Overview

Useful For

Diagnosis of urinary tract infections

Quantitative culture results may be helpful in discriminating contamination, colonization, and infection

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
BLA	Beta Lactamase	No, (Bill only)	No
SUS	Susceptibility	No, (Bill only)	No
MIC	Sensitivity, MIC	No, (Bill only)	No
SIDC	Ident Serologic Agglut Method 4	No, (Bill only)	No
PCRID	Identification by PCR	No, (Bill only)	No

Testing Algorithm

When this test is ordered, the reflex tests may be performed and charged. Antimicrobial agent appropriate to the organism and specimen source will be tested according to Mayo's practice and the laboratory's standard operating procedures.

See Special Instructions to review tables that provide a listing of the antimicrobials routinely tested in the laboratory

as well as antimicrobials 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.

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 Quantitative Culture Technique; Identification of Pathogens Greater Than or Equal to 10,000 cfu/mL with Minimum Inhibitory Concentration (MIC) by Agar Dilution (if appropriate)

NY State Available

Yes

Specimen

Specimen Type

Urine

Shipping Instructions

Specimen must arrive within 24 hours of collection.

Necessary Information

Specimen source is required.

Specimen Required

Supplies: Urine Tubes, 10 mL (T068)

Collection Container/Tube: Clean, plastic urine collection container

Submission Container/Tube: Plastic, 10-mL urine tube

Specimen Volume: 1 mL

Collection Instructions: Collect a random urine specimen.

Specimen Stability Information: Refrigerated 24 hours

Specimen Minimum Volume

1 mL

Reject Due To

Unpreserved specimen >24 hours	Reject
Frozen	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Varies		

Clinical and Interpretive

Clinical Information

Urinary tract infection (UTI) encompasses a broad range of clinical entities that vary in their clinical presentation, degree of tissue invasion, epidemiologic setting, and antibiotic therapy requirements. There are 4 major types of UTIs: urethritis, cystitis, acute urethral syndrome, and pyelonephritis. UTIs may also be classified as uncomplicated or complicated. *Escherichia coli* is the leading cause of uncomplicated community-acquired UTI. Risk factors that predispose one to complicated UTIs include: underlying diseases that are associated with kidney infection (eg, diabetes), kidney stones, structural or functional urinary tract abnormalities, and indwelling urinary catheters. Another classification of UTIs is as upper UTI (related to the kidney, renal pelvis, or ureter) or lower UTI (urinary bladder and urethra). The classic symptoms of upper UTI are fever (often with chills) and flank pain. Frequent painful urination, urgency, and dysuria are more often associated with lower UTI.

Antimicrobial susceptibility testing determines the minimum 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 provides interpretive criteria for determining whether the MIC should be interpreted as susceptible, susceptible-dose dependent, intermediate, nonsusceptible, resistant, or epidemiological cutoff value (ECV).

Reference Values

No growth, Organism present <10,000 cfu/mL, or mixed flora.

Identification of probable pathogens with colony count ranges.

When antimicrobial susceptibilities are performed, 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 the Clinical and Laboratory Standards Institute (CLSI) guidelines.

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

Susceptible (S):

A category defined by a breakpoint that implies that isolates with an MIC at or below the susceptible breakpoint are inhibited by the usually achievable concentrations of antimicrobial agent when the dosage recommended to treat the site of infection is used, resulting in likely clinical efficacy.

Susceptible-Dose Dependent (SDD):

A category defined by a breakpoint that implies that susceptibility of an isolate is dependent on the dosing regimen

that is used in the patient. In order to achieve levels that are likely to be clinically effective against isolates for which the susceptibility testing results are in the SDD category, it is necessary to use a dosing regimen (ie, higher doses, more frequent doses, or both) that results in higher drug exposure than that achieved with the dose that was used to establish the susceptible breakpoint. Consideration should be given to the maximum literature-supported dosage regimens, because higher exposure gives the highest probability of adequate coverage of a SDD isolate. The drug label should be consulted for recommended doses and adjustment for organ function.

Intermediate (I):

A category defined by a breakpoint that includes isolates with MICs within the intermediate range that approach usually attainable blood and tissue levels and for which response rates may be lower than for susceptible isolates.

Note: The intermediate category implies clinical efficacy in body sites where the drugs are physiologically concentrated or when a higher than normal dosage of a drug can be used. This category also includes a buffer zone, which should prevent small, uncontrolled, technical factors from causing major discrepancies in interpretations, especially for drugs with narrow pharmacotoxicity margins.

Resistant (R):

A category defined by a breakpoint that implies that isolates with an MIC at or above the resistant breakpoint are not inhibited by the usually achievable concentrations of the agent with normal dosage schedules and/or that demonstrate MICs that fall in the range in which specific microbial resistance mechanisms are likely, and clinical efficacy of the agent against the isolate has not been reliably shown in treatment studies.

Nonsusceptible (NS):

A category used for isolates for which only a susceptible breakpoint is designated because of the absence or rare occurrence of resistant strains. Isolates for which the antimicrobial agent MICs are above the value indicated for the susceptible breakpoint should be reported as nonsusceptible.

Note: An isolate that is interpreted as nonsusceptible does not necessarily mean that the isolate has a resistance mechanism. It is possible that isolates with MICs above the susceptible breakpoint that lack resistance mechanisms may be encountered within the wild-type distribution subsequent to the time the susceptible-only breakpoint was set.

Epidemiological Cutoff Value (ECV):

The MIC that separates microbial populations into those with and without acquired resistance (non-wild-type or wild-type, respectively). The ECV defines the highest MIC for the wild type population of isolates. ECVs are based on in vitro data only, using MIC distributions. ECVs are **not** clinical breakpoints, and the clinical relevance of ECVs for a particular patient has not yet been identified or approved by CLSI or any regulatory agency.

When an ECV is reported, the following comment will be included: "This MIC is consistent with the Epidemiological Cutoff Value (ECV) observed in isolates (WITH/WITHOUT) acquired resistance; however, correlation with treatment outcome is unknown."

(CLSI: Performance Standards for Antimicrobial Susceptibility Testing. 29th edition. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2019)

Interpretation

In general, the isolation of more than 100,000 cfu/mL of a urinary pathogen is indicative of urinary tract infection (UTI). Isolation of 2 or more organisms with more than 10,000 cfu/mL may suggest specimen contamination. For specimens contaminated with the usual bacterial flora, bacteria that are potentially pathogenic are identified.

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

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

Cautions

Although urine is normally sterile, contamination by organisms normally present in the urethra or on periurethral surfaces can allow a proliferation of these organisms yielding misleading urine culture results.

Urine held at ambient temperature for more than 30 minutes supports the growth of both pathogens and contaminants, leading to potentially inaccurate colony counts.

Urine obtained from catheter bags at the bedside and Foley catheter tips are unacceptable for culture.

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.

Clinical Reference

1. Forbes BA, Sahm DF, Weissfeld AS: Infections of the urinary tract. In Bailey and Scott's Diagnostic Microbiology. 12th edition. St. Louis, MO, Mosby, 2007, pp 842-855

2. Cockerill FR: Conventional and genetic laboratory tests used to guide antimicrobial therapy. Mayo Clin Proc 1998;73:1007-1021

3. Procop GW, Church DL, Hall GS, et al: Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Seventh Edition. Philadelphia: Wolters Kluwer Health, Lippincott, Williams and Wilkins; 2017. Chapter 2, Introduction to Microbiology Part II: Guidelines for the Collection, Transport, Processing, Analysis, and Reporting of Cultures From Specific Specimen Sources; p. 66-110

4. CLSI: Performance Standards for Antimicrobial Susceptibility Testing. 29th edition. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2019, pp 3-5, 246

Performance

Method Description

The urine specimen is inoculated onto sheep blood agar and eosin methylene blue agar using a calibrated loop. Following 18 to 24 hours of incubation, semiquantitative colony counts are determined and pathogens or possible pathogens are identified using one 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 (PCR), and nucleic acid sequencing of the 16S ribosomal RNA (rRNA) gene. Cultures with fewer than 10,000 cfu/mL of a single species are reported as "Organism present <10,000 cfu/mL." The presence of commensal flora of the urethra (contaminants) and mixed cultures of organisms present in colony counts below 10,000 cfu/mL are reported as "mixed flora."(Chan WW: Urine cultures. In Clinical Microbiology Procedures Handbook. Vol 1. Fourth edition. Edited by AL Leber. Washington DC, ASM Press, 2016, Section 3.12)

When antimicrobial susceptibility testing (AST) is performed, an agar dilution method is used for routine testing. 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 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.(CLSI.

Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Standard. 11th edition. CLSI standard M07. Wayne, PA: Clinical and Laboratory Standards Institute; 2018)

PDF Report

No

Day(s) and Time(s) Test Performed

Monday through Sunday

Analytic Time

2 days

Maximum Laboratory Time

5 days

Specimen Retention Time

1 day

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. For assistance, contact Customer Service.

Test Classification

This test has been cleared, approved or is exempt by the U.S. 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

87086-Bacterial Culture, Aerobic, Urine

87077-Identification Commercial Kit (if appropriate)

87077-Ident by MALDI-TOF mass spec (if appropriate)

87077-Bacteria Identification (if appropriate)

87153-Aerobe Ident by Sequencing (if appropriate)

87077-Additional Identification Procedure (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)

87077-Identification Staphylococcus (if appropriate)

87077-Identification Streptococcus (if appropriate)

87185-Beta Lactamase (if appropriate)

87186-Sensitivity, MIC-per organism for routine battery (if appropriate)

87181-Susceptibility per drug and per organism for drugs not in routine battery (if appropriate)

87798-Identification by PCR (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
URNS	Bacterial Culture, Aerobic + Susc	630-4

Result ID	Test Result Name	Result LOINC Value
URNS	Bacterial Culture, Aerobic + Susc	630-4