

## Overview

### Useful For

Detecting disease-causing aerobic bacteria in specimens from patients with cystic fibrosis

Determining the in vitro antimicrobial susceptibility of potentially pathogenic aerobic bacteria, if appropriate

### Reflex Tests

| Test Id | Reporting Name                      | Available Separately | Always Performed |
|---------|-------------------------------------|----------------------|------------------|
| COMM    | Identification Commercial Kit       | No, (Bill Only)      | No               |
| RMALD   | Ident by MALDI-TOF mass spec        | No, (Bill Only)      | No               |
| GID     | Bacteria Identification             | No, (Bill Only)      | No               |
| ISAE    | Aerobe Ident by Sequencing          | No, (Bill Only)      | No               |
| REFID   | Additional Identification Procedure | No, (Bill Only)      | No               |
| SALS    | Serologic Agglut Method 1 Ident     | No, (Bill Only)      | No               |
| EC      | Serologic Agglut Method 2 Ident     | No, (Bill Only)      | No               |
| SHIG    | Serologic Agglut Method 3 Ident     | No, (Bill Only)      | No               |
| STAP    | Identification Staphylococcus       | No, (Bill Only)      | No               |
| STRP    | Identification Streptococcus        | No, (Bill Only)      | No               |
| MIC     | Susceptibility, MIC                 | No, (Bill Only)      | No               |
| SUS     | Susceptibility                      | No, (Bill Only)      | No               |
| SIDC    | Ident Serologic Agglut Method 4     | No, (Bill Only)      | No               |
| PCRID   | Identification by PCR               | No, (Bill Only)      | No               |
| MECAB   | mecA PCR Test, Bill Only            | No, (Bill Only)      | No               |

### Testing Algorithm

When this test is ordered, the reflex tests may be performed at an additional charge. Antimicrobial agent appropriate to the organism and specimen source will be tested according to Mayo Clinic's practice.

The following tables provide a listing of the antimicrobials routinely tested in the laboratory as well as antimicrobials

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that may be tested upon request. These tables are organized by isolate groups and are not all inclusive. Call 800-533-1710 and ask to speak to the Bacteriology Antimicrobial Susceptibility Testing Laboratory if the organism or antimicrobial of interest are not listed in these tables.

[-Aerobic Gram-Negative Bacilli Antimicrobials](#)

[-Additional Gram-Negative Bacteria Antimicrobials](#)

[-Staphylococcus, Enterococcus, Bacillus, and Related Genera Antimicrobials](#)

[-Additional Gram-Positive Bacteria Antimicrobials](#)

### Special Instructions

- [Aerobic Gram-Negative Bacilli Antimicrobials](#)
- [Additional Gram-Negative Bacteria Antimicrobials](#)
- [Staphylococcus, Enterococcus, Bacillus, and Related Genera Antimicrobials](#)
- [Additional Gram-Positive Bacteria Antimicrobials](#)

### Method Name

Conventional Culture Technique with Minimal Inhibitory Concentration (MIC) (Agar Dilution or Broth Microdilution or Gradient Diffusion) or Disk Diffusion (if appropriate)

### NY State Available

Yes

## Specimen

### Specimen Type

Varies

### Shipping Instructions

Specimen must be received in laboratory within 48 hours of collection at refrigerated temperature. Specimens received frozen will be rejected.

### Necessary Information

Specimen source is required

### Specimen Required

Submit only 1 of the following specimens:

#### Preferred:

**Specimen Type:** Sputum, expectorated or induced

**Patient Preparation:** Have the patient brush their teeth or gargle with water immediately before specimen collection. This reduces the number of contaminating oropharyngeal bacteria.

**Container/Tube:** Sterile container

**Specimen Volume:** Entire collection

**Acceptable:**

**Specimen Type:** Bronchial aspirate or washing, sinus aspirate, bronchoalveolar lavage, endotracheal, or tracheal

**Container/Tube:** Sterile container

**Specimen Volume:** Entire collection

**Specimen Type:** Throat swab

**Supplies:**

Culturette (BBL Culture Swab) (T092)

BD E-Swab (T853)

**Container/Tube:** Culture transport swab (Dacron or rayon swab with aluminum or plastic shaft with either Stuart or Amies liquid medium), or ESwab

**Specimen Volume:** Entire collection

**Forms**

If not ordering electronically, complete, print, and send a [Microbiology Test Request](#) (T244) with the specimen.

**Specimen Minimum Volume**

See Specimen Required

**Reject Due To**

|          |        |
|----------|--------|
| Dry swab | Reject |
|----------|--------|

**Specimen Stability Information**

| Specimen Type | Temperature  | Time     | Special Container |
|---------------|--------------|----------|-------------------|
| Varies        | Refrigerated | 48 hours |                   |

**Clinical & Interpretive**

**Clinical Information**

Life expectancy of patients with cystic fibrosis (CF) has increased steadily over the past 50 years, in large part due to improvements in the management of lung disease in this patient population. Still, chronic lung infection is responsible for 75% to 85% of deaths in patients with CF. Appropriate treatment for the causative organism can reduce morbidity and mortality.

The number of microbial species associated with CF lung disease is relatively limited. These include *Pseudomonas aeruginosa* (mucoid and nonmucoid), *Staphylococcus aureus*, *Burkholderia cepacia* complex, *Stenotrophomonas maltophilia*, other non-fermenting gram-negative rods, *Haemophilus influenzae*, and *Streptococcus pneumoniae*. Nontuberculous mycobacteria and *Aspergillus* species may also play a role in CF lung disease, in addition to common respiratory viruses. This culture is specifically designed and utilizes conventional and additional selective media (compared to non-CF respiratory cultures) to isolate bacteria commonly associated with pulmonary disease in patients

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with CF.

In selected centers, lung transplantation is performed on patients with CF. This test is appropriate for lung transplant patients with underlying CF because they can continue to harbor the same types of organisms as they did pretransplantation. Patients with CF may be colonized or chronically infected by these organisms over a long period of time.

Antimicrobial susceptibility testing determines the minimal inhibitory concentration (MIC) value of selected antimicrobial agents against isolated potentially pathogenic bacteria. The MIC is the lowest antimicrobial concentration (of a series of increasing concentrations) that inhibits growth of the bacterium. Agar dilution MIC testing is performed by testing for growth of bacteria on agar plates containing varying concentrations of antimicrobial agents.

For each organism-antimicrobial agent combination, the Clinical and Laboratory Standards Institute and/or the European Committee on Antimicrobial Susceptibility Testing provide interpretive criteria for determining whether the MIC should be interpreted as susceptible, susceptible-dose dependent, intermediate, nonsusceptible, resistant, or epidemiological cutoff value.

**Reference Values**

No growth or usual microbiota

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 negative test result is no growth of bacteria or growth of only usual microbiota. A negative result does not rule out all causes of infectious lung disease. For more information, see Cautions.

Organisms associated with lower respiratory tract infections are reported.

For positive test results, disease-causing bacteria are identified. Patients with cystic fibrosis may be colonized or chronically infected by some organisms over a long period of time, therefore, positive results must be interpreted in conjunction with previous findings and the clinical picture to appropriately evaluate results.

A susceptible category result and a low minimum inhibitory concentration value indicate in vitro susceptibility of the organism to the antimicrobial tested.

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For interpretation of various antimicrobial susceptibility interpretive categories (ie, susceptible, susceptible-dose dependent, intermediate, nonsusceptible, resistant, or epidemiological cutoff value), see Reference Values.

**Cautions**

When culture of sputum is delayed, successful isolation of bacterial pathogens is less likely, due to the overgrowth of usual oropharyngeal microbiota.

Some bacterial agents that cause lower respiratory infections (eg, *Mycobacteria*, *Legionella* species, *Mycoplasma pneumoniae*) are not detected by this assay and require special procedures. If the bacterial culture is negative, clinicians should consider additional testing to detect other bacterial, viral, or fungal agents.

Results must be interpreted in conjunction with clinical findings and previous culture results.

When antimicrobial susceptibilities are performed, in vitro antimicrobial 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.

**Clinical Reference**

1. Miller JM, Binnicker MJ, Campbell S, et al. A guide to utilization of the microbiology laboratory for diagnosis of infectious diseases: 2018 Update by the Infectious Diseases Society of America and the American Society for Microbiology. *Clin Infect Dis*. 2018;67(6):e1-e94. doi:10.1093/cid/ciy381
2. York MK, Gilligan P, Alby K: Lower respiratory tract cultures. In: Leber AL, ed. *Clinical Microbiology Procedures Handbook*, Vol 1, 4th ed. ASM Press; 2016:section 3.11.2
3. LiPuma JJ, Currie BJ, Peacock SJ, VanDamme PAR: *Burkholderia*, *Stenotrophomonas*, *Ralstonia*, *Cupriavidus*, *Pandoraea*, *Brevundimonas*, *Comamonas*, *Delftia*, and *Acidovorax*. In: Carroll KC, Pfaller MC, eds. *Manual of Clinical Microbiology*. 12th ed. ASM Press; 2019:807-828

**Performance****Method Description**

Standard media (5% sheep blood, chocolate, and eosin methylene blue agar plates) used for respiratory cultures are inoculated. In addition, 2 selective agar plates are utilized to enable isolation of slower growing pathogens that may be easily overgrown by usual microbiota and the longstanding colonization by *Pseudomonas aeruginosa*. *Burkholderia cepacia* Selective Agar plate is used for the isolation of *B cepacia* complex, which includes 20 distinct species. Isolates of *B cepacia* will be forwarded to the University of Michigan's CFF Research Testing and Repository for genotyping. There is no additional charge for this shipping/testing. A chromogenic *Staphylococcus aureus* agar is used to enhance the isolation of *S. aureus*. Finally, a second chocolate blood agar plate is incubated in an anaerobic atmosphere. The anaerobic atmosphere allows for detection of *Haemophilus* species that may otherwise be overgrown by *P. aeruginosa*. Pathogens or possible pathogens are identified using 1 or a combination of the following techniques: commercial identification strips or panels, matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, conventional biochemical tests, carbon source utilization, real-time polymerase chain reaction, and nucleic acid

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sequencing of the 16S ribosomal RNA (rRNA) gene.(Gilligan P, Alby K, York MK: Respiratory cultures from cystic fibrosis patients. In: Leber AL, ed. Clinical Microbiology Procedures Handbook, Vol 1, 4th ed. ASM Press; 2016:section 3.11.3)

When antimicrobial susceptibility testing is performed, an agar dilution method is used for routine testing. The agar dilution method employs the use of antimicrobial agents incorporated in agar plates. The antimicrobial is added to agar in various concentrations depending upon levels attainable in serum, urine, or both. A standardized suspension of the organism is applied to the agar plates, which are incubated for a minimum of 16 to 18 hours at 35 degrees C. Complete inhibition of all but one colony or a very fine residual haze represents the end point.(Clinical and Laboratory Standards Institute [CLSI]. Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically. 11th ed. CLSI standard M07. CLSI; 2018)

Daptomycin and tigecycline are tested by agar gradient diffusion.(Clinical and Laboratory Standards Institute[CLSI]. Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically. 11th ed. CLSI standard M07. CLSI; 2018; package insert: Etest Biomerieux;15203E-EN-2016/07. 07/2016)

Cefiderocol is tested by disk diffusion.(Clinical and Laboratory Standards Institute [CLSI]. Performance Standards for Antimicrobial Disk Susceptibility Tests. 13th ed. CLSI standard M02.CLSI; 2018)

**PDF Report**

No

**Day(s) Performed**[Monday through Sunday](#)**Report Available**

4 to 12 days

**Specimen Retention Time**

1 day

**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

- 87070-Bacterial, Culture, cystic fibrosis, respiratory
- 87077-Identification commercial kit (if appropriate)
- 87077-Ident by MALDI-TOF mass spec (if appropriate)
- 87077-Bacteria Identification (if appropriate)
- 87077-Additional Identification procedure (if appropriate)
- 87077-Identification Staphylococcus (if appropriate)
- 87077-Identification Streptococcus (if appropriate)
- 87147 x 1-3-Serologic agglut method 1 ident (if appropriate)
- 87147-Serologic agglut method 2 ident (if appropriate)
- 87147 x 4-Serologic agglut method 3 ident (if appropriate)
- 87147 x 2-6-Serologic Agglut Method 4 Ident (if appropriate)
- 87153-Aerobe ident by sequencing (if appropriate)
- 87150-Identification by PCR (if appropriate)
- 87185-Beta lactamase (if appropriate)
- 87186-Antimicrobial Susceptibility, Aerobic Bacteria, MIC-per organism for routine battery (if appropriate)
- 87181-Susceptibility per drug and per organism for drugs not in routine battery (if appropriate)
- 87150-mec A PCR (if appropriate)

### LOINC® Information

| Test ID | Test Order Name                    | Order LOINC® Value |
|---------|------------------------------------|--------------------|
| CFRCS   | Bacterial Culture,Cystic Fib +Susc | 44798-7            |

| Result ID | Test Result Name                   | Result LOINC® Value |
|-----------|------------------------------------|---------------------|
| CFRCS     | Bacterial Culture,Cystic Fib +Susc | 44798-7             |