

**Staphylococcus aureus, Strain HIP09737**

**Catalog No. NR-45887**

**Product Description:** *Staphylococcus aureus* (*S. aureus*), strain HIP09737 was isolated in June 2000 in California, USA, from bile of a female patient who had a history of acute cholecystitis, complicated cholecystectomy and long-term vancomycin treatment for a methicillin-resistant *S. aureus* (MRSA) infection. *S. aureus*, strain HIP09737 is a vancomycin-intermediate *S. aureus* (VISA) strain.

**Lot<sup>1</sup>: 70011112**

**Manufacturing Date: 20DEC2017**

TEST	SPECIFICATIONS	RESULTS
<b>Phenotypic Analysis</b> Cellular morphology Colony morphology <sup>2</sup>  Motility (wet mount) Hemolysis <sup>3</sup> Biochemical characterization Catalase Coagulase <sup>4</sup> VITEK <sup>®</sup> 2 Compact (GP card) VITEK <sup>®</sup> MS (MALDI-TOF)	Gram-positive cocci Report results  Report results Report results  Positive Report results <i>S. aureus</i> (≥ 89.9%) <i>S. aureus</i>	Gram-positive cocci Circular, convex, entire, smooth and cream (Figure 1) Non-motile β-hemolytic  Positive Positive <i>S. intermedius</i> (99%) <sup>5</sup> <i>S. aureus</i> (99.9%)
<b>Antibiotic Susceptibility Profile<sup>6</sup></b> VITEK <sup>®</sup> (AST-GP71 card) Beta-lactamase <sup>7</sup> Cefoxitin screen Benzylpenicillin Oxacillin Gentamicin Ciprofloxacin Levofloxacin Moxifloxacin Clindamycin (inducible resistance) Erythromycin Clindamycin Quinupristin/dalfopristin Linezolid Daptomycin Vancomycin Minocycline Tetracycline Tigecycline Nitrofurantoin Rifampicin Trimethoprim/sulfamethoxazole Estest <sup>®</sup> antibiotic test strips <sup>11</sup> Chloramphenicol Teicoplanin Vancomycin	Report results Report results Report results Sensitive Sensitive Resistant Resistant Resistant Report results Report results Resistant Resistant Sensitive Sensitive Resistant Intermediate Report results Sensitive Sensitive Report results Report results Report results Sensitive  Report results Sensitive Intermediate	Positive Negative Resistant (≥ 0.5 µg/mL) Sensitive (0.5 µg/mL) Sensitive (≤ 0.5 µg/mL) Resistant (≥ 8 µg/mL) Resistant (≥ 8 µg/mL) Resistant (≥ 8 µg/mL) Resistant (≥ 8 µg/mL) Negative Resistant (≥ 8 µg/mL) Resistant (4 µg/mL) Sensitive (≤ 0.25 µg/mL) Sensitive (2 µg/mL) Sensitive (1 µg/mL) <sup>8</sup> Sensitive (2 µg/mL) <sup>9</sup> Sensitive (≤ 0.5 µg/mL) Sensitive (≤ 1 µg/mL) Sensitive (≤ 0.12 µg/mL) <sup>10</sup> Sensitive (≤ 16 µg/mL) Resistant (≥ 32 µg/mL) Sensitive (≤ 10 µg/mL)  Sensitive (6-8 µg/mL) Sensitive (4 µg/mL) Intermediate (3 µg/mL) <sup>9</sup>
<b>Genotypic Analysis</b> Sequencing of 16S ribosomal RNA gene (740 base pairs) Digital DNA-DNA hybridization (dDDH) <sup>13</sup>	≥ 99% sequence identity to <i>S. aureus</i> type strain (GenBank: L37597) ≥ 70% for species identification	100% sequence identity to <i>S. aureus</i> type strain (GenBank: L37597) <sup>12</sup> <i>S. aureus</i> subsp. <i>aureus</i> (90.3%) <sup>14</sup>

TEST	SPECIFICATIONS	RESULTS
Purity (post-freeze) <sup>15</sup>	Consistent with expected colony morphology	Consistent with expected colony morphology
Viability (post-freeze) <sup>2</sup>	Growth	Growth

<sup>1</sup>*S. aureus*, strain HIP09737 was deposited to BEI Resources as part of the NARSA collection. NR-45887 was produced by inoculation of the deposited material into Tryptic Soy broth and grown 1 day at 37°C in an aerobic atmosphere. Broth inoculum was added to Tryptic Soy agar kolles, which were grown 1 day at 37°C in an aerobic atmosphere to produce this lot.

<sup>2</sup>1 day at 37°C in an aerobic atmosphere on Tryptic Soy agar

<sup>3</sup>1 day at 37°C in an aerobic atmosphere on Tryptic Soy agar with 5% defibrinated sheep blood

<sup>4</sup>1 day at 37°C in rabbit serum with 0.15% EDTA (Coagulase Plasma BBL™ 240827)

<sup>5</sup>Species identification using VITEK® 2 Compact GP card identified NR-45887 as *S. intermedius*. VITEK® MS (MALDI-TOF), sequencing of the 16S ribosomal RNA gene and dDDH identified NR-45887 as *S. aureus*. Biochemical and phenotypic characteristics of these species are highly similar and biochemical testing cannot always distinguish between *S. intermedius* and *S. aureus*. For more information, please refer to Yarbrough, M. L., W. Lainhart and C. A. Burnham. "Epidemiology, Clinical Characteristics, and Antimicrobial Susceptibility Profiles of Human Clinical Isolates of *Staphylococcus intermedius* Group." *J. Clin. Microbiol.* 56 (2018): e01788-17. PubMed: 29305548.

<sup>6</sup>Minimum Inhibitory Concentration (MIC); MIC Interpretation Guideline: CLSI M100-S22 (2018)

<sup>7</sup>The production of beta-lactamase was detected using a Cefinase™ Paper Disc (BBL™ 231650).

<sup>8</sup>*S. aureus*, strain HIP09737 was deposited as resistant to daptomycin. Antibiotic susceptibility testing performed in duplicate determined that strain HIP09737 is sensitive to daptomycin.

<sup>9</sup>*S. aureus*, strain HIP09737 was deposited as intermediately resistant to vancomycin. Antibiotic susceptibility testing performed in duplicate using the VITEK GP71 card determined that strain HIP09737 is sensitive to vancomycin but intermediate resistant using Etest. It has been previously reported in the literature that vancomycin MICs generated by Etest can be one twofold dilution higher than MICs determined by other methods. For more information, please refer to Prakash, V., J. S. Lewis II and J. H. Jorgensen. "Vancomycin MICs for Methicillin-Resistant *Staphylococcus aureus* Isolates Differ Based upon the Susceptibility Test Method Used." *Antimicrob. Agents Chemother.* 52 (2008): 4528. PubMed: 18838599.

<sup>10</sup>MIC Interpretation Guideline: EUCAST Version 8.0 (2018)

<sup>11</sup>1 day at 37°C in an aerobic atmosphere on Mueller Hinton agar

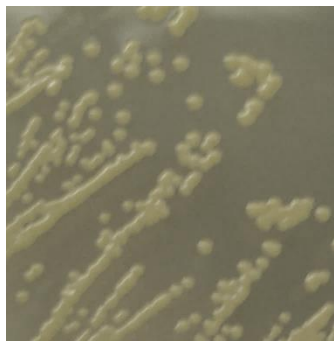
<sup>12</sup>Also consistent with other *Staphylococcus* species.

<sup>13</sup>Relatedness between bacterial strains has traditionally been determined using DDH. For additional information, refer to Auch, A.F., et al. "Digital DNA-DNA Hybridization for Microbial Species Delineation by Means of Genome-to-Genome Sequence Comparison." *Stand. Genomic Sci.* 2 (2010): 117-134. PubMed: 21304684. *S. aureus* subsp. *aureus*, strain DSM 20231<sup>T</sup> (GenBank: CP011526) was used for dDDH analysis.

<sup>14</sup>The whole genome of *S. aureus*, strain HIP09737 (2.84 megabase pairs) was sequenced using the Illumina® MiSeq® system. De novo contig sequences were generated using the PATRIC Comprehensive Genome Analysis tool with the SPAdes pipeline (version 3.10.0).

<sup>15</sup>Purity of this lot was assessed for 7 days at 37°C in an aerobic atmosphere with 5% CO<sub>2</sub> on Tryptic Soy agar with 5% defibrinated sheep blood.

Figure 1: Colony Morphology



/Heather Couch/

Heather Couch

Program Manager or designee, ATCC Federal Solutions

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