CLAIMS

What is claimed is:

1. A controlled release drug delivery composition comprising a self-assembled ~~nanostructure~~ nanovesicle and a biologically active molecule, wherein the biologically active molecule in the composition has a controlled release profile, and wherein the ~~nanostructure~~ nanovesicle comprises a plurality of surfactant peptides and wherein the surfactant peptides have a formula selected from the group consisting of:
    a. $(\Phi)_m(+)_n$ (Formula (1)),
    b. $(+)_n(\Phi)_m$ (Formula (2)),
    c. $(\Phi)_m(-)_n$ (Formula (3)),
    d. $(-)_n(\Phi)_m$ (Formula (4)),
    e. $(-)_n(\Phi)_m(-)_n$ (Formula (5)),
    f. $(+)_n(\Phi)_m(+)_n$ (Formula (6)),
    g. $(\Phi)_m(-)_n(\Phi)_m$ (Formula (7)),
    h. $(\Phi)_m(+)_n(\Phi)_m$ (Formula (8)),
    i. $(+)_n(\Phi)_m(-)_n$ (Formula (9)),
    j. $(-)_n(\Phi)_m(+)_n$ (Formula (10)),

    wherein:

    ($\Phi$) represents independently for each occurrence, a natural or non-natural amino acid comprising a hydrophobic side-chain;

    (+) represents independently for each occurrence a natural or non-natural amino acid comprising a side-chain that is cationic at physiological pH;

    (-) represents independently for each occurrence a natural or non-natural amino acid comprising a side-chain that is anionic at physiological pH;

    wherein the terminal amino acids are optionally substituted;

    m for each occurrence represents an integer greater than or equal to 5; and

    n for each occurrence represents an integer greater than or equal to 1;

wherein the surfactant peptides are less than or equal to 10 amino acids in length, wherein the surfactant peptides have an acetylated N-terminus, and further wherein the biologically active agent is encapsulated within the ~~nanostructure~~nanovesicle.

2. The composition of claim 1, wherein the surfactant peptide has the Formula (1) or the Formula (3).

3. The composition of claim 2, wherein (Φ) is selected from the group consisting of alanine, valine, leucine, isoleucine and proline.

4. The composition of claim 3, wherein (Φ) is alanine.

5. The composition of any one of claims 3 or 4, wherein (+) is selected from the group consisting of histidine, lysine or arginine.

6. The composition of any one of claims 3 or 4, wherein (-) is selected from the group consisting of aspartic acid or glutamic acid.

~~7. The composition of claim 1, wherein the N-terminal amino acid of the surfactant peptides is substituted by an acetyl group.~~

~~8. The composition of claim 1, wherein the C-terminal amino acid of the surfactant peptides is substituted with an amino group.~~

~~9.~~7.The composition of claim 1, wherein n is 1.

~~10.~~8. The composition of claim 1, wherein m is 5, 6 or 7.

~~11.~~9. The composition of claim ~~9~~1, wherein m is 6.

~~12. The composition of claim 1, wherein the surfactant peptide is selected from the group consisting of ac-AAAAAAK-CONH$_2$ (SEQ ID NO: 1), KAAAAAA (SEQ ID NO: 2), ac-AAAAAAD-COOH (SEQ ID NO: 3) and DAAAAAA-COOH (SEQ ID NO: 4).~~

~~13.~~10. The composition of claim ~~12~~1, wherein the surfactant peptide is selected from the group consisting of ac-AAAAAAK-CONH$_2$ (SEQ ID NO: 1) and ac-AAAAAAD-COOH (SEQ ID NO: 3).

~~14. The composition of any one of claims 1 to 13, wherein the nanostructure is a nanovesicle.~~

~~15.~~11. The composition of any one of claims 1 to ~~14~~6, 7 to 9 and 10, wherein the biologically active molecule is hydrophobic.

~~16.~~12. The composition of any one of claims 1 to ~~14~~6, 7 to 9 and 10, wherein the biologically active molecule is hydrophilic.

~~17.~~13. The composition of any one of claims 1 to ~~14~~6, 7 to 9 and 10, wherein the biologically active molecule is a nucleic acid.

~~18. The composition of claim 1, wherein the surfactant peptides have an acetylated N-terminus.~~

~~19.~~14. The composition of claim 1 ~~or claim 18~~, wherein the surfactant peptides have a positively charged amino acid at the C-terminus.

~~20.~~15. The composition of ~~any one of~~ claims 1~~, 18 or 19~~, wherein the surfactant peptides have an amidated C-terminus.

~~21.~~16. The composition of any one of the preceding claims ~~1 to 20~~, further comprising a liposome.

~~22. A method for administering a biologically active molecule to a subject comprising administering to said subject a composition of any one of claims 1 to 21.~~

~~23.~~17. The ~~method~~ composition of claim ~~22~~1, wherein the biologically active molecule is to be delivered to the gastrointestinal tract or across the blood brain barrier of said subject.

~~24.~~18. The ~~method~~ composition of claim ~~23~~17, wherein the biologically active molecule is to be delivered to the gastrointestinal tract.

~~25.~~19. The ~~method~~ composition of claim ~~24~~18, wherein the surfactant peptides are negatively charged.

~~26. The method of any one of claims 1 to 25, wherein the biologically active molecule in the composition has a controlled release profile.~~

~~27.~~20. A method of preparing the composition of any one claims 1 to ~~21~~16, comprising bringing into contact a biologically active molecule with the surfactant peptides in an aqueous solution under conditions suitable for self-assembly.

21. A controlled release drug delivery composition comprising a self-assembled nanovesicle and a biologically active molecule, wherein the biologically active molecule in the composition has a controlled release profile, and wherein the nanovesicle comprises a plurality of surfactant peptides and wherein the surfactant peptides have a formula selected from the group consisting of:

$(\Phi)_m(+)_n$ (Formula (1)), and

$(\Phi)_m(-)_n$ (Formula (3));

wherein:

(Φ) represents independently for each occurrence, a natural or non-natural amino acid comprising a hydrophobic side-chain;

(+) represents independently for each occurrence a natural or non-natural amino acid comprising a side-chain that is cationic at physiological pH;

(-) represents independently for each occurrence a natural or non-natural amino acid comprising a side-chain that is anionic at physiological pH;

wherein the terminal amino acids are optionally substituted;

m for each occurrence is 5, 6 or 7; and

n for each occurrence is 1;

wherein the surfactant peptides have an acetylated N-terminus, and further wherein the biologically active agent is encapsulated within the nanovesicle.

22. The composition of claim 21, wherein the surfactant peptide has the Formula (1).

23. The composition of claim 21, wherein the surfactant peptide has the Formula (3).

24. The composition of any one of claims 22 and 23, wherein (Φ) is selected from the group consisting of alanine, valine, leucine, isoleucine and proline.

25. The composition of claim 24, wherein (Φ) is alanine.

26. The composition of any one of claims 22 and 24 to 25, wherein (+) is selected from the group consisting of histidine, lysine or arginine.

27. The composition any one of claims 23 to 25, wherein (-) is selected from the group consisting of aspartic acid or glutamic acid.

28. The composition of claim 27 wherein (-) is aspartic acid.

29. The composition of claim 22, wherein the nanovesicle comprises a plurality of surfactant peptides having the formula ac-AAAAAAK-$CONH_2$ (SEQ ID NO: 1).

30. The composition of claim 23, wherein the nanovesicle comprises a plurality of surfactant peptides having the formula ac-AAAAAAD-COOH (SEQ ID NO: 3).

31. The composition of claim 21, wherein the surfactant peptides have an amidated C-terminus.

32. The composition of any one of claims 21 to 31, wherein the biologically active molecule is hydrophobic.

33. The composition of any one of claims 21 to 31, wherein the biologically active molecule is hydrophilic.

34. The composition of any one of claims 21 to 31, wherein the biologically active molecule is a nucleic acid.

35. The composition of any one of claim 21 to 34 wherein the composition is suitable for use in administering a biologically active molecule to a subject.

36. The composition of claim 35, wherein the biologically active molecule is to be delivered to the gastrointestinal tract or across the blood brain barrier of said subject.

37. The composition of claim 35, wherein the biologically active molecule is to be delivered to the gastrointestinal tract.