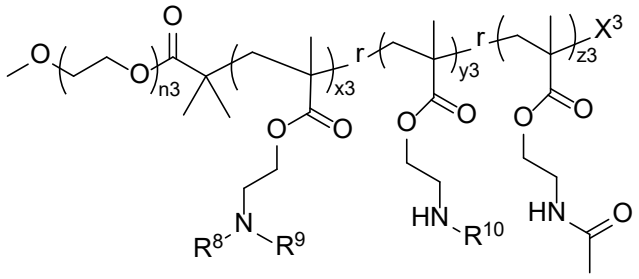
CLAIMS

1. A micelle comprising:

(i) a block copolymer of Formula (III), or a pharmaceutically acceptable salt, solvate, or hydrate thereof:



Formula (III),

wherein:

n_3 is an integer from 10-200;

x_3 is an integer from 40-300;

y_3 is an integer from 1-6;

z_3 is an integer from 1-10;

X^3 is a halogen, -OH, or -C(O)OH;

R^8 and R^9 are each independently an optionally substituted C_1-C_6 alkyl, C_3-C_{10} cycloalkyl or aryl;

or R^8 and R^9 are taken together with the corresponding nitrogen to which they are attached to form an optionally substituted 5 to 7-membered ring; and

R^{10} is indocyanine green; and

(ii) a therapeutic agent encapsulated by the block copolymer,

wherein the therapeutic agent is a protein conjugated to the indocyanine green.

2. The micelle of claim 1, wherein R^8 and R^9 are each independently an optionally substituted C_1-C_6 alkyl.

3. The micelle of claim 1 or 2, wherein R^8 and R^9 are each independently -CH_2CH_3, -$CH_2CH_2CH_3$, or -$CH_2CH_2CH_2CH_3$.

4. The micelle of any one of claims 1-3, wherein R^8 and R^9 are each -$CH_2CH_2CH_2CH_3$.

5. The micelle of claim 1, wherein R^8 and R^8 are taken together with the corresponding nitrogen to which they are attached to form an optionally substituted 5 to 7-membered ring.

6. The micelle of claim 1 or 5, wherein R^8 and R^9 taken together are -$CH_2(CH_2)_2CH_2$-, -$CH_2(CH_2)_3CH_2$-, or -$CH_2(CH_2)_4CH_2$-.

7. The micelle of any one of claims 1-6, wherein x_3 is an integer from 50-200, 60-160, or 90-140.

8. The micelle of claim 7, wherein x_3 is 90-140.

9. The micelle of any one of claims 1-8, wherein y_3 is an integer from 1-6, 1-5, 1-4, or 1-3.

10. The micelle of any one of claims 1-9, wherein z_3 is an integer from 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, or 1-3.

11. The micelle of any one of claims 1-10, wherein n_3 is an integer from 60-150 or 100-140.

12. The micelle of claim 11, wherein n_3 is 100-140.

13. The micelle of any one of claims 1-12, wherein X^3 is a halogen.

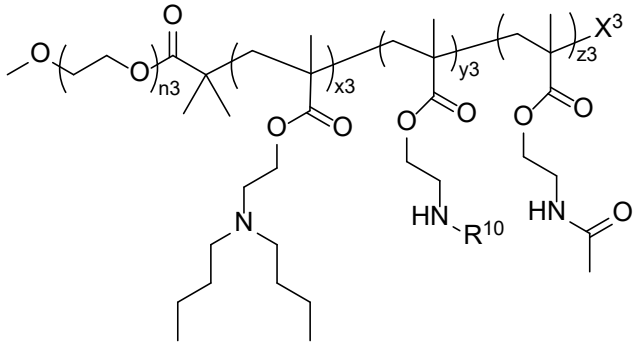
14. The micelle of claim 13, wherein X^3 is -Br.

15. The micelle of any one of claims 1-14, wherein the protein is a protein of 5 to 20 KDa optionally a cytokine or fragment thereof, or is an antibody optionally an engineered antibody, or a fragment thereof.

16. The micelle of claim 15, wherein the cytokine is an interleukin (IL), chemokine, interferon, lymphokine, monokine, colony stimulating factor, or tumor necrosis factor, optionally an IL-2, IL-1, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-15, IL-17, or IL-18 protein, or a fragment thereof.

17. A micelle comprising:

(i) a block copolymer of Formula (IV), or a pharmaceutically acceptable salt, solvate, or hydrate thereof:



Formula (IV),

wherein:

n_3 is an integer from 10-200;

x_3 is an integer from 40-300;

y_3 is an integer from 1-6;

z_3 is an integer from 1-10;

R^{10} is indocyanine green; and

X^3 is a halogen, -OH, or -C(O)OH; and

(ii) a therapeutic agent encapsulated by the block copolymer,

wherein the therapeutic agent is a protein conjugated to the indocyanine green.

18. The micelle according to any one of claims 1-17, for use as a medicament.

19. Use of a micelle according to any one of claims 1-17 in the preparation of a medicament for treating cancer.

20. The use of claim 19, wherein the cancer is a solid tumor.

21. The use of claim 19 or 20, wherein the cancer is breast cancer, head and neck squamous cell carcinoma (NHSCC), peritoneal metastasis, lung cancer, ovarian cancer, prostate cancer, bladder cancer, kidney cancer, urethral cancer, esophageal cancer, colorectal cancer, brain cancer, or skin cancer.

22. A method for increasing encapsulation of a therapeutic agent into a micelle, comprising conjugating the therapeutic agent with a fluorescent dye.