

Clostridium difficile GDH+ Toxin A +Toxin B
Combo Rapid Test Cassette (Faeces)
Package Insert

REF ICD-635	English
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In vitro rapid diagnostic test for the detection of Clostridium difficile GDH, Toxin A and Toxin B antigen in human faeces samples
For professional use only.

[INTENDED USE]

The *Clostridium difficile* GDH +Toxin A +Toxin B Combo Rapid Test Cassette (Faeces) is a rapid chromatographic immunoassay for the qualitative detection of *Clostridium difficile* GDH, Toxin A and Toxin B in the human faeces specimen.

[SUMMARY]

Clostridium difficile is an anaerobic bacteria acting as an opportunistic pathogen; it grows in the intestine when the normal flora has been altered by treatment with antibiotics.^{1,2,3} Toxinogenic strains of *Clostridium difficile* cause infections from mild-diarrhea to pseudomembranous colitis, potentially leading to death.⁴

Disease is caused by two toxins produced by toxinogenic strains of *C.difficile*: Toxin A (tissue-damaging enterotoxin) and Toxin B (cytotoxin). Some strains produce both toxins A and B, some others produce Toxin B only. The potential role of a third (binary) toxin in pathogenicity is still debated.⁴

The use of Glutamate Dehydrogenase (GDH) as an antigen marker of *C.difficile* proliferation has been shown to be very effective because all strains produce high amount of this enzyme.^{5,6}

Clostridium difficile + Toxin A +Toxin B Combo Rapid Test Cassette allows the detection of GDH, Toxin A and Toxin B specific to *C. difficile* in faecal specimen.

[PRINCIPLE]

Clostridium difficile Rapid Test Cassette detects three distinct antigens in faecal specimens for *C. difficile*, viz., GDH, Toxin A and Toxin B on three different test strips in a single test cassette, thus simultaneously detecting three antigens specific of *Clostridium difficile*.

For C. difficile-specific GDH Testing

The membrane is precoated with anti-*C.diff*.GDH antibody on the test line region. During testing, the specimen reacts with the particle coated with anti-*C.diff* GDH antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-*C.diff* GDH antibody on the membrane and generate a coloured line.

For C. difficile-specific Toxin A Testing

The membrane is precoated with anti-*C.diff*. Toxin A antibody on the test line region. During testing, the specimen reacts with the particle coated with anti-*C.diff* Toxin A antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-*C.diff* Toxin A antibody on the membrane and generate a coloured line. The presence of this coloured line in the test line region indicates a positive result, while its absence indicates a negative result.

For C. difficile-specific Toxin B Testing

The membrane is precoated with anti-*C.diff* Toxin B antibody on the test line region. During testing, the specimen reacts with the particle coated with anti-*C.diff* Toxin B antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-*C.diff* Toxin B antibody on the membrane and generate a coloured line. The presence of this coloured line in the test line region indicates a positive result, while its absence indicates a negative result.

To serve as a procedural control, a coloured line will always appear in the control line region of all the three test strips, indicating that the proper volume of specimen has been added and membrane wicking has occurred.

[REAGENTS]

The test cassette contains anti-*Clostridium difficile* GDH, anti-*Clostridium difficile* Toxin A and anti-*Clostridium difficile* Toxin B particles gold conjugate pair with anti-*Clostridium difficile* GDH, anti-*Clostridium difficile* Toxin A and anti-*Clostridium difficile* Toxin B coated on the membrane.

[PRECAUTIONS]

- For professional in vitro diagnostic use only. Do not use after expiration date.
- The test should remain in the sealed pouch until use.
- Do not eat, drink or smoke in the area where the specimens or kits are handled.
- Handle all specimens as if they contain infectious agents. Observe established precautions against microbiological hazards throughout all procedures and follow the standard procedures for proper disposal of specimens.
- Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are assayed.
- The used test should be discarded according to local regulations.
- Humidity and temperature can adversely affect results.

[STORAGE AND STABILITY]

Store as packaged at room temperature or refrigerated (2-30°C). The test is stable through the expiration date printed on the sealed pouch. The test must remain in the sealed pouch until use. **DO NOT FREEZE.** Do not use beyond the expiration date

[SPECIMEN COLLECTION AND PREPARATION]

The stool specimens must be tested as soon as possible after collection. If necessary, original faeces specimen could be stored at 2-8°C for 3 days or -20°C for longer periods of time; extracted specimen in buffer could be stored at 2-8°C for 1 week or -20°C for longer periods of time. Make sure that the specimens are not treated with solutions containing formaldehyde or its derivatives.

[MATERIAL]

- | | | |
|------------------|------------------|--|
| • Test cassettes | • Package Insert | • Specimen collection tube with buffer |
| • Droppers | | |

Materials required but not provided

- Stool container

[PROCEDURE]

Allow the test, specimen, stool collection buffer and/or control to equilibrate to room temperature (15-30°C) prior to testing.

1. To collect faecal specimens:

Collect sufficient quantity of faeces (1-2mL or 1-2g) in a clean, dry specimen collection container to obtain enough antigens (if present). Best results will be obtained if the assay is performed within 6 hours after collection. Specimen collected may be stored for 3 days at 2-8°C if not tested within 6 hours. For long term storage, specimens should be kept below -20°C.

2. To process faecal specimens:

- For **Solid Specimens**:

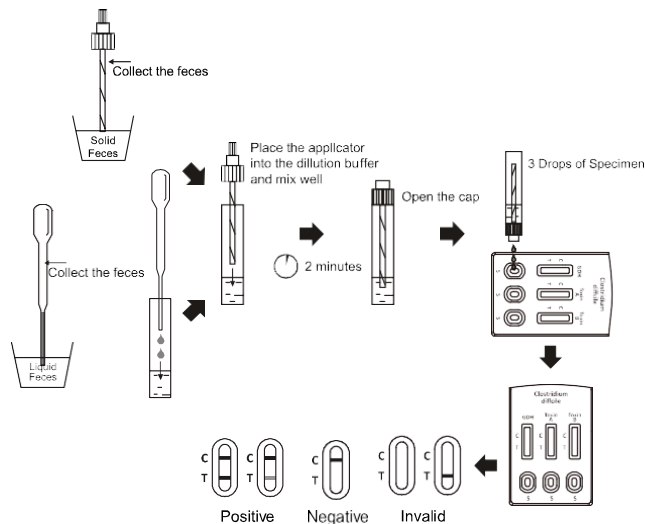
Unscrew the cap of the specimen collection tube, then randomly **stab the specimen collection applicator into the faecal specimen at least 3 different sites** to collect approximately **50 mg of faeces** (equivalent to 1/4 of a pea). Do not scoop the faecal specimen.

- For **Liquid Specimens**:

Hold the dropper vertically, aspirate faecal specimens, and then transfer **2 drops of the liquid specimen** (approximately 80 µL) into the specimen collection tube containing the extraction buffer.

Tighten the cap onto the specimen collection tube, then **shake the specimen collection tube vigorously** to mix the specimen and the extraction buffer. Leave the collection tube for reaction for 2 minutes.

3. Bring the pouch to room temperature before opening it. Remove the test cassette from the foil pouch and use it as soon as possible. Best results will be obtained if the test is performed immediately after opening the foil pouch.
4. Hold the specimen collection tube upright and **unscrew the tip** of the specimen collection tube. Invert the specimen collection tube and **transfer 3 full drops of the extracted specimen** (approximately 120 µL) to each specimen well of the test cassette, then start the timer. Avoid trapping air bubbles in the specimen well (S). See illustration below.
5. Read the results at **10 minutes** after dispensing the specimen. Do not read results after 20 minutes.
6. **Note:** If the specimen does not migrate (presence of particles), centrifuge the diluted sample contained in the extraction buffer vial. Collect 120µL of supernatant, dispense into the specimen well (S). Start the timer and continue from step 5 onwards in the above instructions for use.



[INTERPRETING RESULTS]

The test results appear in three different test windows respectively for GDH, Toxin A or Toxin B. The interpretation criteria remain the same for positivity or negativity for specific antigens under tests as per indication of the respective Test window. The results are to be interpreted as follows:

POSITIVE: Two distinct coloured lines appear. One coloured line should be in the control line region (C) and another apparent coloured line should be in the test line region (T).

***NOTE:** The intensity of the colour in the test line region (T) will vary depending on the concentration of *Clostridium difficile* antigens present in the specimen. Therefore, any shade of colour in the test line region (T) should be considered positive.

NEGATIVE: One coloured line appears in the control line region (C). No line appears in the test line region (T).

INVALID: Control line (C) fails to appear. Insufficient specimen 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 cassette. If the problem persists, discontinue using the test kit immediately and contact your local distributor.

[QUALITY CONTROL]

An internal procedural control is included in the test. A coloured line appearing in the control line region (C) is an internal positive procedural control. It confirms sufficient specimen volume, adequate membrane wicking and correct procedural technique.

Control standards are not supplied with this kit; however, it is recommended that positive and negative controls be tested as a good laboratory practice to confirm the test procedure and to verify proper test performance.

[LIMITATION]

1. The *Clostridium difficile* GDH +Toxin A +Toxin B Combo Rapid Test Cassette (Faeces) is for in vitro diagnostic use only.

2. The test is qualitative and cannot predict the quantity of antigens present in the sample. Clinical presentation and other test results must be taken into consideration to establish diagnosis.

3. A positive test does not rule out the possibility that other pathogens may be present.

[EXPECT VALUE]

In a healthy individual's faecal specimens, *Clostridium difficile* test should give negative test result for any of the antigens tested. *The Clostridium difficile* GDH+Toxin A+Toxin B Combo Rapid Test Cassette (Faeces) has been compared with another leading commercial rapid test. The correlation between two system is 98.5% for *C.diff* GDH and 98.5% for *C.diff* Toxin A+Toxin B.

[PERFORMANCE]

Detection Limit

Detection limit values of *Clostridium difficile* GDH+Toxin A+Toxin B Combo Rapid Test Cassette was 1ng/ml for GDH, 2ng/ml for Toxin A and 1ng/ml for Toxin B.

Sensitivity - Specificity

Clostridium difficile GDH Results

Method		Other Rapid Test		Total Results
<i>Clostridium difficile</i> GDH +Toxin A +Toxin B Combo Rapid Test Cassette (Faeces)	Results	Positive	Negative	
	Positive	78	2	80
	Negative	1	119	120
Total Results		79	121	200

Relative Sensitivity: 98.7% (95%CI: *93.1%-100%)

Relative Specificity: 98.3% (95%CI: *94.2%-99.8%)

Relative Accuracy: 98.5% (95%CI: *95.7%-99.7%)

*Confidence Intervals

Clostridium difficile Toxin A +Toxin B Results

Method		Other Rapid Test		Total Results
<i>Clostridium difficile</i> GDH +Toxin A +Toxin B Combo Rapid Test Cassette (Faeces)	Results	Positive	Negative	
	Positive	56	2	58
	Negative	1	141	142
Total Results		57	143	200

Relative Sensitivity: 98.2% (95%CI: *90.6%-99.9%)

Relative Specificity: 98.6% (95%CI: *95.0%-99.8%)

Relative Accuracy: 98.5% (95%CI: *95.7%-99.7%)

*Confidence Intervals

Repeatability and reproducibility

To check intra-batch accuracy (repeatability), the same positive samples and a buffer solution were processed 15 times on kits of the same production batch in the same experimental conditions. All observed results were confirmed as expected to check inter-batch accuracy (reproducibility), some samples (positive and buffer) were processed on kits from three different production batches. All results were confirmed as expected.

Cross Reactivity

An evaluation was performed to determine the cross reactivity of *Clostridium difficile* GDH +Toxin A +Toxin B Combo Rapid Test Cassette (Faeces). No cross reactivity against gastrointestinal pathogens occasionally present as follows:

<i>Campylobacter coli</i>	<i>Salmonella enteritidis</i>	<i>Shigella dysenteriae</i>
<i>Campylobacter jejuni</i>	<i>Salmonella paratyphi</i>	<i>Shigella flexneri</i>
<i>E.coli</i> O157:H7	<i>Salmonella typhi</i>	<i>Shigella sonnei</i>
<i>H.pylori</i>	<i>Salmonella typhimurium</i>	<i>Staphylococcus aureus</i>
<i>Listeria monocytogenes</i>	<i>Shigella boydii</i>	<i>Yersinia enterocolitica</i>

[BIBLIOGRAPHIC REFERENCES]

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2. E. J. Kuijper, B. Coignard and P. Tüll: *Emergence of Clostridium difficile-associated disease in North America and Europe*, Review Clinical Microbiology and Infections, 12 suppl 6, p. 2-18, Oct. 2006
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4. Ramsey L., et al: *Fulminant Clostridium difficile: an underappreciated and increasing cause of death and complications*, Annals of Surgery 235 (3) p. 363-372: Mar. 2002
5. Wren MW., Kinson R., Sivapalan M., Shemko M., Shetty NR.: *Detection of Clostridium difficile infection: a suggested laboratory diagnostic algorithm*, British Journal of Biomedical Sciences, 66(4) p. 175-179, 2009.
6. Willis DH. And JA Kraft: *Confirmation that the latex-reactive protein of Clostridium difficile is a Glutamate Dehydrogenase*. Journal of clinical microbiology, 30, p. 1363-1364, May 1992

Index of Symbols			
	Attention, see instructions for use		Tests per kit
	For in vitro diagnostic use only		Use by
	Store between 2-30°C		Lot Number
	Do not use if package is damaged		Catalog #
			Authorized Representative
			Do not reuse
			Do not reuse

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