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A

BD Directigen™ EZ Group A Strep Test

A rapid test for the qualitative detection of Strep A antigen in throat swab specimens. For professional *in vitro* diagnostic use.

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INTENDED USE

The Directigen™ EZ Group A Strep Test is a rapid chromatographic immunoassay for the qualitative detection of Strep A antigen from throat swab specimens to aid in the diagnosis of group A streptococcal infection.

SUMMARY AND EXPLANATION

Streptococcus pyogenes is a non-motile gram-positive coccus, which contains the Lancefield group A antigen that can cause serious infections such as pharyngitis, respiratory infection, impetigo, endocarditis, meningitis, puerperal sepsis, and arthritis.¹ Left untreated, these infections can lead to serious complications, including rheumatic fever and peritonsillar abscess.² Traditional identification procedures for group A streptococcal infection involve the isolation and identification of viable organisms using techniques that require 24 to 48 hours or longer.³

Rapid diagnosis and early antibiotic therapy of group A streptococcal infection appear to be the best means of preventing medical complications and reducing the spread of the disease.⁴

The Directigen EZ Group A Strep Test is a rapid test to qualitatively detect the presence of Strep A antigen in throat swab specimens, providing results within 5 minutes. The test utilizes antibodies specific for whole cell Lancefield group A *Streptococcus* to selectively detect Strep A antigen in a throat swab specimen.

PRINCIPLES OF THE PROCEDURE

The Directigen EZ Group A Strep Test is a qualitative, lateral flow immunoassay for the detection of Strep A carbohydrate antigen in a throat swab. In this test, antibody specific to Strep A carbohydrate antigen is coated on the test line region of the strip. During testing, the extracted throat swab specimen reacts with an antibody to Strep A that is coated onto particles. The mixture migrates up the membrane to react with the antibody to Strep A on the membrane and generate a red line in the test region. The presence of this red line in the test region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a red line will always appear in the control region indicating that proper volume of specimen has been added and membrane wicking has occurred.

REAGENTS

Directigen EZ Group A Strep Test:

Test Devices (25)
Disposable Extraction Test Tubes (25)
Extraction Tube Tips (25)
Sterile Swabs (25)
Reagent A (10 mL), 2 M Sodium Nitrite
Reagent B (10 mL), 0.4 M Acetic Acid
Positive Control (1 mL), Non-viable Strep A; 0.09% NaN₃
Negative Control (1 mL), Non-viable Strep C; 0.09% NaN₃
Workstation
Test Tube Holder

Warnings and Precautions

For professional *in vitro* diagnostic use.

Do not use after expiration date.

Do not eat, drink or smoke in the area where the specimens and kits are handled. Pathogenic microorganisms, including hepatitis viruses and Human Immunodeficiency Virus, may be present in clinical specimens. "Standard Precautions"⁵⁻⁸ and institutional guidelines should be followed in handling all items contaminated with blood and other body fluids.

Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are assayed.

Humidity and temperature can adversely affect results; therefore, test the device at room temperature (15–30°C) as soon as it is removed from the pouch.

Reagent B contains an acidic solution. If the solution contacts the skin or eye, flush with large volumes of water.

The positive and negative controls contain sodium azide (NaN₃) as a preservative.

Do not interchange kit reagents.

Do not interchange reagent bottle caps.

Do not interchange external control solution bottle caps.

Storage and Stability

The kit can be stored at room temperature or refrigerated (2–30°C). The test device must remain in the sealed pouch until use. DO NOT FREEZE. The test device and the reagents are stable through the expiration date printed on the box. Do not use beyond the expiration date.

SPECIMEN COLLECTION AND HANDLING

Only use components provided in the kit.

Collect the throat swab specimen with the sterile 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.⁹

Testing should ideally be performed immediately after the specimens have been collected. Swab specimens may be stored in clean, dry plastic tubes for up to 8 h at room temperature or 72 h at 2–8°C.

If a culture is desired, lightly roll the swab tip onto a group A selective blood agar plate before using the swab in the Directigen EZ Group A Strep Test.

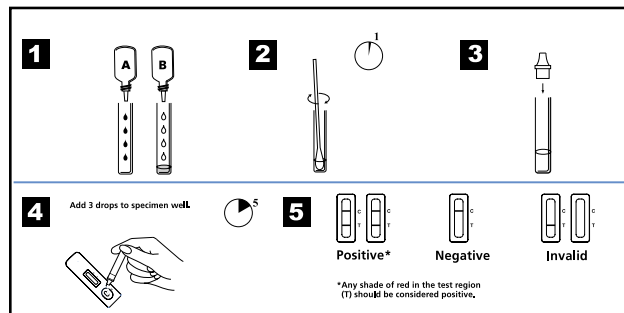
PROCEDURE

Materials Provided: See "Reagents."

Materials Required But Not Provided: Timer

Test Procedure: Allow the test device, reagents, and/or controls to reach room temperature (15–30°C) prior to testing.

- In order to obtain accurate results, the test should be performed immediately after opening the pouch. Remove the test device from the sealed foil pouch and use it as soon as possible.
- Hold the Reagent A bottle upright and add 4 full drops (approximately 240 µL) to an extraction test tube. Reagent A is red in color. Hold the Reagent B bottle upright and add 4 full drops (approximately 160 µL) to the tube. Reagent B is colorless. Mix the solution by gently swirling the extraction test tube. The addition of Reagent B to Reagent A changes the color of the solution from red to yellow (see Illustration 1).
- Immediately add the throat swab into the extraction test tube of pale yellow solution. Agitate the swab 10 times in the tube. Leave the swab in the tube for 1 min. Then press the swab against the side of the tube and squeeze the bottom of the tube as the swab is withdrawn so most of the liquid stays in the tube. Discard the swab (see Illustration 2).
- Fit the dropper tip on top of the extraction test tube (see Illustration 3). Place the test device on a clean and level surface. Add 3 full drops of solution (approximately 100 µL) into the specimen well (S) (see Illustration 4) and then start the timer.
- Wait for the red line(s) to appear. Read the result at 5 min. Do not read the result after 10 min. (see Illustration 5).



INTERPRETATION OF RESULTS

(Refer to illustration 5)

POSITIVE: Two distinct red lines appear. One line should be in the control region (C) and another line should be in the test region (T). A positive result indicates that Strep A antigen was detected in the sample.

NOTE: The intensity of the red color in the test line region (T) will vary depending on the concentration of Strep A antigen present in the sample. Therefore, any shade of red in the test region (T) should be considered positive.

NEGATIVE: One red line appears in the control region (C). No apparent red or pink line appears in the test region (T). A negative result indicates that Strep A antigen is not present in the sample, or is present below the detectable level of the test. The patient's sample should be cultured to confirm the absence of Strep A infection. If clinical symptoms are not consistent with results, obtain another sample for culture.

INVALID: Control line fails to appear. Insufficient sample 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 device. If the problem persists, discontinue using the test kit immediately and contact BD Technical Services at 800-638-8663.

QUALITY CONTROL

Internal Quality Control

Internal procedural controls are included in the test. A red line appearing in the control region (C) is an internal positive procedural control. It confirms sufficient specimen volume and correct procedural technique. A clear background is an internal negative procedural control. If the test is working properly, the background in the result area should be white to light pink and not interfere with the ability to read the test result.

External Quality Control

It is recommended that a positive and negative external control be run every 25 tests and as deemed necessary by your internal laboratory procedures. External positive and negative controls are supplied in the kit.

Alternatively, other group A and non-group A *Streptococcus* ATCC™ reference strains may be used as external controls. Some commercial controls may contain interfering preservatives; therefore, other commercial controls are not recommended.

Procedure for External Quality Control Testing

- Add 4 full drops of Reagent A and 4 full drops of Reagent B into an extraction test tube. Tap the bottom of the tube gently to mix the liquid.
- Add 1 full drop of positive or negative control solution into the tube, holding the bottle upright.
- Place a clean swab into the tube. Rotate the swab 10 times in the tube. Leave the swab in the tube for 1 min. Then press the swab against the side of the tube and squeeze the bottom of the tube while removing the swab so that most of the liquid stays in the tube. Discard the swab.
- Continue with Step 4 of Test Procedure.

Quality control requirements must be performed in accordance with applicable local, state and/or federal regulations or accreditation requirements and your laboratory's standard Quality Control procedures. It is recommended that the user refer to pertinent CLSI (formerly NCCLS) guidance and CLIA regulations for appropriate Quality Control practices.

LIMITATIONS OF THE PROCEDURE

- The Directigen EZ Group A Strep Test is for *in vitro* diagnostic use only. The test should be used for the detection of Strep A antigen in throat swab specimens only. Neither the quantitative value nor the rate of increase in Strep A antigen concentration can be determined by this qualitative test.
- This test will only indicate the presence of Strep A antigen in the specimen from both viable and non-viable group A *Streptococcus* bacteria.
- A negative result obtained from this kit should be confirmed by culture. A negative result may be obtained if the concentration of the Strep A antigen present in the throat swab is not adequate or is below the detectable level of the test.
- Excess blood or mucus on the swab specimen may interfere with test performance and may yield a false positive result. Avoid touching the tongue, cheeks, and teeth⁹ and any bleeding areas of the mouth with the swab when collecting specimens.
- As with all diagnostic tests, all results must be interpreted together with other clinical information available to the physician.

EXPECTED VALUES

Approximately 15% of pharyngitis in children ages 3 months to 5 years is caused by group A beta-hemolytic *Streptococcus*.¹⁰ In school-aged children and adults, the incidence of Strep throat infection is about 40%.¹¹ This disease usually occurs in the winter and early spring in temperate climates.³

PERFORMANCE CHARACTERISTICS

Sensitivity and Specificity

Using three medical centers for evaluation, a total of 492 throat swabs were collected from patients exhibiting symptoms of pharyngitis. Each swab was rolled onto a Strep A selective blood agar plate, and then tested by the **Directigen EZ Group A Strep Test**. The plates were further streaked for isolation, and then incubated at 37°C with 5–10% CO₂ and a bacitracin disk for 18–24 h. The negative culture plates were incubated for an additional 18–24 h. Possible group A *Streptococcus* colonies were subcultured and confirmed with a commercially available latex agglutination grouping kit. Of the 492 total specimens, 384 were found to be negative by culture and 108 were found to be positive by culture.

Pediatric Population:

		Culture	
		+	-
Directigen EZ Group A Strep Test	+	91	6
	-	5	300

Sensitivity: 91/96 = 95% (88%–98%)*

Specificity: 300/306 = 98% (96%–99%)*

Accuracy: 391/402 = 97% (95%–99%)*

Adult Population:

		Culture	
		+	-
Directigen EZ Group A Strep Test	+	11	1
	-	1	77

Sensitivity: 11/12 = 92% (62%–100%)*

Specificity: 77/78 = 99% (93%–100%)*

Accuracy: 88/90 = 98% (92%–100%)*

Combined Population:

		Culture	
		+	-
Directigen EZ Group A Strep Test	+	102	7
	-	6	377

Sensitivity: 102/108 = 94% (88%–98%)*

Specificity: 377/384 = 98% (96%–99%)*

Accuracy: 479/492 = 97% (96%–98%)*

* Denotes a 95% Confidence Interval

Positive Culture Classification	Directigen EZ Group A Strep Device/Culture	% Correct
Rare	2/3 =	67
1+	9/9 =	100
2+	24/27 =	89
3+	18/20 =	90
4+	49/49 =	100

Cross-Reactivity

The following organisms were tested at 1.0 x 10⁷ organisms per test and were all found to be negative when tested with the **Directigen EZ Group A Strep Test**. No mucoid-producing strains were tested.

<i>Bordetella pertussis</i>	<i>Neisseria sicca</i>
<i>Branhamella catarrhalis</i>	<i>Neisseria subflava</i>
<i>Candida albicans</i>	<i>Pseudomonas aeruginosa</i>
<i>Corynebacterium diphtheriae</i>	<i>Serratia marcescens</i>
<i>Enterococcus faecalis</i>	<i>Staphylococcus aureus</i>
<i>Escherichia coli</i>	<i>Staphylococcus epidermidis</i>
Group B <i>Streptococcus</i>	<i>Streptococcus anginosus</i>
Group C <i>Streptococcus</i>	<i>Streptococcus intermedius</i>
Group F <i>Streptococcus</i>	<i>Streptococcus mitis</i>
Group G <i>Streptococcus</i>	<i>Streptococcus mutans</i>
<i>Hemophilus influenzae</i>	<i>Streptococcus oralis</i>
<i>Klebsiella pneumoniae</i>	<i>Streptococcus pneumoniae</i>
<i>Neisseria gonorrhoeae</i>	<i>Streptococcus sanguinis</i>
<i>Neisseria meningitidis</i>	

POL Studies

Three physicians' offices were used to conduct an evaluation of the **Directigen EZ Group A Strep Test**. Personnel with various educational backgrounds performed the testing. Each physician's office tested a randomly coded panel of samples consisting of negative (20), low positive (20), and medium positive (20) for three days. The results obtained had a 100% correlation with the expected results.

AVAILABILITY

Cat. No.	Description
256032	Directigen™ EZ Group A Strep Test , 25 test kit

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CLIA Category Moderately Complex

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