CLAIMS

1. A composition comprising a therapeutic amount of a conjugate, wherein the conjugate comprises a quantum dot and a therapeutically effective peptide or protein.

2. The composition of claim 1, wherein the peptide or protein is less than about 30 kDa in size.

3. The composition of claim 1 or claim 2, wherein the peptide or protein is selected from the group consisting of insulin, growth hormone, fibroblast growth factor 21 (FGF21) a glucagon-like peptide-1 (GLP-1) agonist, a glucagon-like peptide-2 (GLP-2) agonist, a platelet derived growth factor (PDGF) beta receptor modulator, and an integrin alpha-4/beta-7 antagonist, a PYY(3-36) analogue, vasopressin, interleukins (less than 30 kDa in size), enkephalins, endorphins and combinations thereof.

4. The composition of claim 3, wherein:
the GLP-1 agonist is liraglutide or exenatide; and/or
the GLP-2 agonist is apraglutide; and/or
the PDGF beta receptor modulator is BOT191; and/or
the integrin alpha-4/beta-7 antagonist is PN-10943.

5. The composition of any one of claims 1 to 4, wherein the composition is formulated for oral administration.

6. The composition of any one of claims 1 to 5, wherein the quantum dot is an Ag_2S quantum dot.

7. The composition of any one of claims 1 to 6, wherein the average diameter of the quantum dot is between 1 nm and 20 nm.

8. The composition of claim 7, wherein the average diameter is less than 10 nm.

9. The composition of any one of claims 1 to 8, wherein the conjugate further comprises a polymer.

10. The composition of claim 9, wherein the polymer is a biopolymer.

11. The composition of claim 10, wherein the biopolymer is selected from the group consisting of heparin, gelatin, hyaluronic acid, chitosan, galactose, glucose, and any combination thereof.

12. The composition of claim 11, wherein the biopolymer is chitosan, galactose, glucose, or any combination thereof.

13. The composition of any one of claims 9 to 12, wherein the polymer or the biopolymer covers at least part of the conjugate.

14. The composition of any one of claims 1 to 13, wherein the conjugate accumulates on/in a hepatocyte of the subject after oral administration.

15. The composition of any one of claims 1 to 14, wherein the composition is for administration to a subject that has been diagnosed with a condition related to insufficient endogenous peptide or protein production.

16. The composition of claim 15, wherein the condition is type I or type II diabetes.

17. The composition of any one of claims 1 to 14, wherein the composition is for administration to a subject that has been diagnosed with a condition requiring exogenous therapeutic peptide or protein administration.

18. The composition of claim 17, wherein the condition is selected from diabetic nephrology, liver fibrosis, non-alcoholic steatohepatitis (NASH), renal fibrosis, celiac disease, inflammatory bowel disease (IBD), ulcerative colitis or another gastrointestinal disease.

19. The composition of any one of claims 1 to 18, wherein the composition comprises a pharmaceutically acceptable excipient.

20. Use of a conjugate comprising a quantum dot and insulin in the manufacture of a medicament for treating hyperglycemia in a subject in need thereof.

21. Use of a conjugate comprising a quantum dot and a protein or peptide effective in replacing the insufficient endogenous peptide in the manufacture of a medicament for treating insufficient endogenous peptide production in a subject in need thereof.

22. Use of a conjugate comprising a quantum dot and the therapeutic exogenous peptide or protein in the manufacture of a medicament for treating a subject suffering from a condition, wherein the condition is treatable with administration of a therapeutic exogenous peptide or protein.

23. The use of any one of claims 20 to 22, wherein the conjugate is to be administered to the subject orally.

24. The use of claim 21, wherein the condition is type I or type II diabetes.

25. The use of any one of claims 20 to 24, wherein the quantum dot is a Ag_2S quantum dot.

26. The use of any one of claims 20 to 25, wherein the average diameter of the quantum dot is between 5nm and 20nm.

27. The use of any one of claim 20 to 26, wherein the conjugate further comprises a polymer.

28. The use of claim 27, wherein the polymer is a biopolymer.

29. The use of claim 28, wherein the biopolymer at least partially coats the conjugate.

30. The use of claim 28 or claim 29, wherein the biopolymer is selected from the group consisting of heparin, gelatin, hyaluronic acid, chitosan, galactose, glucose, and any combination thereof.

31. The use of claim 30, wherein the biopolymer is chitosan, galactose, glucose, or any combination thereof.

32. Use of a conjugate comprising a quantum dot and the peptide or protein in the manufacture of a medicament for delivering a peptide or protein to an organ of a subject, wherein the

medicament is to be orally administered to the subject, wherein the organ is selected from the liver, pancreas, small bowel or kidneys.

33. The use of claim 32, wherein the quantum dot is an Ag_2S quantum dot.

34. The use of claim 33, wherein the Ag_2S quantum dot is between 5nm and 20 nm in diameter.

35. The use of any one of claims 32 to 34, wherein the conjugate optionally comprises a biopolymer selected from the group consisting of gelatin, chitosan, galactose, glucose, and any combination thereof.

36. Use of a conjugate comprising a quantum dot and insulin in the manufacture of a medicament for lowering blood glucose in a subject, wherein the use comprises that the medicament is to be orally administered to the subject, wherein the quantum dot is an Ag_2S quantum dot between 5nm and 20 nm in diameter, wherein the conjugate is metabolized in a hepatocyte, thereby releasing the insulin into the blood stream of the subject.

37. Use of a conjugate comprising a quantum dot and insulin for the manufacture of a medicament for treating type I or type II diabetes.

38. A conjugate comprising a quantum dot and a protein or peptide for use in therapy.

39. The conjugate of claim 38, wherein the therapy comprises insufficient endogenous production of the peptide or protein in a subject.

40. The use of claim 37 or the conjugate of claim 38 or 39, wherein the medicament is to be formulated for oral administration.

41. The use of claim 37 or 40 or the conjugate of any one of claims 38 to 40, wherein the conjugate further comprises a polymer or a biopolymer.