Claims

1. A cationic carrier unit comprising

   (i) a targeting moiety (A) which targets the transporter LAT1,

   (ii) a water soluble polymer which is PEG,

   (iii) a cationic carrier moiety comprising cationic polymer blocks which are lysine, and

   (iv) two or more adjuvant moieties which are vitamin B3.

2. The cationic carrier unit of claim 1, wherein the targeting moiety comprises phenylalanine.

3. A micelle comprising the cationic carrier unit of claim 1 or 2 and an anionic payload.

4. The micelle of claim 3, wherein the positive charges of the cationic carrier moiety and the negative charges of the anionic payload in the micelle are at a charge ratio of between about 1:3 and about 3:1.

5. The micelle of claim 4, wherein the positive charges of the cationic carrier moiety and the negative charges of the anionic payload in the micelle are at a charge ratio of about 1:1.

6. The micelle of any one of claims 3 to 5, wherein the anionic payload comprises a nucleic acid selected from the group consisting of mRNA, miRNA, miRNA sponge, tough decoy miRNA, antimir, small RNA, rRNA, siRNA, shRNA, gDNA, cDNA, pDNA, PNA, BNA, antisense oligonucleotide (ASO), aptamer, cyclic dinucleotide, or any combination thereof.

7. The micelle of claim 6, wherein the nucleic acid comprises a nucleotide sequence having 5 to 30 nucleotides in length.

8. The micelle of any one of claims 3 to 7, wherein

   (a) the water soluble polymer comprises between about 40 and about 1000 ethylene glycol units;

   (b) the cationic carrier moiety comprises between about 3 and about 100 lysines; and,

(c) the adjuvant moieties comprise between 1 and 100 vitamin B3.

9. The micelle of any one of claims 3 to 7, wherein

(a) the water soluble polymer comprises about 40, 100, 150, 200, 300, 400, 500, 600, 700, 800, 900 or 1000 ethylene glycol units;

(b) the cationic carrier moiety comprises about 3, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100 lysines; and,

(c) the adjuvant moieties comprise about 1, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100 vitamin B3.

10. The micelle of any one of claims 3 to 7, wherein

(a) the water soluble polymer comprises about 100 to about 120 ethylene glycol units;

(b) the cationic carrier moiety comprises a poly-lysine with about 30 to about 40 lysines; and,

(c) the adjuvant moieties comprise about 5 to about 10 vitamin B3.

11. The micelle of any one of claims 3 to 7, wherein

(a) the water soluble polymer comprises about 120 to about 130 ethylene glycol units;

(b) the cationic carrier moiety comprising about 70 to about 90 lysines; and,

(c) the adjuvant moieties comprising about 20 to about 50 vitamin B3.

12. The micelle of any one of claims 3 to 11, wherein the cationic carrier moiety and the anionic payload are associated by a covalent bond, a non-covalent bond, or an ionic bond.

13. A pharmaceutical composition comprising the cationic carrier unit of claim 1 or 2 or the micelle of any one of claims 3 to 12 and a pharmaceutically acceptable carrier.

14. A method of preparing the micelle of any one of claims 3 to 12, comprising mixing the cationic carrier unit with the anionic payload at an ionic ratio of 1:1 in solution.

15. The micelle of any one of claims 3 to 12 for use in the treatment of a disease or condition.

16. Use of the micelle of any one of claims 3 to 12 in the manufacture of a medicament for the treatment of a disease or condition.

17. The micelle of any one of claims 3 to 12 for use in the treatment of a neurodegenerative disease, wherein the micelle reduces inflammation.

18. The micelle of any one of claims 3 to 12 for use in the treatment of a neurodegenerative disease, wherein the micelle recovers, induces, or recovers and induces neurogenesis.

19. The micelle of any one of claims 3 to 12 for use in the treatment of a neurodegenerative disease, wherein the micelle improves cognitive function.

20. Use of the micelle of any one of claims 3 to 12 in the manufacture of a medicament for the treatment of a neurodegenerative disease.

21. The micelle of any one of claims 3 to 12 for use in the treatment of Alzheimer’s disease, wherein the micelle reduces amyloid plaque burden.

22. Use of the micelle of any one of claims 3 to 12 in the manufacture of a medicament for the treatment of Alzheimer’s disease.