahaemolyticus	*Streptococcus mutans*
Haemophilus parainfluenzae	*Streptococcus oralis*
Klebsiella pneumoniae	*Streptococcus pneumoniae*
Moraxella catarrhalis	*Streptococcus salivarius*

Neisseria gonorrhea	*Streptococcus sanguinis*
Adenovirus type 1	Human metapneumovirus A2
Adenovirus type 2	Influenza A (H1N1)
Adenovirus type 3	Influenza A (H1N1)pdm09
Adenovirus type 4	Influenza A (H3N2)
Adenovirus type 5	Influenza B Victoria lineage
Adenovirus type 7	Influenza B Yamagata lineage
Adenovirus type 55	Parainfluenza virus 1
Coxsackievirus A16	Parainfluenza virus 2
Coxsackie virus A24	Parainfluenza virus 3
Coxsackievirus B1	Parainfluenza virus 4
Epstein Barr Virus	Respiratory syncytial virus A
Echovirus	Respiratory syncytial virus B
Human coronavirus 229E	Rhinovirus A30
Human coronavirus NL63	Rhinovirus B52
Human coronavirus OC43	

Interfering Substances Study

The following substances, naturally present in respiratory specimens or artificially introduced into the respiratory tract, were evaluated at the concentrations listed below. None of them were found to affect the test performance of the Strep A Rapid Test Device (Swab).

Interferents	Concentration
Whole blood	4%
Mucin	2.5mg/mL
Cepacol® Sore Throat Lozenges (benzocaine/menthol)	3mg/mL
Yu® Oxymetazoline Hydrochloride Spray	15%v/v
Fangchen® Physiological Seawater Nasal Spray	15%v/v
Chloroseptic® Sore Throat spray (Phenol, Glycerin)	15%v/v
Listerine Mouthwash (Eucalyptol, menthol, Methyl Salicylate, Thymol)	5% v/v
Qiangnuo® Dextromethorphan Hydrobromide and Guaifenesin Syrup	5% v/v
Emergen-C (Zinc, Magnesium, Riboflavin, Vitamin C)	80mg/mL
Nyquil (Acetaminophen, Doxylamine succinate, Dextromethorphan HBr)	5% v/v
Toothpaste (Colgate)	0.5% v/v
Robitussin	5% v/v
Cotinine	0.03g/mL
Alcohol (Ethanol)	5%v/v
(±)-Phenylephrine-d3 hydrochloride solution	15%v/v
Mupirocin	10mg/mL
Oseltamivir phosphate	5mg/mL
Acetylsalicylic acid	10mg/mL
Albuterol	10mg/mL
Chlorpheniramine	5mg/mL
Dexamethasone	50μg/mL
Dextromethorphan	10μg/mL
Diphenhydramine	5mg/mL
Zanamivir	10mg/mL
Triamcinolone	1mg/mL

Hook effect

No high dose hook effect was observed when tested with up to a concentration of 1×10^{10}organisms/mL of inactivated *S. pyogenes* with the Strep A Rapid Test Device (Swab).

Reproducibility

Reproducibility has been determined by using the precision panel containing negative, moderate positive,low positive and high negative. 3 different lots have been tested using these specimens by 6 operators at 3 different sites(2 operators at each site) over 5 days. The coincidence rate > 95%. The result are consistent between the different lots, sites and operators.

LITERATURE REFERENCES

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GLOSSARY OF SYMBOLS

REF	Catalog number		Temperature limitation
	Consult instructions for use	LOT	Batch code
IVD	*In vitro* diagnostic medical device		Use by
	Manufacturer		Do not reuse
	Contains sufficient for <n>tests		

Distributed by:

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