Product Information Sheet for HM-991

Staphylococcus aureus, Strain CM05

Catalog No. HM-991

For research use only. Not for use in humans.

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Manufacturer:
BEI Resources

Product Description:
Bacteria Classification: *Staphylococcaceae*, *Staphylococcus*
Species: *Staphylococcus aureus*
Strain: CM05
Original Source: *Staphylococcus aureus (S. aureus)*, strain CM05 was isolated in 2005 in Medellin, Colombia from a tracheal aspirate of a patient with a fatal ventilator-associated pneumonia.[1,2,3]
Comments: *S. aureus*, strain CM05 (HMP ID 1384) is a linezolid-resistant *S. aureus* (LRSA), methicillin-resistant *S. aureus* (MRSA) strain.[1,2,3] Strain CM05 exhibited resistance to linezolid as well as to several other antibiotics. The patient received only two doses of linezolid, and thus, the emergence of linezolid resistance was rather unexpected and had been previously associated with prolonged treatment with the antibiotic.[1,2] In addition to linezolid, strain CM05 is reported to be resistant to chloramphenicol, ciprofloxacin, clindamycin, dalfopristin, erythromycin, gentamicin, oxacillin and quinupristin; it shows sensitivity to rifampin, teicoplanin, tetracycline and vancomycin.[1,4] *S. aureus*, strain CM05 is a reference genome for The Human Microbiome Project (HMP). HMP is an initiative to identify and characterize human microbial flora. The complete genome of *S. aureus*, strain CM05 was sequenced by the Genome Institute at Washington University (GenBank: AMAB00000000).
Note: HMP material is taxonomically classified by the depositor. Quality control of these materials is only performed to demonstrate that the material distributed by BEI Resources is identical to the deposited material.

S. aureus is a Gram-positive, cluster-forming coccus that normally inhabits human nasal passages, skin and mucus membranes. It is also a human pathogen and causes a variety of pus-forming infections as well as food-poisoning and toxic shock syndrome. In 1961, two years after the introduction of methicillin, a penicillinase-resistant penicillin, *S. aureus* developed methicillin-resistance due to acquisition of the *mecA* gene. Subsequently, MRSA infections have become widespread in both hospital and community settings.[5] MRSA infections have been increasingly difficult to treat as this organism has developed resistance to a number of commonly used antibiotics, including the preferred antibiotic of choice for the treatment of MRSA infections, vancomycin.[6] More recently, strains have been isolated that are resistant to linezolid. These LRSA strains typically have the same G2576T point mutation in their 23S rRNA genes preventing linezolid from binding to its site of action. A second, rarer mechanism of resistance is due to the presence of *cfr*, which encodes for a ribosomal methyltransferase that modifies a specific rRNA nucleotide located in the site of the drug action. While the *cfr* gene was initially identified on plasmids isolated from animal sources, an increasing number of human cases have been reported.[7,8,9,10]

Material Provided:
Each vial contains approximately 0.5 mL of bacterial culture in Tryptic Soy broth supplemented with 10% glycerol.

Note: If homogeneity is required for your intended use, please purify prior to initiating work.

Packaging/Storage:
HM-991 was packaged aseptically in cryovials. The product is provided frozen and should be stored at -60°C or colder immediately upon arrival. For long-term storage, the vapor phase of a liquid nitrogen freezer is recommended. Freeze-thaw cycles should be avoided.

Growth Conditions:
Media:
Brain Heart Infusion broth or Tryptic Soy broth or equivalent
Brain Heart Infusion agar or Tryptic Soy agar with 5% defibrinated sheep blood or equivalent
Incubation:
Temperature: 37°C
Atmosphere: Aerobic
Propagation:
1. Keep vial frozen until ready for use, then thaw.
2. Transfer the entire thawed aliquot into a single tube of broth.
3. Use several drops of the suspension to inoculate an agar slant and/or plate.
4. Incubate the tube, slant and/or plate at 37°C for 1 day.

Citation:
Acknowledgment for publications should read "The following reagent was obtained through BEI Resources, NIAID, NIH as part of the Human Microbiome Project: *Staphylococcus aureus*, Strain CM05, HM-991."

Biosafety Level: 2
Appropriate safety procedures should always be used with this material. Laboratory safety is discussed in the following publication: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health. Biosafety in Microbiological and Biomedical Laboratories. 6th ed. Washington, DC: U.S. Government Printing Office, 2020; see www.cdc.gov/biosafety/publications/bmbl5/index.htm.

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References:

1. Toh, S. M., et al. “Acquisition of a Natural Resistance Gene Renders a Clinical Strain of Methicillin-Resistant Staphylococcus aureus Resistant to the Synthetic Antibiotic Linezolid.” Mol. Microbiol. 64 (2007): 1506-1514. PubMed: 17555436.
2. Arias, C. A., et al. “Clinical and Microbiological Aspects of Linezolid Resistance Mediated by the *cfr* Gene Encoding a 23S rRNA Methyltransferase.” J. Clin. Microbiol. 46 (2008): 892-896. PubMed: 18174304.
3. Arias, C. A., Personal Communication.
4. Baudoux, P., et al. “Activity of Quinupristin/Dalfopristin against Extracellular and Intracellular *Staphylococcus aureus* with Various Resistance Phenotypes.” J. Antimicrob. Chemother. 65 (2010): 1228-1236. PubMed: 20378672.
5. Deurenberg, R. H. and E. E. Stobberingh. "The Evolution of *Staphylococcus aureus*." Infect. Genet. Evol. 8 (2008): 747-763. PubMed: 18718557.
6. Howden, B. P., et al. "Reduced Vancomycin Susceptibility in *Staphylococcus aureus*, Including Vancomycin-Intermediate and Heterogeneous Vancomycin-Intermediate Strains: Resistance Mechanisms, Laboratory Detection, and Clinical Implications." Clin. Microbiol. Rev. 23 (2010): 99-139. PubMed: 20065327.
7. Locke, J. B., et al. “Genetic Environment and Stability of *cfr* in Methicillin-Resistant *Staphylococcus aureus* CM05.” Antimicrob. Agents Chemother. 56 (2012): 332-340. PubMed: 22024827.
8. Morales, G., et al. “Resistance to Linezolid is Mediated by the *cfr* Gene in the First Report of an Outbreak of Linezolid-Resistant *Staphylococcus aureus*.” Clin. Infect. Dis. 50 (2010): 821-825. PubMed: 20144045.
9. Locke, J. B., et al. “Identification and Characterization of Linezolid-Resistant *cfr*-Positive *Staphylococcus aureus* USA300 Isolates from a New York City Medical Center.” Antimicrob. Agents Chemother. 58 (2014): 6949-6952. PubMed: 25136008.
10. Locke, J. B., et al. “Linezolid-Resistant *Staphylococcus aureus* Strain 1128105, the First Known Clinical Isolate Possessing the *cfr* Multidrug Resistance Gene.” Antimicrob. Agents Chemother. 58 (2014): 6592-6598. PubMed: 25155597.

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