CLAIMS

What is claimed is:

1. A cell-targeting nanoparticle, wherein the cell-targeting nanoparticle is directly conjugated to at least one cysteine-containing peptide, wherein the cysteine-containing peptide is selected from the group consisting of glutathione (GSH), a GSH-containing peptide, and a peptide comprising a nuclear localization signal (NLS) sequence and a transporter sequence.

2. The cell-targeting nanoparticle of claim 1, wherein the cell-targeting nanoparticle is directly conjugated to the cysteine-containing peptide via a functional group.

3. The cell-targeting nanoparticle of claim 2, wherein the functional group is a thiol group.

4. The cell-targeting nanoparticle of any one of claims 1 to 3, wherein the cell-targeting nanoparticle surface comprises at least one functional group for conjugating to the at least one cysteine-containing peptide.

5. The cell-targeting nanoparticle of claim 4, wherein the functional group is a thiol group.

6. The cell-targeting nanoparticle of any one of claims 1 to 5, wherein the NLS sequence is derived from SV40 Large T antigen or nucleoplasmin.

7. The cell-targeting nanoparticle of claim 6, wherein the NLS sequence comprises a sequence selected from the group consisting of SEQ ID NO: 1 (C***PKKKRKV*), SEQ ID NO: 2 (CG**PKKKRKV*), SEQ ID NO: 3 (CGC*PKKKRKV*), SEQ ID NO: 4: (CGC*PKKKRKV*) or SEQ ID NO: 5 (CGCGPKKKRKVG).

8. The cell-targeting nanoparticle of any one of claims 1 to 7, wherein the transporter sequence comprises a sequence of 10 to 50 amino acid residues or 10 to 30 amino acid residues in length.

9. The cell-targeting nanoparticle of any one of claims 1 to 8, wherein the transporter sequence comprises the amino acid sequence as set forth in SEQ ID NO: 6 (GWTLNSAGYLLGKINLKALAALAKKIL).

10. The cell-targeting nanoparticle of any one of claims 1 to 9, wherein the diameter of the nanoparticle is in the range of about 1 nm to about 50 nm.

11. The cell-targeting nanoparticle of any one of claims 1 to 10, wherein the cell-targeting nanoparticle comprises a metal nanoparticle.

12. The cell-targeting nanoparticle of any one of claims 1 to 11, wherein the cell-targeting nanoparticle comprises a quantum dot.

13. The cell-targeting nanoparticle of claim 12, wherein the quantum dot is selected from the group consisting of CdSe, CdS, ZnSe, ZnS, PbS, PbSe, CuS and combinations thereof.

14. The cell-targeting nanoparticle of any one of claims 1 to 10, wherein the cell-targeting nanoparticle comprises a magnetic nanoparticle.

15. The cell-targeting nanoparticle of claim 14, wherein the magnetic nanoparticle is selected from the group consisting of Fe_2O_3, Fe_3O_4, Fe_2O_4, Fe_xPt_y, Co_xPt_y, $MnFe_xO_y$, $CoFe_xO_y$, $NiFe_xO_y$, $CuFe_xO_y$, $ZnFe_xO_y$, and $CdFe_xO_y$, wherein x and y vary between 1 and 6, depending on the method of synthesis.

16. The cell-targeting nanoparticle of any one of claims 1 to 15, wherein the nanoparticle is for targeting a sub-cellular structure of a cell.

17. ~~The cell-targeting nanoparticle of claim 16, wherein the sub-cellular structure is~~ selected from the group consisting of organelle, cytoskeleton and genetic material.

18. The cell-targeting nanoparticle of claim 17, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

19. The cell-targeting nanoparticle of claim 17, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

20. The cell-targeting nanoparticle of claim 17, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

21. The cell-targeting nanoparticle of any one of claims 16 to 20, wherein the cell is derived from a human.

22. The cell-targeting nanoparticle of any one of claims 16 to 21, wherein the cell is a stem cell.

23. The cell-targeting nanoparticle of claim 22, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

24. A method for targeting a cell comprising incubating at least one cell-targeting nanoparticle according to any one of claims 1 to 23 in a culture containing the cell, under conditions which allow the cell to be targeted by the at least one cell-targeting nanoparticle.

25. The method of claim 24, wherein the sub-cellular structure of the cell is targeted by the cell-targeting nanoparticle.

26. The method of claim 25, wherein the sub-cellular structure is selected from the group consisting of organelle, cytoskeleton and genetic material.

27. The method of claim 26, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

28. The method of claim 26, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

29. The method of claim 26, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

30. The method of any one of claims 24 to 29, wherein the cell is derived from a human.

31. The method of any one of claims 24 to 30, wherein the cell is a stem cell.

32. The method of claim 31, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

33. The method of any one of claims 24 to 32, wherein the method is carried out using fluorescence spectroscopy or magnetic resonance imaging.

34. A kit for the targeting of a cell comprising at least one cell-targeting nanoparticle according to any one of claims 1 to 23.

35. The kit of claim 34, further comprising a staining reagent.

CLAIMS

What is claimed is:

1. A cell-targeting nanoparticle, wherein the cell-targeting nanoparticle comprises a quantum dot directly conjugated to at least one cysteine-containing peptide, wherein the cysteine-containing peptide is selected from the group consisting of glutathione (GSH), a GSH-containing peptide, and a peptide comprising a nuclear localization signal (NLS) sequence and a transporter sequence.

2. The cell-targeting nanoparticle of claim 1, wherein the cell-targeting nanoparticle is directly conjugated to the cysteine-containing peptide via a functional group.

3. The cell-targeting nanoparticle of claim 2, wherein the functional group is a thiol group.

4. The cell-targeting nanoparticle of claim 1, wherein the cell-targeting nanoparticle surface comprises at least one functional group for conjugating to the at least one cysteine-containing peptide.

5. The cell-targeting nanoparticle of claim 4, wherein the functional group is a thiol group.

6. The cell-targeting nanoparticle of claim 1, wherein the NLS sequence is derived from SV40 Large T antigen or nucleoplasmin.

7. The cell-targeting nanoparticle of claim 6, wherein the NLS sequence comprises a sequence selected from the group consisting of SEQ ID NO: 1 (C***PKKKRKV*), SEQ ID NO: 2 (CG**PKKKRKV*), SEQ ID NO: 3 (CGC*PKKKRKV*), SEQ ID NO: 4: (CGC*PKKKRKV*) or SEQ ID NO: 5 (CGCGPKKKRKVG).

8. The cell-targeting nanoparticle of claim 1, wherein the transporter sequence comprises a sequence of 10 to 50 amino acid residues or 10 to 30 amino acid residues in length.

9. The cell-targeting nanoparticle of claim 1, wherein the transporter sequence comprises the amino acid sequence as set forth in SEQ ID NO: 6 (GWTLNSAGYLLGKINLKALAALAKKIL).

10. The cell-targeting nanoparticle of claim 1, wherein the diameter of the nanoparticle is in the range of about 1 nm to about 50 nm.

11. The cell-targeting nanoparticle of claim 1, wherein the quantum dot is selected from the group consisting of CdSe, CdS, ZnSe, ZnS, PbS, PbSe, CuS and combinations thereof.

12. The cell-targeting nanoparticle of claim 1, wherein the nanoparticle is for targeting a sub-cellular structure of a cell.

13. The cell-targeting nanoparticle of claim 12, wherein the sub-cellular structure is selected from the group consisting of organelle, cytoskeleton and genetic material.

14. The cell-targeting nanoparticle of claim 13, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

15. The cell-targeting nanoparticle of claim 13, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

16. The cell-targeting nanoparticle of claim 13, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

17. The cell-targeting nanoparticle of claim 12, wherein the cell is derived from a human.

18. The cell-targeting nanoparticle of claim 12, wherein the cell is a stem cell.

19. The cell-targeting nanoparticle of claim 18, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

20. A method for targeting a cell comprising incubating at least one cell-targeting nanoparticle in a culture containing the cell, under conditions which allow the cell to be targeted by the at least one cell-targeting nanoparticle, wherein the cell-targeting nanoparticle comprises a quantum dot directly conjugated to at least one cysteine-containing peptide, wherein the cysteine-containing peptide is selected from the group consisting of glutathione (GSH), a GSH-containing peptide, and a peptide comprising a nuclear localization signal (NLS) sequence and a transporter sequence.

21. The method of claim 20, wherein the sub-cellular structure of the cell is targeted by the cell-targeting nanoparticle.

22. The method of claim 21, wherein the sub-cellular structure is selected from the group consisting of organelle, cytoskeleton and genetic material.

23. The method of claim 22, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

24. The method of claim 22, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

25. The method of claim 22, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

26. The method of claim 20, wherein the cell is derived from a human.

27. The method of claim 20, wherein the cell is a stem cell.

28. The method of claim 27, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

29. The method of claim 20, wherein the method is carried out using fluorescence spectroscopy or magnetic resonance imaging.

CLAIMS

What is claimed is:

1. A cell-targeting nanoparticle, wherein the cell-targeting nanoparticle comprises a quantum dot directly conjugated to at least one cysteine-containing peptide, wherein the cysteine-containing peptide is selected from the group consisting of glutathione (GSH), a GSH-containing peptide, and a peptide comprising a nuclear localization signal (NLS) sequence and a transporter sequence.

2. The cell-targeting nanoparticle of claim 1, wherein the cell-targeting nanoparticle is directly conjugated to the cysteine-containing peptide via a functional group.

3. The cell-targeting nanoparticle of claim 2, wherein the functional group is a thiol group.

4. The cell-targeting nanoparticle of claim 1, wherein the cell-targeting nanoparticle surface comprises at least one functional group for conjugating to the at least one cysteine-containing peptide.

5. The cell-targeting nanoparticle of claim 4, wherein the functional group is a thiol group.

6. The cell-targeting nanoparticle of claim 1, wherein the NLS sequence is derived from SV40 Large T antigen or nucleoplasmin.

7. The cell-targeting nanoparticle of claim 6, wherein the NLS sequence comprises a sequence selected from the group consisting of SEQ ID NO: 1 (C***PKKKRKV*), SEQ ID NO: 2 (CG**PKKKRKV*), SEQ ID NO: 3 (CGC*PKKKRKV*), SEQ ID NO: 4: (CGC*PKKKRKV*) or SEQ ID NO: 5 (CGCGPKKKRKVG).

8. The cell-targeting nanoparticle of claim 1, wherein the transporter sequence comprises a sequence of 10 to 50 amino acid residues or 10 to 30 amino acid residues in length.

9. The cell-targeting nanoparticle of claim 1, wherein the transporter sequence comprises the amino acid sequence as set forth in SEQ ID NO: 6 (GWTLNSAGYLLGKINLKALAALAKKIL).

10. The cell-targeting nanoparticle of claim 1, wherein the diameter of the nanoparticle is in the range of about 1 nm to about 50 nm.

11. The cell-targeting nanoparticle of claim 1, wherein the quantum dot is selected from the group consisting of CdSe, CdS, ZnSe, ZnS, PbS, PbSe, CuS and combinations thereof.

12. The cell-targeting nanoparticle of claim 1, wherein the nanoparticle is for targeting a sub-cellular structure of a cell.

13. The cell-targeting nanoparticle of claim 12, wherein the sub-cellular structure is selected from the group consisting of organelle, cytoskeleton and genetic material.

14. The cell-targeting nanoparticle of claim 13, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

15. The cell-targeting nanoparticle of claim 13, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

16. The cell-targeting nanoparticle of claim 13, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

17. The cell-targeting nanoparticle of claim 12, wherein the cell is derived from a human.

18. The cell-targeting nanoparticle of claim 12, wherein the cell is a stem cell.

19. The cell-targeting nanoparticle of claim 18, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

20. A method for targeting a cell comprising incubating at least one cell-targeting nanoparticle in a culture containing the cell, under conditions which allow the cell to be targeted by the at least one cell-targeting nanoparticle, wherein the cell-targeting nanoparticle comprises a quantum dot directly conjugated to at least one cysteine-containing peptide, wherein the cysteine-containing peptide is selected from the group consisting of glutathione (GSH), a GSH-containing peptide, and a peptide comprising a nuclear localization signal (NLS) sequence and a transporter sequence.

21. The method of claim 20, wherein the sub-cellular structure of the cell is targeted by the cell-targeting nanoparticle.

22. The method of claim 21, wherein the sub-cellular structure is selected from the group consisting of organelle, cytoskeleton and genetic material.

23. The method of claim 22, wherein the organelle is selected from the group consisting of nucleus, nucleolus, ribosome, vesicle, rough endoplasmic reticulum, Golgi apparatus, smooth endoplasmic reticulum, mitochondria, vacuole, cytosol, lysosome and centriole.

24. The method of claim 22, wherein the cytoskeleton is selected from the group consisting of an actin filament, a microtubule, and an intermediate filament.

25. The method of claim 22, wherein the genetic material is deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

26. The method of claim 20, wherein the cell is derived from a human.

27. The method of claim 20, wherein the cell is a stem cell.

28. The method of claim 27, wherein the stem cell is a bone marrow stem cell or a mesenchymal stem cell.

29. The method of claim 20, wherein the method is carried out using fluorescence spectroscopy or magnetic resonance imaging.