pathogenic bacteria such as *S. aureus, Enterobacter* and *Klebsiella* are developing resistance to vancomycin and carbapenems, which are potent antibiotics traditionally reserved as the last line of defence for vulnerable patients in hospitals. With the on-going dearth in small molecular antibiotics development, the design and identification of alternative classes of antimicrobial agents with new modes of action that can effectively overcome drug resistance mechanisms is more pressing than ever.

[006] As the majority of the antimicrobial peptides exert their antimicrobial activities through a rapid and direct membrane lytic mechanism, they possess an inherent advantage in overcoming conventional mechanisms of antibiotics resistance such as the increased expression of drug efflux pumps on microbial membranes, production of drug degradation enzymes or alteration to drug interaction sites acquired by microbes against small molecular antibiotics targeting specific biosynthetic pathways. Significant barriers limiting the successful clinical translation of antimicrobial peptides, however, include high systemic toxicities as a result of poor microbial membrane selectivities, relatively high manufacturing cost (for long peptide sequences) and susceptibility to degradation by proteases present in biological fluids such as blood serum, wound exudates or lacrimal fluids.

[007] In view of the above, there is a need to provide alternative antimicrobial peptides. There is also a need to provide an alternative method of treating microbial infections.

SUMMARY OF THE INVENTION

[008] In one aspect, the present invention refers to an amphiphilic peptide, wherein the peptide comprises: (X1Y1X2Y2)n (Formula I), wherein the C-terminal end of the peptide is amidated; the N-terminal end of the peptide is not acetylated; X_1 and X_2 is independently of each other a hydrophobic amino acid; Y_1 and Y_2 is independently of each other a cationic amino acid; and n is any number selected from the group consisting of 1.5, 2, 2.5, 3, 3.5, 4, 4.5, and 5; and wherein when assembled, the peptide has β-sheet structure. In one ~~aspect~~example, ~~there is provided~~ disclosed herein is an amphiphilic peptide. The peptide comprises $(X_1Y_1X_2Y_2)_n$ (Formula I), wherein the C-terminal end of the peptide is amidated; X_1 and X_2 is independently of each other a hydrophobic amino acid; Y_1 and Y_2 is independently of each other a cationic amino acid and wherein n is at least 1. In another aspect, the present invention refers to a method of removing a biofilm comprising administering an effective amount of a peptide as disclosed herein, wherein the biofilm occur on surfaces.

[009] In another ~~aspect~~example, there is ~~provided~~ disclosed the peptide as described herein for use as a medicament.

[0010] In another ~~aspect~~example, there is ~~provided~~ disclosed a method of treating a bacterial infection or removing bacteria. The method comprises the administration of a pharmaceutically effective amount of a peptide as described herein.

[0011] In another ~~aspect~~example, there is ~~provided~~ disclosed a method of neutralizing endotoxins. The method comprising administration of a pharmaceutically effective amount of a peptide as described herein.

[0012] In another ~~aspect~~example, there is ~~provided~~ disclosed a method of treating viral based infectious diseases. The method comprising administration of a pharmaceutically effective amount of the peptide as described herein.

[0013] In another ~~aspect~~example, there is ~~provided~~ disclosed a method of treating fungal infection or infestation or removing fungus. The method comprising administration of a pharmaceutically effective amount of the peptide as described herein.

[0014] In another ~~aspect~~example, there is ~~provided~~ disclosed a method of treating proliferative diseases. The method comprising administration of a pharmaceutically effective amount of the peptide as described herein.

[0015] In another ~~aspect~~example, there is ~~provided~~ disclosed a use of a peptide as described herein in the manufacture of a medicament for treating a bacterial infection, or removing bacteria, or neutralizing endotoxins, or treating viral based infectious diseases, or treating a fungal infection or infestation, or removing fungus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The invention will be better understood with reference to the detailed description when considered in conjunction with the non-limiting examples and the accompanying drawings, in which:

[0017] **Figure 1** shows design features of synthetic β-sheet forming peptides. A) shows exemplary peptide of the present disclosure. B) shows an example of the peptide of the present disclosure presented as a linear molecule. C) shows a schematic diagram of possible membrane disruption caused by the peptide of the present disclosure. In brief, in aqueous solutions, the peptides exist as monomeric random coils due to electrostatic repulsion between the protonated Arg and/or Lys residues. However, in the presence of microbial cell membranes, the peptides readily assemble into β-sheet secondary structures stabilized by electrostatic interactions between the positively charged residues and the negatively charged phospholipids, followed by the insertion of their hydrophobic residues into the lipid bilayer to mediate membrane disruption.

[0018] **Figure 2** shows circular dichroism spectra of (a) $(VRVK)_2$-NH_2 (SEQ ID NO: 11), (b) $(IRIR)_2$-NH_2 (SEQ ID NO: 12), (c) $(IKIK)_2$-NH_2 (SEQ ID NO: 13), (d) $(IRIK)_2$-NH_2 (SEQ ID NO: 17), (e) $(IRVK)_2$-NH_2 (SEQ ID NO: 14), (f) $(FRFK)_2$-NH_2 (SEQ ID NO: 15), (g) $(VRVK)_3$-NH_2 (SEQ ID NO: 20), (h) $(IRIK)_3$-NH_2 (SEQ ID NO: 21), (i) $(IRVK)_3$-NH_2 (SEQ

Claims

1. An amphiphilic peptide, wherein the peptide comprises: $(X_1Y_1X_2Y_2)_n$ (Formula I), wherein

the C-terminal end of the peptide is amidated;

X_1 and X_2 is independently of each other a hydrophobic amino acid

Y_1 and Y_2 is independently of each other a cationic amino acid; and

n is at least 1.5,

wherein the peptide is capable of self-assembly into β-sheet structure.

2. The peptide of claim 1, wherein n is 2 or 2.5 or 3 or 3.5 or 4 or 4.5 or 5.

3. The peptide of any one of claims 1 to 2, wherein $(X_1Y_1X_2Y_2)_n$ is $(X_1Y_1X_2Y_2)_n$-NH_2.

4. The peptide of any one of claims 1 to 3, wherein the hydrophobic amino acid is selected from the group consisting of alanine (A), valine (V), isoleucine (I), leucine (L), methionine (M), phenylalanine (F), tryptophan (W) and cysteine (C).

5. The peptide of claim 4, wherein the hydrophobic amino acid is isoleucine (I), or valine (V).

6. The peptide of any one of claims 1 to 5, wherein the cationic amino acid is selected from the group consisting of lysine (K), arginine (R) and histidine (H).

7. The peptide of any one of claims 1 to 6, wherein each repeating unit n of Formula I comprises independently of each other 1 or 2 or 3 or 4 or 6 or 8 D-amino acids with the remaining amino acids being L-amino acids.

8. The peptide of any one of claims 1 to 6, wherein each repeating unit n of Formula I comprises independently of each other 2 or 4 or 6 or 8 D-amino acids with the remaining amino acids being L-amino acids.

9. The peptide of claim 7 or 8, wherein the distribution of D-amino acids in each repeating unit n of Formula I is identical or different from each other.

10. The peptide of any one of claims 7 to 9, wherein n is 2 and amino acids in position 4 and 6 are D-amino acids while the remaining amino acids are L-amino acids.

11. The peptide of any one of claims 1 to 10 comprising the sequence $(IY_1IY_2)_n$-NH_2.

12. The peptide of any one of claims 1 to 10 comprising the sequence $(IRX_2K)_n$-NH_2.

13. The peptide of any one of claims 1 to 12, wherein the peptide is selected from the group consisting of VRVKVRVK-NH_2 (SEQ ID NO: 11), VRVKVRVKVRVK-NH_2 (SEQ ID NO: 20), IRIRIRIR-NH_2 (SEQ ID NO: 12), IKIKIKIK-NH_2 (SEQ ID NO: 13), IRVKIRVK-NH_2 (SEQ ID NO: 14), FRFKFRFK-NH_2 (SEQ ID NO: 15), WRWKWRWK-NH_2 (SEQ ID NO: 16), IRIKIRIK-NH_2 (SEQ ID NO: 17), IRIKIRIKIRIK-NH_2 (SEQ ID NO: 21), irikir-NH_2 (SEQ ID NO: 10), irikirik-NH_2 (SEQ ID NO: 18), IRIkIrIK-NH_2 (SEQ ID NO: 19), IRVKIRVKIRVK-NH_2 (SEQ ID NO: 22) and irvkirvkirvk-NH_2 (SEQ ID NO: 23), wherein small underlined residues represent D-amino acids while capital non-underlined represent L-amino acid.

14. A peptide of any one of claims 1 to 13 for use as a medicament.

15. A method of treating a bacterial infection or removing bacteria comprising administration of a pharmaceutically effective amount of a peptide according to any one of claims 1 to 13.

16. The method of claim 15, wherein the bacteria are Gram-positive or Gram-negative bacteria.

17. The method of claim 15 or 16, wherein the bacteria are selected from the genus selected from the group of *Acetobacter, Acinetobacter, Actinomyces, Agrobacterium spp., Azorhizobium, Azotobacter, Anaplasma spp., Bacillus spp., Bacteroides spp., Bartonella spp.,*

Bordetella spp., Borrelia, Brucella spp., Burkholderia spp., Calymmatobacterium, Campylobacter, Chlamydia spp., Chlamydophila spp., Clostridium spp., Corynebacterium spp., Coxiella, Ehrlichia, Enterobacter, Enterococcus spp., Escherichia, Francisella, Fusobacterium, Gardnerella, Haemophilus spp., Helicobacter, Klebsiella, Lactobacillus spp., Lactococcus, Legionella, Listeria, Methanobacterium extroquens, Microbacterium multiforme, Micrococcus luteus, Moraxella catarrhalis, Mycobacterium spp., Mycoplasma spp., Neisseria spp., Pasteurella spp., Peptostreptococcus, Porphyromonas, Pseudomonas, Rhizobium, Rickettsia spp., Rochalimaea spp., Rothia, Salmonella spp., Serratia, Shigella, Staphylococcus spp., Stenotrophomonas, Streptococcus spp., Treponema spp., Vibrio spp., Wolbachia, and Yersinia spp.

18. The method of claim 17, wherein the bacteria are selected from the group consisting of *Acetobacter aurantius, Acinetobacter baumannii, Actinomyces Israelii, Agrobacterium radiobacter, Agrobacterium tumefaciens, Azorhizobium caulinodans, Azotobacter vinelandii, Anaplasma phagocytophilum, Anaplasma marginale, Bacillus anthracis, Bacillus brevis, Bacillus cereus, Bacillus fusiformis, Bacillus licheniformis, Bacillus megaterium, Bacillus mycoides, Bacillus stearothermophilus, Bacillus subtilis, Bacteroides fragilis, Bacteroides gingivalis, Bacteroides melaminogenicus (Prevotella melaminogenica), Bartonella henselae, Bartonella quintana, Bordetella bronchiseptica, Bordetella pertussis, Borrelia burgdorferi, Brucella abortus, Brucella melitensis, Brucella suis, Burkholderia mallei, Burkholderia pseudomallei, Burkholderia cepacia* complex, *Burkholderia cenocepacia, Calymmatobacterium granulomatis, Campylobacter coli, Campylobacter fetus, Campylobacter jejuni, Campylobacter pylori, Chlamydia trachomatis, Chlamydophila.* (such as *C. pneumoniae, Chlamydophila psittaci, Clostridium botulinum, Clostridium difficile, Clostridium perfringens, Clostridium tetani*), *Corynebacterium diphtheriae, Corynebacterium fusiforme, Coxiella bumetii, Ehrlichia chaffeensis, Enterobacter cloacae, Enterococcus avium, Enterococcus durans, Enterococcus faecalis, Enterococcus faecium, Enterococcus galllinarum, Enterococcus maloratus, Escherichia coli, Francisella tularensis, Fusobacterium nucleatum, Gardnerella vaginalis, Haemophilus ducreyi, Haemophilus influenzae, Haemophilus parainfluenzae, Haemophilus pertussis, Haemophilus vaginalis, Helicobacter pylori, Klebsiella pneumoniae, Lactobacillus acidophilus, Lactobacillus casei, Lactococcus lactis, Legionella pneumophila, Listeria monocytogenes, Methanobacterium*

extroquens, Microbacterium multiforme, Micrococcus luteus, Moraxella catarrhalis, Mycobacterium avium, Mycobacterium bovis, Mycobacterium diphtheriae, Mycobacterium intracellulare, Mycobacterium leprae, Mycobacterium lepraemurium, Mycobacterium phlei, Mycobacterium smegmatis, Mycobacterium tuberculosis, Mycoplasma fermentans, Mycoplasma genitalium, Mycoplasma hominis, Mycoplasma penetrans, Mycoplasma pneumoniae, Neisseria gonorrhoeae, Neisseria meningitidis, Pasteurella multocida, Pasteurella tularensis Peptostreptococcus, Porphyromonas gingivalis, Pseudomonas aeruginosa, Rhizobium Radiobacter, Rickettsia prowazekii, Rickettsia psittaci, Rickettsia quintana, Rickettsia rickettsii, Rickettsia trachomae, Rochalimaea henselae, Rochalimaea quintana, Rothia dentocariosa, Salmonella enteritidis, Salmonella typhi, Salmonella typhimurium, Serratia marcescens, Shigella dysenteriae, Staphylococcus aureus, Staphylococcus epidermidis, Stenotrophomonas maltophilia, Streptococcus agalactiae, Streptococcus. avium, Streptococcus bovis, Streptococcus cricetus, Streptococcus faceium, Streptococcus faecalis, Streptococcus ferus, Streptococcus gallinarum, Streptococcus lactis, Streptococcus mitior, Streptococcus mitis, Streptococcus mutans, Streptococcus oralis, Streptococcus pneumoniae, Streptococcus pyogenes, Streptococcus rattus, Streptococcus salivarius, Streptococcus sanguis, Streptococcus sobrinus, Treponema pallidum, Treponema denticola, Vibrio cholerae, Vibrio comma, Vibrio parahaemolyticus, Vibrio vulnificus, Wolbachia, Yersinia enterocolitica, Yersinia pestis and Yersinia pseudotuberculosis.

19. The method of any one of claims 16 to 18, wherein the bacterial infection is selected from the group consisting of pneumonia, tuberculosis, meningitis, diarrhoeal diseases, formation of biofilm, sepsis, listeriosis, gastroenteritis, toxic shock syndrome, hemorrhagic colitis; hemolytic uremic syndrome, Lyme Disease, gastric and duodenal ulcers, human ehrlichiosis, pseudomembranous colitis, cholera, salmonellosis, cat scratch fever, necrotizing fasciitis (GAS), streptococcal toxic shock syndrome, nosocomial and community associated infections, atherosclerosis, sudden infant death syndrome (SIDS), ear infections, respiratory tract infections, urinary tract infections, skin and soft tissue infections, nail bed infections, wound infection, septicemia, gastrointestinal disease, hospital-acquired endocarditis and blood stream infections.

20. A method of neutralizing endotoxins comprising administration of a pharmaceutically effective amount of a peptide according to any one of claims 1 to 13.

21. The method of claim 20, wherein the endotoxins are bacterial endotoxins or fungal endotoxins.

22. A method of treating viral based infectious diseases comprising administration of a pharmaceutically effective amount of a peptide according to any one of claims 1 to 13.

23. The method of claim 22, wherein the viral infectious disease is selected from the common cold, influenza, chickenpox, cold sores, Ebola, AIDS, avian influenza, SARS, dengue, herpes, shingles, measles, mumps, rubella, rabies, human papillomavirus, sexually transmitted diseases, viral meningitis, viral hepatitis, coxsackie virus and Epstein Barr virus.

24. A method of treating a fungal infection or infestation, or removing fungus comprising administration of a pharmaceutically effective amount of a peptide according to any one of claims 1 to 13.

25. The method of claim 24, wherein the fungus is selected from the group consisting of the genus of *Absidia, Ajellomyces, Arthroderma, Aspergillus, Blastomyces, Candida, Cladophialophora, Coccidioides, Cryptococcus, Cunninghamella, Epidermophyton, Exophiala, Filobasidiella, Fonsecaea, Fusarium, Geotrichum, Histoplasma, Hortaea, Issatschenkia, Madurella, Malassezia, Microsporum, Microsporidia, Mucor, Nectria, Paecilomyces, Paracoccidioides, Penicillium, Pichia, Pneumocystis, Pseudallescheria, Rhizopus, Rhodotorula, Scedosporium, Schizophyllum, Sporothrix, Trichophyton, and Trichosporon.*

26. The method of claim 25, wherein the fungus is selected from the group consisting of *Absidia corymbifera, Ajellomyces capsulatus, Ajellomyces dermatitidis, Arthroderma benhamiae, Arthroderma fulvum, Arthroderma gypseum, Arthroderma incurvatum, Arthroderma otae and Arthroderma vanbreuseghemii, Aspergillus flavus, Aspergillus fumigatus and Aspergillus niger, Blastomyces dermatitidis, Candida albicans, Candida glabrata, Candida guilliermondii, Candida krusei, Candida parapsilosis, Candida tropicalis*

and Candida pelliculosa, Cladophialophora carrionii, Coccidioides immitis and Coccidioides posadasii, Cryptococcus neoformans, Cunninghamella Sp, Epidermophyton floccosum, Exophiala dermatitidis, Filobasidiella neoformans, Fonsecaea pedrosoi, Fusarium solani, Geotrichum candidum, Histoplasma capsulatum, Hortaea werneckii, Issatschenkia orientalis, Madurella grisae, Malassezia furfur, Malassezia globosa, Malassezia obtusa, Malassezia pachydermatis, Malassezia restricta, Malassezia slooffiae, Malassezia sympodialis, Microsporum canis, Microsporum fulvum, Microsporum gypseum, Microsporidia, Mucor circinelloides, Nectria haematococca, Paecilomyces variotii, Paracoccidioides brasiliensis, Penicillium marneffei, Pichia anomala, Pichia guilliermondii, Pneumocystis jiroveci, Pneumocystis carinii, Pseudallescheria boydii, Rhizopus oryzae, Rhodotorula rubra, Scedosporium apiospermum, Schizophyllum commune, Sporothrx schenckii, Trichophyton mentagrophytes, Trichophyton rubrum, Trichophyton verrucosum and Trichophyton violaceum, and Trichosporon asahii, Trichosporon cutaneum, Trichosporon inkin and *Trichosporon mucoides*.

27. A method of removing a biofilm comprising administration of an effective amount of a peptide according to any one of claims 1 to 13.

28. The method of claim 27, wherein the biofilm occur on surfaces.

29. The method of claim 28, wherein the surfaces is selected from the group consisting of a ship, dockyard, food processors, mixers, machines, containers, water tanks, water filtrations, purification systems, preservatives in food industries, personal care products, scalpels, needles, scissors and other devices used in invasive surgical, therapeutic or diagnostic procedures; implantable medical devices, including artificial blood vessels, catheters and other devices for the removal or delivery of fluids to patients, artificial hearts, artificial kidneys, orthopaedic pins, plates and implants, catheters, urological and biliary tubes, endotracheal tubes, peripherally insertable central venous catheters, dialysis catheters, long term tunnelled central venous catheters, peripheral venous catheters, short term central venous catheters, arterial catheters, pulmonary catheters, Swan-Ganz catheters, urinary catheters, peritoneal catheters, long term urinary devices, tissue bonding urinary devices, artificial urinary sphincters, urinary dilators, ventricular or arterio-venous shunts; breast

implants, penile prostheses, vascular grafting prostheses, heart valves, artificial joints, artificial larynxes, otological implants, vascular catheter ports, wound drain tubes, hydrocephalus shunts, pacemakers and implantable defibrillators, dental implants, fillings, dentures, medical equipment, medical gear worn or carried by personnel in the health care setting, counter tops and fixtures in areas used for medical procedures or for preparing medical apparatus, tubes and canisters used in respiratory treatments, nebulisers, aesthetic agents, gloves, aprons and face-shields.

30. A method of treating proliferative diseases comprising administration of a pharmaceutically effective amount of a peptide according to any one of claims 1 to 13.

31. The method of claim 30, wherein the proliferative disease is selected from the group consisting of tumour, cancer, malignancy or combinations thereof.

32. The method of claim 31, wherein the proliferative disease is selected from the group consisting of colorectal cancer, fibrosarcoma, myxosarcoma, liposarcoma, chondrosarcoma, osteogenic sarcoma, chordoma, angiosarcoma, endotheliosarcoma, lymphangiosarcoma, lymphangio-endotheliosarcoma, synovioma, mesothelioma, Ewing's tumour, leiomyosarcoma, rhabdomyosarcoma, colon carcinoma, gastric cancer, pancreatic cancer, breast cancer, ovarian cancer, prostate cancer, squamous cell carcinoma of the head and neck, basal cell carcinoma, adenocarcinoma, sweat gland carcinoma, sebaceous gland carcinoma, papillary carcinoma, papillary adenocarcinomas, cystadenocarcinoma, medullary carcinoma, bronchogenic carcinoma, renal cell carcinoma, hepatoma, liver metastases, bile duct carcinoma, choriocarcinoma, seminoma, embryonal carcinoma, thyroid carcinoma such as anaplastic thyroid cancer, Wilms' tumour, cervical cancer, testicular tumour, lung cancer, small cell cancer of the lung, non-small cell cancer of the lung, bladder carcinoma, epithelial carcinoma, glioma, astrocytoma, medulloblastoma, craniopharyngioma, ependymoma, pinealoma, hemangioblastoma, acoustic neuroma, oligodendroglioma, meningioma, melanoma, neuroblastoma, and retinoblastoma.

33. Use of a peptide of any one of claims 1 to 13 in the manufacture of a medicament for treating cancer, a bacterial infection, or removing bacteria, or neutralizing endotoxins, or

treating viral based infectious diseases, or treating a fungal infection or infestation, or removing fungus, or treating proliferative diseases.

1. An amphiphilic peptide, wherein the peptide comprises: $(X_1Y_1X_2Y_2)_n$ (Formula I), wherein
   the C-terminal end of the peptide is amidated;
   the N-terminal end of the peptide is not acetylated;
   X_1 and X_2 is independently of each other a hydrophobic amino acid;
   Y_1 and Y_2 is independently of each other a cationic amino acid; and
   n is any number selected from the group consisting of 1.5, 2, 2.5, 3, 3.5, 4, 4.5, and 5; and
   wherein when assembled, the peptide has β-sheet structure.

2. The peptide of claim 1, wherein n is 2 or 2.5 or 3 or 3.5 or 4 or 4.5 or 5.

3. The peptide of claim 1, wherein $(X_1Y_1X_2Y_2)_n$ is $(X_1Y_1X_2Y_2)_n$-NH_2.

4. The peptide of claim 1, wherein the hydrophobic amino acid is any one of alanine (A), valine (V), isoleucine (I), leucine (L), methionine (M), phenylalanine (F), tryptophan (W) or cysteine (C).

5. The peptide of claim 1, wherein the hydrophobic amino acid is isoleucine (I), or valine (V).

6. The peptide of claim 1, wherein the cationic amino acid is selected from the group consisting of lysine (K), arginine (R) and histidine (H).

7. The peptide of claim 1, wherein each repeating unit n of Formula I comprises independently of each other 1 or 2 or 3 or 4 or 6 or 8 D-amino acids with the remaining amino acids being L-amino acids.

8. The peptide of claim 1, wherein each repeating unit n of Formula I comprises independently of each other 2 or 4 or 6 or 8 D-amino acids with the remaining amino acids being L-amino acids.

9. The peptide of claim 8, wherein the distribution of D-amino acids in each repeating unit n of Formula I is identical or different from each other.

10. The peptide of claim 1, wherein n is 2 and amino acids in position 4 and 6 are D-amino acids while the remaining amino acids are L-amino acids.

11. The peptide of claim 1 comprising the sequence $(IY_1IY_2)_n$-NH_2.

12. The peptide of claim 1 comprising the sequence $(IRX_2K)_n$-NH_2.

13. The peptide of claim 1, wherein the peptide is selected from the group consisting of VRVKVRVK-NH_2 (SEQ ID NO: 11), VRVKVRVKVRVK-NH_2 (SEQ ID NO: 20), IRIRIRIR-NH_2 (SEQ ID NO: 12), IKIKIKIK-NH_2 (SEQ ID NO: 13), IRVKIRVK-NH_2 (SEQ ID NO: 14), FRFKFRFK-NH_2 (SEQ ID NO: 15), WRWKWRWK-NH_2 (SEQ ID NO: 16), IRIKIRIK-NH_2 (SEQ ID NO: 17), IRIKIRIKIRIK-NH_2 (SEQ ID NO: 21), irikir-NH_2 (SEQ ID NO: 10), irikirik-NH_2 (SEQ ID NO: 18), IRIkIrIK-NH_2 (SEQ ID NO: 19), IRVKIRVKIRVK-NH_2 (SEQ ID NO: 22) and irvkirvkirvk-NH_2 (SEQ ID NO: 23), wherein small underlined residues represent D-amino acids while capital non-underlined represent L-amino acid.

14. A method of removing a biofilm comprising administering an effective amount of a peptide according to claim 1, wherein the biofilm occur on surfaces.

15. The method of claim 14, wherein the surfaces is selected from the group consisting of a ship, dockyard, food processors, mixers, machines, containers, water tanks, water filtrations, purification systems, preservatives in food industries, personal care products, scalpels, needles, scissors and other devices used in invasive surgical, therapeutic or diagnostic procedures; implantable medical devices, including artificial blood vessels, catheters and other devices for the removal or delivery of fluids to patients, artificial hearts, artificial kidneys, orthopaedic pins, plates and implants, catheters, urological and biliary tubes, endotracheal tubes, peripherally insertable central venous catheters, dialysis catheters, long term tunnelled central venous catheters, peripheral venous catheters, short term central venous catheters, arterial catheters, pulmonary catheters, Swan-Ganz catheters, urinary catheters, peritoneal catheters, long term urinary devices, tissue bonding urinary devices, artificial urinary sphincters, urinary dilators, ventricular or arterio-venous shunts; breast implants, penile prostheses, vascular grafting prostheses, heart valves, artificial joints, artificial larynxes, otological implants, vascular catheter ports, wound drain tubes, hydrocephalus shunts, pacemakers and implantable defibrillators, dental implants, fillings, dentures, medical equipment, medical gear worn or carried by personnel in the health care setting, counter tops and fixtures in areas used for medical procedures or for preparing medical apparatus, tubes and canisters used in respiratory treatments, nebulisers, aesthetic agents, gloves, aprons and face-shields.