

CLAIMS

1. A method for detecting *S. aureus* in a sample, the method comprising the steps of:
 - (a) contacting the sample with a lysate comprised of a plurality of non-replicative transduction particles (NRTPs) such that the plurality of NRTPs transduces *S.*
5 *aureus*, if present in the sample, wherein the plurality of NRTPs are produced by
 - (i) inducing a lytic phase of a bacterial cell packaging system, wherein said bacterial cell packaging system comprises: a host bacteria cell; a $\phi 80\alpha$ bacteriophage genome having a disrupted *terS* packaging initiation site sequence existing as a lysogen within the host bacteria cell; a reporter nucleic
10 acid molecule separate from the $\phi 80\alpha$ bacteriophage genome, having a *luxAB* reporter gene and a non-disrupted packaging initiation site sequence for facilitating packaging of a replicon of the reporter nucleic acid molecule into the NRTP, wherein the reporter nucleic acid molecule comprises a sequence selected from SEQ ID NO: 3, SEQ ID NO: 4, and SEQ ID NO:5;
 - 15 (ii) allowing the replicon of the reporter nucleic acid molecule to be packaged to produce the NRTPs;
 - (b) providing conditions for expression of the *luxAB* reporter gene; and
 - (c) detecting the presence or absence of light produced by the *luxAB* reporter gene, wherein the presence of light indicates the presence of *S. aureus*.
- 20 2. The method of claim 1 further comprising a step prior to step (b) of providing an antimicrobial agent to the sample and detecting for the presence or absence of light produced by the *luxAB* reporter gene to determine whether the sample contains *S. aureus* that is resistant or susceptible to the antimicrobial agent.
3. The method of any one of claims 1 or 2, wherein the reporter nucleic acid molecule
25 comprises the sequence of SEQ ID NO: 3.
4. The method of any one of claims 1 or 2, wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 4.
5. The method of any one of claims 1 or 2, wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 5.
- 30 6. The method of any one of claims 1 to 5, wherein the $\phi 80\alpha$ bacteriophage genome having a disrupted *terS* packaging initiation site sequence comprises the sequence of SEQ ID NO: 1.

7. A bacterial cell packaging system for packaging a reporter nucleic acid molecule into a non-replicative transduction particle (NRTP) for introduction into *S. aureus*, comprising:
- (a) a host bacteria cell;
 - 5 (b) a $\phi 80\alpha$ bacteriophage genome having a disrupted packaging initiation site sequence existing as a lysogen within the host bacteria cell; and
 - (c) a reporter nucleic acid molecule separate from the $\phi 80\alpha$ bacteriophage genome, having a luxAB reporter gene and a non-disrupted packaging initiation site sequence for facilitating packaging of a replicon of the reporter nucleic acid molecule into the NRTP, wherein the reporter nucleic acid molecule comprises a sequence selected from SEQ ID NO: 3, SEQ ID NO: 4, and SEQ ID NO:5.
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8. The cell packaging system of claim 7 wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 3.
9. The cell packaging system of claim 7 wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 4.
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10. The cell packaging system of claim 7 wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 5.
11. The cell packaging system of any one of claims 7 to 10, wherein the $\phi 80\alpha$ bacteriophage genome having a disrupted terS packaging initiation site sequence comprises the sequence of SEQ ID NO: 1.
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12. A method for producing and collecting a plurality of non-replicative transduction particles (NRTPs) for detecting *S. aureus* in a sample, comprising:
- (a) inducing a lytic phase of a bacterial cell packaging system, wherein said bacterial cell packaging system comprises:
- 25 (i) a host bacteria cell;
 - (ii) a $\phi 80\alpha$ bacteriophage genome having a disrupted packaging initiation site sequence existing as a lysogen within the host bacteria cell;
 - (iii) a reporter nucleic acid molecule separate from the $\phi 80\alpha$ bacteriophage genome, having a luxAB reporter gene and a non-disrupted packaging initiation site sequence for facilitating packaging of a replicon of the reporter nucleic acid molecule into the NRTP, wherein the reporter nucleic acid molecule comprises a sequence selected from SEQ ID NO: 3, SEQ ID NO: 4,
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and SEQ ID NO:5;

- (b) allowing the replicon of the reporter nucleic acid molecule to be packaged to produce the NRTPs; and
- (c) collecting a lysate comprising the plurality of NRTPs.

- 5 13. The method of claim 12, wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 3.
- 14. The method of claim 12, wherein the reporter nucleic acid molecule comprises the sequence of SEQ ID NO: 4.
- 15. The method of claim 12, wherein the reporter nucleic acid molecule comprises the
10 sequence of SEQ ID NO: 5.
- 16. The method of any one of claims 12 to 15, wherein the $\phi 80\alpha$ bacteriophage genome having a disrupted terS packaging initiation site sequence comprises the sequence of SEQ ID NO: 1.
- 17. A reporter nucleic acid molecule comprising a sequence selected from SEQ ID NO: 3,
15 SEQ ID NO: 4, and SEQ ID NO:5.