Claims

1. A nanoconjugate comprising: a gold nanoparticle (AuNP), dithiolated diethylenetriamine pentaacetic acid (DTDTPA), a thioctic acid terminated peptide, and doxorubicin,

   wherein the DTDTPA is directly linked to the gold nanoparticle surface via at least one Au-S bond;

   the thioctic acid terminated peptide is directly linked to the gold nanoparticle surface via at least one Au-S bond; and

   the doxorubicin is linked to the DTDTPA.

2. The nanoconjugate of claim 1, wherein the thioctic acid terminated peptide is thioctic acid terminated bombesin.

3. The nanoconjugate of claim 2, wherein the thioctic acid terminated bombesin has a sequence: Lipoic-Gln-Trp-Ala-Val-Gly-His-Leu- Met-NH_2.

4. The nanoconjugate of any one of claims 1 to 3, wherein the doxorubicin is linked to the DTDTPA via an amide bond.

5. The nanoconjugate of any one of claims 1 to 4, which is prepared by a process comprising conjugating AuNP-DTDTP A nanoparticle with the thioctic acid terminated peptide, wherein the gold in the gold nanoparticle and the thioctic acid terminated peptide are present in the conjugation reaction in a stoichiometric ratio of 1 :0.5 to 1:4.

6. The nanoconjugate of claim 5, wherein the gold in the gold nanoparticle and the thioctic acid terminated peptide are present in the conjugation reaction in a stoichiometric ratio of about 1:2.

7. The nanoconjugate of any one of claims 1 to 6, wherein the thioctic acid terminated peptide comprises 1 % to 40% by weight of the nanoconjugate.

8. The nanoconjugate of claim 7, wherein the thioctic acid terminated peptide comprises 20% to 30% by weight of the nanoconjugate.

9. The nanoconjugate of any one of claims 1 to 8, wherein the doxorubicin comprises 0.01% to 0.05% by weight of the nanoconjugate.

10. The nanoconjugate of claim 9, wherein the doxorubicin comprises about 0.03% by weight of the nanoconjugate.

11. The nanoconjugate of any one of claims 1 to 10, wherein the nanoconjugate has a hydrodynamic diameter of 110 nm to 140 nm as measured by dynamic light scattering (DLS).

12. The nanoconjugate of claim 11, wherein the nanoconjugate has a hydrodynamic diameter of 120 nm to 130 nm as measured by dynamic light scattering (DLS).

13. The nanoconjugate of any one of claims 1 to 12, wherein the nanoconjugate has a zeta potential value of -15 mV to -30 mV.

14. The nanoconjugate of claim 13, wherein the nanoconjugate has a zeta potential value of -20 mV to -25 mV.

15. A pharmaceutical composition comprising the nanoconjugate of any one of claims 1 to 14, and a pharmaceutically acceptable carrier.

16. The nanoconjugate of any one of claims 1 to 14 for use in the treatment of cancer in a subject in need thereof.

17. The nanoconjugate of claim 16 for use in the treatment of cancer, wherein the cancer is selected from the group consisting of acute lymphoblastic leukemia (ALL), acute myeloblastic leukemia (AML), bone sarcoma, breast cancer, endometrial cancer, gastric cancer, head and neck cancer, Hodgkin lymphoma, Non-Hodgkin lymphoma, liver cancer, kidney cancer, multiple myeloma, neuroblastoma, ovarian cancer, lung cancer, soft tissue sarcoma, thyomas, thyroid cancer, bladder cancer, uterine sarcoma, prostate cancer, colon cancer, ovarian cancer, non-small cell lung cancer, pancreatic cancer, Wilms' tumor, and Waldenstr6m macroglobulinemia.

18. The nanoconjugate of claim 16 or claim 17 for use in the treatment of cancer, wherein the nanoconjugate is to be administered to the subject by injection.

19. A nanoconjugate comprising: a gold nanoparticle (AuNP), dithiolated diethylenetriamine pentaacetic acid (DTDTPA), and doxorubicin, wherein the DTDTPA is directly linked to the gold nanoparticle surface via at least one Au-S bond; and the doxorubicin is linked to the DTDTPA.

20. A pharmaceutical composition comprising the nanoconjugate of claim 19, and a pharmaceutically acceptable carrier.

21. The nanoconjugate of claim 19 for use in the treatment of cancer in a subject in need thereof.