MAYO CLINIC LABORATORIES

Test Definition: CDIFS

Clostridioides difficile Culture with Antimicrobial Susceptibilities, Varies

Overview

Useful For

Providing an isolate suitable for antimicrobial susceptibility testing to direct antimicrobial therapy of extraluminal infections and in cases of treatment failure

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
ANAID	Anaerobe Ident	No, (Bill Only)	No
RMALA	Id MALDI-TOF Mass Spec Anaerobe	No, (Bill Only)	No
ISAN	Anaerobe Ident by Sequencing	No, (Bill Only)	No
SANA	Anaerobe Suscep per agent	No, (Bill Only)	No
BATTA	Anaerobe Suscep Battery	No, (Bill Only)	No

Testing Algorithm

When this test is ordered, the reflex tests may be performed and charged separately. Isolates of *Clostridioides (Clostridium) difficile* (1,2) will automatically have susceptibility testing performed and billed as appropriate. Antimicrobial agents appropriate to the organism and specimen source will be tested according to Mayo's practice and the laboratory's standard operating procedures.

See Anaerobic Bacteria Antimicrobials in Special Instructions to review the table which provides a listing of the antimicrobials routinely tested in our laboratory as well as antimicrobials that may be tested upon request. If the antimicrobial of interest is not listed in this table, contact Mayo Clinic Laboratories at 800-533-1710 and ask to speak to the Bacteriology Anaerobe Laboratory.

Anaerobe susceptibilities battery will routinely be performed at an additional charge. If fewer than 3 antibiotics will be reported, then anaerobe susceptibilities battery will be canceled and anaerobe susceptibilities per agent will be charged per antibiotic tested. Based on susceptibility criteria, anaerobe susceptibilities per agent may be performed at an additional charge.

Special Instructions

- Anaerobic Bacteria Antimicrobials

Highlights

Culture provides definitive evidence of the presence of the bacterium *Clostridioides* (*Clostridium*) *difficile* in feces, providing an isolate for antimicrobial susceptibility testing.

Susceptibility testing of *C difficile* isolates may be warranted in cases of treatment failure, or when used to guide therapy

of extraluminal infections.

Method Name
Conventional Culture Technique with Minimum Inhibitory Concentration (MIC) by Agar Dilution

NY State Available
Yes

Specimen

Specimen Type
Varies

Ordering Guidance
Culture is **not the preferred diagnostic test** for *Clostridioides difficile*. For routine diagnostic testing, order CDPCR / *Clostridioides difficile* Toxin, PCR, Feces

Necessary Information
Specimen source is required.

Specimen Required
Submit only 1 of the following specimens:

Patient Preparation: Patient should not use antacids, barium, bismuth, antidiarrheal medication, zinc oxide paste, Vagisil cream or oily laxatives prior to specimen collection.

Preferred:
Specimen Type: Preserved feces
Supplies: Culture and Sensitivity Stool Transport Vial (T058); Stool Collection Kit, Random (T635)
Container/Tube: Commercially available transport system specific for recovery of enteric pathogens from fecal specimens (15 mL of non-nutritive transport medium containing phenol red as a pH indicator, either Cary-Blair or Para-Pak C and S [T058])
Specimen Volume: Representative portion of feces; 5 mL
Collection Instructions:
1. Collect 1 gram or 5 mL fresh fecal specimen and submit in container with transport medium.
2. Place feces in preservative within 2 hours of collection.
Additional Information: Only diarrheal (ie., unformed) feces should be tested. Testing formed feces for *C difficile* is not clinically indicated.
Specimen Stability Information: Ambient (preferred) 96 hours/Refrigerated 96 hours/Frozen 7 days

Acceptable:
Specimen Type: Unpreserved feces

Supplies: Stool container, Small (Random), 4 oz (T288); Stool Collection Kit, Random (T635)
Specimen Volume: Representative portion of stool
Collection Instructions: Collect fresh stool and submit representative sample in stool container.
Specimen Stability Information: Ambient (preferred) 72 hours/Frozen 7 days
Additional Information: Only diarrheal (i.e., unformed) stool should be tested. Testing formed stool for *C difficile* is not clinically indicated.
Specimen Stability Information: Ambient (preferred) 72 hours/Frozen 7 days

Specimen Type: Fresh tissue or biopsy
Sources: Colon
Supplies: Anaerobe Transport Tube (T588)
Specimen Volume: Entire collection, 1-2 cm(3)
Collection Instructions: Aseptically collect a 1-2 cm(3) piece of tissue whenever possible. In general, a larger piece of tissue is preferred. Submit in an anaerobic transport tube.
Specimen Stability Information: Ambient 72 hours

Specimen Minimum Volume

Stool: 1 gram or 5 mL
Tissue: 5 mm(3)

Reject Due To

Fecal swab Specimen in Ecofix	Reject

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Varies	Varies		

Clinical & Interpretive

Clinical Information

Clostridioides difficile can cause diarrhea and may cause pseudomembranous colitis. Overgrowth of toxin-producing *C difficile* in the colon leads to the production of toxins A and/or B by the organism, and subsequent diarrhea. *C difficile* infection should be suspected in patients with symptoms of diarrhea with risk factors such as current or recent use of antibiotics, history of *C difficile* infection, current or recent hospitalization or placement in a nursing home or long-term care facility, over 65 years of age, and gastric acid suppression. *C difficile* infection is the most common cause of diarrhea in hospitalized patients and may lead to serious complications, including sepsis, bowel perforation, and increased overall mortality (especially in elderly patients). The incidence of *C difficile* infection has risen in the community and in healthcare settings. While culture is not the preferred means to diagnose *C difficile*-associated diarrhea, culture for *C difficile* provides an isolate suitable for antimicrobial susceptibility testing.

Susceptibility testing routinely includes metronidazole and vancomycin. Routine antimicrobial susceptibility testing of *C difficile* isolates associated with intestinal infection is not suggested.(4,5) Recent Infectious Diseases Society of America and Society for Healthcare Epidemiology of America guidelines provide treatment guidance for *C difficile* infection based on clinical course and history rather than measured minimal inhibitory concentrations of isolates.(6) Susceptibility testing of *C difficile* isolates may be warranted in cases of treatment failure, or when used to guide therapy of extraluminal infections.

Note that this test does not differentiate between toxin-producing and nontoxigenic strains of *C difficile*.

Reference Values

No growth of *Clostridioides difficile*.

Susceptibility results are reported as minimal inhibitory concentration (MIC) in mcg/mL. Breakpoints (also known as clinical breakpoints) are used to categorize an organism as susceptible, susceptible-dose dependent, intermediate, resistant, or nonsusceptible according to breakpoint setting organizations, either the Clinical and Laboratory Standards Institute (CLSI) or the European Committee on Antimicrobial Susceptibility Testing (EUCAST), as applicable.

In some instances, an interpretive category cannot be provided based on available data; therefore, the following comment will be included on the report: There are no established interpretive guidelines for agents reported without interpretations.

For information regarding CLSI and EUCAST susceptibility interpretations, see Susceptibility Interpretative Category Definitions.

Interpretation

A positive result indicates the presence of viable *Clostridioides difficile* in stool.

A positive culture may be found with asymptomatic *C difficile* colonization with a toxin-producing or non-toxin-producing strain, or with *C difficile*-associated diarrhea.

A negative result indicates the absence of *C difficile* growth in culture.

Isolation of *C difficile* does not differentiate between toxin-producing and non-toxin-producing strains.

Refer to the Reference Values section for interpretation of various antimicrobial categories.

Cautions

The assay must be performed on fresh feces, fresh-frozen feces, or feces in transport medium. Only diarrheal (ie, unformed) feces should be tested.

Submission of more than 1 specimen for testing is not recommended.

Repeated testing during a single episode of diarrhea is not recommended.

Testing of asymptomatic patients (ie, without diarrhea) or for test of cure is not recommended.

Patients may asymptomatically carry *C difficile*.

Testing of specimens collected by colostomy, ileostomy, or colonoscopy has not been validated.

When antimicrobial susceptibilities are performed, in vitro susceptibility does not guarantee clinical response. Therefore, the decision to treat with a particular agent should not be based solely on the antimicrobial susceptibility testing result.

Supportive Data

Fifty fecal specimens in Cary Blair transport media that were previously determined as positive for *Clostridioides difficile* by toxin PCR were subcultured directly onto CHROMagar *C difficile* plates. Plates were incubated under anaerobic conditions at 37 degrees C for 24 hours in accordance with the manufacturer's recommendation. *C difficile* identification was performed by matrix assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS) directly from bacterial colony growth on CHROMagar plates. Using this method, *C difficile* was identified from 47 of 50 fecal specimens, corresponding to a 94% recovery rate. Two specimens that did not yield *C difficile* on CHROMagar media also failed to produce growth on conventional *C difficile* selective media (taurochocolate, cycloserine, cefoxitin, fructose agar; TCCFA). One specimen was recovered by the TCCFA media, but not by the CHROMagar *C difficile* media. Organisms other than *C difficile* were not recovered on CHROMagar, corresponding to 100% analytical specificity.

Metronidazole clinical breakpoints are interpreted according to Clinical and Laboratory Standards Institute (CLSI) guidelines. For *C difficile*, an epidemiological cutoff value (ECV) of less than or equal to 2 mcg/mL (wild-type) and greater than or equal to 4 mcg/mL (non-wild type) is applied for vancomycin, according to CLSI guidelines. If *C difficile* strains were to acquire a resistance gene or undergo gene mutation resulting in reduced susceptibility, vancomycin minimal inhibitory concentration (MIC) values of greater than or equal to 4 mcg/mL would be expected. When considering vancomycin therapy for *C difficile* infection, clinical breakpoints have not been established due to lack of sufficient data on clinical outcomes by MIC.(7,8) It is suggested that susceptibility testing of *C difficile* isolates and interpretation of results be discussed with appropriate clinical specialists (eg, infectious diseases and/or pharmacy).

Clinical Reference

1. Lawson PA, Citron DM, Tyrrell KL, Finegold SM. Reclassification of *clostridium difficile* as *clostridioides difficile* (Hall and O'Toole 1935) Prevot 1938. Anaerobe. 2016;40;95-99. doi:10.1016/j.anaerobe.2016.06.008
2. Oren A, Garrity GM. List of new names and new combinations previously effectively, but not validly, published. Int J Syst Evol Microbiol, 2016;66(7):2463-2466. doi:10.1099/ijsem.0.001149
3. CLSI: Performance Standards for Antimicrobial Susceptibility Testing. 32nd edition. CLSI Supplement M100. Wayne, PA. Clinical and Laboratory Standards Institute. 2023
4. McDonald LC, Gerding DN, Johnson S, et al. Clinical practice guidelines for *clostridium difficile* Infection in adults and children: 2017 update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis. 2018;66(7):987-994)
5. Schuetz AN, Carpenter DE: Susceptibility test methods: anaerobic bacteria. In: Carroll KC, Pfaller MA, eds. Manual of Clinical Microbiology. 12th ed. ASM Press; 2019:1377-1397
6. Johnson S, Lavergne V, Skinner AM, et al. Clinical practice guidelines by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA): 2021 focused update guidelines on management of

clostridioides difficile infection in adults. Clin Infect Dis. 2021;73(5):e1029-e1044
7. Snydman DR, McDermott LA, Jacobus NV, et al. U.S.-Based National Sentinel Surveillance Study for the epidemiology of *clostridium difficile*-associated diarrheal isolates and their susceptibility to fidaxomicin. Antimicrob Agents Chemother. 2015;59(10):6437-6443. doi:10.1128/AAC.00845-15
8. Goldstein EJ, Citron DM, Tyrrell KL, Merriam CV. Comparative in vitro activities of SMT19969, a new antimicrobial agent, against *clostridium difficile* and 350 gram-positive and gram-negative aerobic and anaerobic intestinal flora isolates. Antimicrob Agents Chemother. 2013;57(10):4872-4876. doi:10.1128/AAC.01136-13
6. Johnson S, Lavergne V, Skinner AM, et al. Clinical practice guidelines by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA): 2021 focused update guidelines on management of *clostridioides difficile* infection in adults. Clin Infect Dis. 2021;73(5):e1029-e1044

Performance

Method Description

Specimens are directly inoculated onto a chromogenic *C difficile* plate which is incubated anaerobically at 35 to 37 degrees C for 24 hours. Plates are observed for characteristic fluorescence using ultraviolet light at 365 nm. Fluorescent colonies are identified by MALDI-TOF MS or 16S ribosomal RNA gene sequencing.(Instruction manual: CHROMagar *C. difficile*, NT-EXT-077, Version 9, Available at www.CHROMagar.com)

The agar dilution method is used for routine susceptibility testing. The antimicrobial is added to agar in various concentrations depending upon levels attainable in serum. A standardized suspension of the organism is applied to the agar plates, which are incubated anaerobically for 42 to 48 hours at 35 to 37 degrees C. The end point is that in which a marked reduction occurs in the appearance of growth on the test plate as compared to that of growth on the control plate. Examples of marked change include a change from confluent growth to a haze, less than 10 tiny colonies, or 1 to 3 normal-sized colonies.(CLSI. Methods for Antimicrobial Susceptibility Testing of Anaerobic Bacteria. 9th ed. CLSI standard M11. Wayne PA, CLSI, 2018)

PDF Report

No

Day(s) Performed

Monday through Sunday

Report Available

2 to 9 days

Specimen Retention Time

7 days

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

87081-*C. difficile* Culture
87076-Anaerobe Ident (if appropriate)
87076-Id MALDI-TOF Mass Spec Anaerobe (if appropriate)
87153-Anaerobe Ident by Sequencing (if appropriate)
87181-Anaerobe Susceptibility per agent (if appropriate)
87181 x 3-Antimicrobial Susceptibility, Anaerobic Bacteria, MIC (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
CDIFS	C. difficile Culture + Susc	105047-5

Result ID	Test Result Name	Result LOINC® Value
CDIFS	C. difficile Culture + Susc	105047-5