MAYO CLINIC LABORATORIES

# Test Definition: MECPI

Methicillin Resistance Gene, Molecular Detection, PCR, Varies

## Overview

### Useful For

Detecting *mecA* in staphylococcal bacterial isolates

Evaluating treatment options when oxacillin or cefoxitin breakpoints are unavailable (eg, certain *Staphylococcus* species other than *Staphylococcus aureus*)

Predicting antimicrobial resistance when bacterial growth is inadequate for phenotypic antimicrobial susceptibility testing (eg, staphylococcal small colony variants)

Assessing discrepancies amongst cefoxitin and oxacillin phenotypic testing results or penicillin-binding protein 2a test results

### Special Instructions

- Infectious Specimen Shipping Guidelines

### Highlights

This rapid molecular test detects *mecA* DNA associated with prediction of resistance to methicillin and other applicable beta-lactam antibiotics in isolates of *Staphylococcus* species.

### Method Name

Real-Time Polymerase Chain Reaction (PCR)/Reverse Transcription PCR (RT-PCR)

### NY State Available

Yes

## Specimen

### Specimen Type

Varies

### Shipping Instructions

1. For shipping information, see Infectious Specimen Shipping Guidelines.
2. Place specimen in a large infectious container and label as an etiologic agent/infectious substance.

### Necessary Information

**Organism identification and specimen source are required.**

### Specimen Required

**Supplies:** Infectious Container, Large (T146)
**Container/Tube:** Agar slant or other appropriate media
**Specimen Volume:** Organism in pure culture
**Collection Instructions:**
1. Perform isolation of bacteria.
2. Organism must be in pure culture, actively growing. **Do not submit mixed cultures.**

### Specimen Minimum Volume
See Specimen Required

### Reject Due To

| | |
|---|---|
| Agar plate<br>Mixed culture | Reject |

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Varies | Ambient (preferred) | | |
| | Refrigerated | | |

## Clinical & Interpretive

### Clinical Information
The presence of *mecA* has been associated with methicillin resistance in staphylococcal isolates. Rapid identification of *mecA* in staphylococcal isolates will help in determining which antimicrobial therapy to use when treating infections due to methicillin-resistant *Staphylococcus aureus* or methicillin-resistant *Staphylococcus* species other than *S aureus*.

Bacteria can acquire resistance to certain beta-lactam antibiotics through a variety of mechanisms. One such mechanism is the *mecA* gene. The *mecA* gene encodes penicillin-binding protein 2a (PBP2a), which has a low affinity for beta-lactam antibiotics. Bacteria expressing this gene can maintain cell wall synthesis even in the presence of beta-lactam antibiotics.

Testing of bacterial isolates by molecular methods may be needed when oxacillin or cefoxitin breakpoints are unavailable (eg, certain *Staphylococcus* species other than *S aureus*) or when discrepancies exist among cefoxitin and oxacillin phenotypic antimicrobial susceptibility testing results or PBP2a results. Use of this assay may also be helpful when isolates do not grow adequately for phenotypic antimicrobial susceptibility testing (eg, staphylococcal small colony variants).

### Reference Values
Not detected

### Interpretation
A positive result indicates the presence of the methicillin resistance gene (*mecA*) in the bacterial isolate.

A negative result indicates the absence of detectable DNA in the bacterial isolate.

### Cautions

Only pure isolates of staphylococcal species should be tested.

This test should be used in conjunction with phenotypic antimicrobial susceptibility tests, when available, and interpreted considering the patient's clinical condition.

This US Food and Drug Administration-modified assay will not predict methicillin resistance caused by mechanisms other than *mecA.* Methicillin resistance due to *mecC* is not assessed by this assay.

False-negative results may occur due to the presence of *mecA* in quantities lower than the limit of detection of the assay.

Mutations or polymorphisms in primer or probe binding regions may affect detection of new or unknown *Staphylococcus aureus* or methicillin-resistant *S aureus* variants resulting in a false-negative result.

Xpert SA Nasal Complete assay results may sometimes be invalid due to a failed sample processing control, an error, or lack of a result and may require retesting, which can lead to a delay in obtaining final results.

### Supportive Data

Staphylococcal bacterial isolates were tested for the presence of *mecA* by the Cepheid GeneXpert - Xpert SA Nasal Complete compared to Mayo Clinic's laboratory developed test (LDT) MARP / mecA, Molecular Detection, PCR, Varies. There was 95% or greater concordance for the detection of 25 *mecA* negative methicillin susceptible *Staphylococcus* species other than *Staphylococcus aureus*, 10 *mecA* negative methicillin susceptible *S aureus*, and 20 *mecA* positive methicillin-resistant *S aureus*. Greater than 95% concordance was achieved for 25 *mecA* positive methicillin-resistant *Staphylococcus* species other than *S aureus* isolates. Additionally, 10 isolates of *Staphylococcus saccharolyticus* and 10 isolates of small colony variant staphylococci were tested for the presence of *mecA* by both the Cepheid GeneXpert - Xpert SA Nasal Complete platform and the LDT, yielding 95% or greater correlation.

### Clinical Reference

1. Xpert SA Nasal Complete 300-8799. Package insert: Cepheid; Rev H, 09/2019
2. Ali GH, Seiffein N. Association of some virulence genes in methicillin resistant and methicillin sensitive *Staphylococcus aureus* infections isolated in community with special emphasis on *pvl*/*mecA* genes profiles in Alexandria, Egypt. Gene Reports. 2021;25:101334. doi:10.1016/j.genrep.2021.101334
3. Seker E, Ozenc E, Turedi OK, Yilmaz M. Prevalence of *mecA* and *pvl* genes in coagulase negative staphylococci isolated from bovine mastitis in smallholder dairy farms in Turkey. Anim Biotechnol. 2022;34(7):2427-2432. doi:10.1080/10495398.2022.2094802
4. Palavecino E. Rapid methods for detection of MRSA in clinical specimens. Methods Mol Biol. 2020:2069:29-45. doi:10.1007/978-1-4939-9849-4_2

## Performance

### Method Description

The GeneXpert Dx System automates and integrates sample purification, nucleic acid amplification, and detection of the target sequence using real-time polymerase chain reaction (PCR). The system uses single-use disposable cartridges that hold the PCR reagents and host the PCR process. Because the cartridges are self-contained, cross-contamination is minimized. The test utilizes automated PCR for qualitative detection of proprietary sequences for the staphylococcal protein A (*spa*) gene, the gene for methicillin resistance (*mecA*), and the staphylococcal methicillin-resistant *Staphylococcus aureus* /*S aureus* DNA cassette chromosome mec (*SCCmec*) inserted into the *S aureus* chromosomal attB site. The assay includes a sample processing control to ensure the sample was processed correctly and to monitor for the presence of inhibitors in the PCR reaction. A probe check control verifies reagent rehydration, PCR tube filling in the cartridge, probe integrity, and dye stability.(Package insert: Xpert SA Nasal Complete 300-8799. Cepheid; Rev H, 09/2019)

### PDF Report

No

### Day(s) Performed

Monday through Friday

### Report Available

2 to 4 days

### Specimen Retention Time

30 days

### Performing Laboratory Location

Rochester

## 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 modified from the manufacturer's instructions. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

### CPT Code Information

87641

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## LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| MECPI | Methicillin Resistance Gene, Varies | 48813-0 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| MESCR | Specimen Source | 31208-2 |
| MEORG | Organism Identified by Client | In Process |
| MECPR | mecA Resistance Gene | 48813-0 |