Claims

[Claim 1] An isolated lysin protein from phage F87s/06, or a fragment thereof having antimicrobial and/or targeting activity against *S. aureus*.

[Claim 2] The isolated lysin protein of claim 1, said protein comprising the amino acid sequence of SEQ ID NO:2, or a fragment thereof having antimicrobial and/or targeting activity against *S. aureus*.

[Claim 3] An isolated first protein having at least 85% sequence identity to a second protein of the same size, wherein said first protein has antimicrobial and/or targeting activity against *S. aureus* and said second protein has the amino acid sequence of SEQ ID NO:2 or a fragment thereof.

[Claim 4] The isolated first protein of claim 3 having at lest 95% sequence identity to said second protein.

[Claim 5] A nucleic acid comprising a nucleotide sequence encoding the protein of claim 1, 2, 3 or 4.

[Claim 6] The nucleic acid of claim 5 comprising the nucleotide sequence of SEQ ID NO:1 or a fragment thereof.

[Claim 7] A vector comprising the nucleic acid of claim 5.

[Claim 8] The vector of claim 7 that is an expression vector.

[Claim 9] A host cell comprising the vector of claim 8.

[Claim 10] A pharmaceutical composition comprising an isolated lysin protein derived from phage F87s/06, or fragment thereof having antimicrobial and/or targeting activity against*S. aureus*, and a pharmaceutically acceptable carrier.

[Claim 11] The pharmaceutical composition of claim 10, wherein said isolated lysin protein comprises the amino acid sequence of SEQ ID NO:2, or a fragment thereof.

[Claim 12] A pharmaceutical composition comprising a pharmaceutically acceptablecarrier and an isolated first protein having at least 85% sequence identity to a second protein of the same size, wherein said first protein has antimicrobial and/ortargeting activity against *S. aureus* and said second protein has the amino acid sequence of SEQ ID NO:2 or a fragment thereof.

[Claim 13] The pharmaceutical composition of claim 12 wherein said isolated first protein has at least 95% sequence identity to said second protein.

[Claim 14] A method for treating a bacterial infection in a subject in need thereof, said method comprising administering to said subject a therapeutically effective amount of the pharmaceutical composition of any one of claims 10-13.

[Claim 15] The method of claim 14 wherein said bacterial infection is an infection by a Gram-positive bacteria.

[Claim 16] The method of claim 14 wherein said Gram-positive bacteria is a *Staphylococcus*,*Micrococcus*, *Bacillus*, or *Enterococcus*.

[Claim 17] The method of claim 15 wherein said Gram-positive bacteria is a *Staphylococcus*.

[Claim 18] The method of claim 17 wherein said *Staphylococcus* is *Staphylococcus aureus*.

[Claim 19] A method of screening peptides for antibiotic activity, said method comprising screening sequences of contiguous amino acids at least 6 residues in length from SEQ ID NO:2 for antimicrobial and/or targeting activity against liquid cultures of *S. aureus*.

[Claim 20] The method of claim 19 wherein said sequences of contiguous amino acids are at least 10 residues in length.

[Claim 21] A method for recombinantly producing the protein of any one of claims 1-4, said method comprising: (i) culturing in a medium a host cell comprising a nucleic acid encoding said polypeptide, under conditions suitable for the expression of said polypeptide; and (ii) recovery of said polypeptide from said medium.

[Claim 22] A chimeric polypeptide comprising the protein of any one of claims 1-4 wherein a catalytic domain of said protein is substituted with a catalytic domain of a heterologous lysin protein.

[Claim 23] The chimeric polypeptide of claim 22 wherein said hetorologous lysin protein comprises a lysin protein from phage F170/08 or phage F168/08 having antimicrobial activity against *S. aureus*.

[Claim 24] The chimeric polypeptide of claim 23, said chimeric polypeptide comprising the amino acid sequence of SEQ ID NO:4 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 25] The chimeric polypeptide of claim 23, said chimeric polypeptide comprising the amino acid sequence of SEQ ID NO:6 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 26] A chimeric third polypeptide having at least 85% sequence identity to a fourth polypeptide of the same size wherein said

third polypeptide has antimicrobial activity against *S. aureus* and said fourth polypeptide has the amino acid sequence of SEQ ID NO:4 or a fragment thereof.

[Claim 27] The chimeric polypeptide of claim 26 wherein said third polypeptide has at lest 95% sequence identity to said fourth polypeptide.

[Claim 28] A chimeric fifth polypeptide having having at least 85% sequence identity to a sixth polypeptide of the same size wherein said fifth polypeptide has antimicrobial activity against *S. aureus* and said sixth polypeptide has the amino acid sequence of SEQ ID NO:6 or a fragment thereof.

[Claim 29] The chimeric polypeptide of claim 28 wherein said fifth polypeptide has at lest 95% sequence identity to said sixth polypeptide.

[Claim 30] A nucleic acid comprising a nucleotide sequence encoding the chimeric polypeptide of any one of claims 22-29.

[Claim 31] The nucleic acid of claim 30 comprising the nucleotide sequence of SEQ ID NO:3 or a fragment thereof.

[Claim 32] The nucleic acid of claim 30 comprising the nucleotide sequence of SEQ ID NO:5 or a fragment thereof.

[Claim 33] A vector comprising the nucleic acid of claim 30.

[Claim 34] The vector of claim 33 that is an expression vector.

[Claim 35] A host cell comprising the vector of claim 34.

[Claim 36] A pharmaceutical composition comprising and a pharmaceutically acceptable carrier and the protein of any one of claims 1-4 wherein a catalytic domain of said protein is substituted with a catalytic domain of a heterologous lysin protein to give a chimeric polypeptide.

[Claim 37] The pharmaceutical composition of claim 36 wherein said heterologous lysin protein comprises a lysin protein from phage F170/08 or phage F168/08 having antimicrobial activity against *S. aureus*.

[Claim 38] The pharmaceutical composition of claim 37 wherein said chimeric polypeptide comprises the amino acid sequence of SEQ ID NO:4 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 39] The pharmaceutical composition of claim 37 wherein said chimeric polypeptide comprises the amino acid sequence of SEQ

ID NO:6 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 40] A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a chimeric third polypeptide having at least 85% sequence identity to a fourth polypeptide of the same size, wherein said third polypeptide has antimicrobial activity against *S. aureus* and said fourth polypeptide has the amino acid sequence of SEQ ID NO:4 or a fragment thereof.

[Claim 41] The pharmaceutical composition of claim 40 wherein said third polypeptide has at lest 95% sequence identity to said fourth polypeptide.

[Claim 42] A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a chimeric fifth polypeptide having at least 85% sequence identity to a sixth polypeptide of the same size wherein said fifth polypeptide has antimicrobial activity against *S. aureus* and said sixth polypeptide has the amino acid sequence of SEQ ID NO:6 or a fragment thereof.

[Claim 43] The pharmaceutical composition of claim 42 wherein said fifth polypeptide has at lest 95% sequence identity to said sixth polypeptide.

[Claim 44] A method for treating a bacterial infection in a subject in need thereof, said method comprising administering to said subject a therapeutically effective amount of the pharmaceutical composition of any one of claims 36-43.

[Claim 45] The method of claim 44 wherein said bacterial infection is an infection by a Gram-positive bacteria.

[Claim 46] The method of claim 45 wherein said Gram-positive bacteria is a *Staphylococcus*, *Micrococcus*, *Bacillus*, or *Enterococcus*.

[Claim 47] The method of claim 46 wherein said Gram-positive bacteria is a *Staphylococcus*.

[Claim 48] The method of claim 47, wherein said *Staphylococcus* is *Staphylococcus aureus*.

[Claim 49] A method of screening peptides for antibiotic activity, said method comprising screening sequences of contiguous amino acids at least 6 residues in length from SEQ ID NO:4 or SEQ ID NO:6 for antimicrobial activity against liquid cultures of *S. aureus*.

[Claim 50] The method of claim 49 wherein said sequences of contiguous

amino acids are at least 10 residues in length.

[Claim 51] A method for recombinantly producing the chimeric polypeptide of any one of claims 22-29, said method comprising: (i) constructing a chimeric nucleic acid encoding said polypeptide; (ii) culturing in a medium a host cell comprising said chimeric nucleic acid, under conditions suitable for the expression of said polypeptide; and (iii) recovery of said polypeptide from said medium.

Claims

[Claim 1] A chimeric polypeptide comprising a protein selected from the group consisting of:

(a) an isolated lysin protein from phage F87s/06, or a fragment thereof having antimicrobial and/or targeting activity against *S. aureus*;

(b) an isolated lysin protein from phage F87s/06, or a fragment thereof having antimicrobial and/or targeting activity against *S. aureus*, said protein comprising the amino acid sequence of SEQ ID NO:2, or a fragment thereof having antimicrobial and/or targeting activity against *S. aureus*;

(c) an isolated first protein having at least 85% sequence identity to a second protein of the same size, wherein said first protein has antimicrobial and/or targeting activity against *S. aureus* and said second protein has the amino acid sequence of SEQ ID NO:2 or a fragment thereof; and

(d) an isolated first protein having at least 95% sequence identity to a second protein of the same size, wherein said first protein has antimicrobial and/or targeting activity against *S. aureus* and said second protein has the amino acid sequence of SEQ ID NO:2 or a fragment thereof,

wherein a catalytic domain of said protein is substituted with a catalytic domain of a heterologous lysin protein.

[Claim 2] The chimeric polypeptide of claim 1 wherein said hetorologous lysin protein comprises a lysin protein from phage F170/08 or phage F168/08 having antimicrobial activity against *S. aureus*.

[Claim 3] The chimeric polypeptide of claim 2, said chimeric polypeptide comprising the amino acid sequence of SEQ ID NO:4 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 4] The chimeric polypeptide of claim 2, said chimeric polypeptide comprising the amino acid sequence of SEQ ID NO:6 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 5] A chimeric third polypeptide having at least 85% sequence identity to a fourth polypeptide of the same size wherein said third polypeptide has antimicrobial activity against *S. aureus* and said fourth polypeptide has the amino acid sequence of SEQ ID NO:4 or a fragment thereof.

[Claim 6] The chimeric polypeptide of claim 5 wherein said third polypeptide has at least 95% sequence identity to said fourth polypeptide.

[Claim 7] A chimeric fifth polypeptide having at least 85% sequence identity to a sixth polypeptide of the same size wherein said fifth polypeptide has antimicrobial activity against *S. aureus* and said sixth polypeptide has the amino acid sequence of SEQ ID NO:6 or a fragment thereof.

[Claim 8] The chimeric polypeptide of claim 7 wherein said fifth polypeptide has at least 95% sequence identity to said sixth polypeptide.

[Claim 9] A nucleic acid comprising a nucleotide sequence encoding the chimeric polypeptide of any one of claims 1-8.

[Claim 10] The nucleic acid of claim 9 comprising the nucleotide sequence of SEQ ID NO:3 or a fragment thereof.

[Claim 11] The nucleic acid of claim 9 comprising the nucleotide sequence of SEQ ID NO:5 or a fragment thereof.

[Claim 12] A vector comprising the nucleic acid of claim 9.

[Claim 13] The vector of claim 12 that is an expression vector.

[Claim 14] A host cell comprising the vector of claim 13.

[Claim 15] A pharmaceutical composition comprising a pharmaceutically acceptable carrier and the chimeric polypeptide of any one of claims 1-8.

[Claim 16] The pharmaceutical composition of claim 15 wherein said hetorologous lysin protein comprises a lysin protein from phage F170/08 or phage F168/08 having antimicrobial activity against *S. aureus*.

[Claim 17] The pharmaceutical composition of claim 16 wherein said chimeric polypeptide comprises the amino acid sequence of SEQ ID NO:4 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 18] The pharmaceutical composition of claim 16 wherein said chimeric polypeptide comprises the amino acid sequence of SEQ ID NO:6 or a fragment thereof having antimicrobial activity against *S. aureus*.

[Claim 19] A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a chimeric third polypeptide having at least 85% sequence identity to a fourth polypeptide of the same size, wherein said third polypeptide has antimicrobial activity against *S. aureus* and said fourth polypeptide has the amino acid sequence of SEQ ID NO:4 or a fragment thereof.

[Claim 20] The pharmaceutical composition of claim 19 wherein said third polypeptide has at least 95% sequence identity to said fourth polypeptide.

[Claim 21] A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a chimeric fifth polypeptide having at least 85% sequence identity to a sixth polypeptide of the same size wherein said fifth polypeptide has antimicrobial activity against *S. aureus* and said sixth polypeptide has the amino acid sequence of SEQ ID NO:6 or a fragment thereof.

[Claim 22] The pharmaceutical composition of claim 21 wherein said fifth polypeptide has at least 95% sequence identity to said sixth polypeptide.

[Claim 23] Use of the pharmaceutical composition of any one of claims 15-22 in the manufacture of a medicament for treating a bacterial infection in a subject in need thereof.

[Claim 24] The use of claim 23 wherein said bacterial infection is an infection by a Gram-positive bacteria.

[Claim 25] The use of claim 24 wherein said Gram-positive bacteria is a *Staphylococcus, Micrococcus, Bacillus,* or *Enterococcus.*

[Claim 26] The use of claim 25 wherein said Gram-positive bacteria is a *Staphylococcus*.

[Claim 27] The use of claim 26, wherein said *Staphylococcus* is *Staphylococcus aureus*.

[Claim 28] A method of screening peptides for antibiotic activity, said method comprising screening sequences of contiguous amino acids at least 6 residues in length from SEQ ID NO:4 or SEQ ID NO:6 for antimicrobial activity against liquid cultures of *S. aureus*.

[Claim 29] The method of claim 28 wherein said sequences of contiguous amino acids are at least 10 residues in length.

[Claim 30] A method for recombinantly producing the chimeric polypeptide of any one of claims 1-8, said method comprising: (i) constructing a chimeric nucleic acid encoding said polypeptide; (ii) culturing in a medium a host cell comprising said chimeric nucleic acid, under conditions suitable for the expression of said polypeptide; and (iii) recovery of said polypeptide from said medium.