CLAIMS

What is claimed is:

1. A liquid formulation comprising a polypeptide and a surfactant, wherein at least about 70% (wt%) of the surfactant are isosorbide polyoxyethylene (POE) fatty acid esters.

2. The liquid formulation of claim 1, wherein the isosorbide POE fatty acid esters comprise about 5-30 POE units~~.~~, or

~~3. The liquid formulation of claim 1 or claim 2,~~ wherein the isosorbide POE fatty acid esters comprise about 20 POE units~~.~~, or

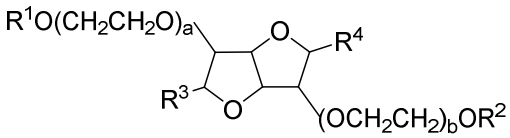
~~4. The liquid formulation of any one of claims 1-3,~~ wherein the isosorbide POE fatty acid esters comprise fatty acid chains selected from the group consisting of an optionally substituted C_{4-28} alkyl and an optionally substituted C_{4-28} alkenyl.

~~5.~~3. The liquid formulation of ~~any one of~~ claim~~s~~ 1~~-4~~ or 2, wherein the isosorbide POE fatty acid esters are monoesters~~.~~, or

~~6. The liquid formulation of claim 5,~~ wherein the isosorbide POE fatty acid esters are monoesters ~~are~~ selected from the group consisting of isosorbide POE monolaurate, isorsobide POE monomyristate, isosorbide POE monopalmitate, isosorbide POE monostearate and isosorbide POE monooelate, or wherein the isosorbide POE fatty acid ester is isosorbide POE monolaurate.

~~7.~~4. The liquid formulation of ~~any one of~~ claim~~s~~ 1~~-4~~ or 2, wherein the isosorbide POE fatty acid esters are monoesters, diesters, or a mixture of the foregoing.

~~8.~~5. The liquid formulation of claim 1, wherein the isosorbide POE fatty acid ester is a compound of Formula (I):



(I);

wherein:

a and b are independently integers from 2 to 28, provided that the sum of a and b is an integer from 5-30;

R^1 and R^2 are independently selected from the group consisting of hydrogen and

-C(O)R", wherein R" is an optionally substituted C_{3-27} alkyl or an optionally substituted C_{3-27} alkenyl; and

R^3 and R^4 are independently hydrogen.

9.6. The liquid formulation of claim 85, wherein the sum of a and b is 9.,

10. The liquid formulation of claim 8 or claim 9, or wherein R^1 is H and R^2 is -C(O)R".,

or

11. The liquid formulation of claim 8 or claim 9, wherein R^1 is -C(O)R" and R^2 is H., or

12. The liquid formulation of claim 8 or claim 9, wherein both R^1 and R^2 are -C(O)R".

13.7. The liquid formulation of any one of claims 8-125 or 6, wherein R" is an unsubstituted C_{3-27} alkyl.,

14. The liquid formulation of claim 13, or wherein R" is an unsubstituted C_{11} alkyl.

15.8. The liquid formulation of any one of claims 8-125 or 6, wherein R" is an unsubstituted C_{3-27} alkenyl.,

16. The liquid formulation of claim 15, or wherein R" is an unsubstituted C_{17} alkenyl.

17.9. The liquid formulation of any one of claims 1-168, wherein at least about 80% (wt%) of the surfactant are isosorbide POE fatty acid esters.

18.10. The liquid formulation of any one of claims 1-179, wherein the surfactant further comprises a POE fatty acid ester.,

19. The liquid formulation of claim 18, or wherein the surfactant comprises a greater amount of isosorbide POE fatty acid esters than POE fatty acid esters., or

20. The liquid formulation of claim 18 or claim 19, wherein the POE fatty acid ester comprises a fatty acid chains selected from the group consisting of an optionally substituted C_{4-28} alkyl and an optionally substituted C_{4-28} alkenyl., or

21. The liquid formulation of claim 20, wherein the POE fatty acid ester is selected from a group consisting of POE monolaurate, POE monomyristate, POE monopalmitate, POE monostearate, and POE monooelate., or

22. The liquid formulation of any one of claims 18-21, wherein less than about 20% (wt%) of the surfactant are POE fatty acid esters., or

23. The liquid formulation of any one of claims 1-22, wherein the surfactant is about 0.0005% to 0.2% (w:v) of the liquid formulation., or

24. The liquid formulation of any one of claims 1-23, wherein the surfactant further comprises a sorbitan POE fatty acid ester.

25.11. The liquid formulation of any one of claims 1-2410, wherein the polypeptide is a protein., or

~~26.~~ ~~The liquid formulation of claim 25,~~ wherein the polypeptide is a protein that is an antibody~~.~~, or

~~27.~~ ~~The liquid formulation of claim 26,~~ wherein the polypeptide is a protein that is an antibody ~~is~~ selected from the group consisting of a polyclonal antibody, a monoclonal antibody, a humanized antibody, a human antibody, a chimeric antibody, and an antibody fragment~~.~~,

~~28.~~ ~~The liquid formulation of claim 27,~~ or wherein the polypeptide is a protein that is an antibody fragment ~~is~~ selected from the group consisting of Fab, Fab', $F(ab')_2$, and Fv fragments.

~~29.~~12. The liquid formulation of ~~any one of~~ claim~~s~~ ~~26-28~~11, wherein the antibody concentration is about 0.1 mg/mL to about 300 mg/mL~~.~~, or

~~30.~~ ~~The liquid formulation of claim 29, wherein the antibody concentration is~~ about 100 mg/mL to about 300 mg/mL.

~~31.~~13. The liquid formulation of any one of claims 1-~~30~~12, wherein the liquid formulation is a reconstituted lyophilized formulation.

~~32.~~14. The liquid formulation of claim ~~29~~ 12~~or claim 30~~, wherein the liquid formulation is further diluted with an infusion solution to a polypeptide concentration of about 0.001 mg/mL to about 0.5 mg/mL.

~~33.~~15. The liquid formulation of any one of claims 1-~~32~~14, wherein the liquid formulation is substantially free of aggregates~~.~~, or

~~34.~~ ~~The liquid formulation of any one of claims 1-32, wherein the liquid formulation~~ comprises less free fatty acid particle formation.

~~35.~~16. The liquid formulation of any one of claims ~~18~~10-~~34~~15, wherein at least about 80% (wt%) of the surfactant are isosorbide polyoxyethylene (POE) fatty acid esters and POE fatty acid esters~~.~~, or

~~36.~~ ~~The liquid formulation of any one of claims 18-35,~~ wherein at least about 90% (wt%) of the surfactant are isosorbide polyoxyethylene (POE) fatty acid esters and POE fatty acid esters.

~~37.~~17. A lyophilized formulation comprising a ~~comprising a~~ polypeptide and a surfactant, wherein at least about 70% (wt%) of the surfactant are isosorbide polyoxyethylene (POE) fatty acid esters and POE fatty acid esters; and wherein the lyophilized formulation is prepared by lyophilizing the liquid formulation according to any one of claims ~~18~~10-~~36~~16.

38.18. An article of manufacture comprising a container enclosing the liquid formulation of any one of claims 1-3616.

39.19. The article of manufacture of claim 3818, wherein the container is an IV bag.-, or

40. The article of manufacture of claim 39, wherein the container is anthe IV bag that comprises an injection device.-, or

41. The article of manufacture of claim 39 or claim 40, wherein the container is an IV bag that comprises an infusion solution.

42.20. The article of manufacture of claim 3818, wherein the container is a vial or a pre-filled syringe.

43. The article of manufacture of claim 38, further comprising a second container enclosing a diluent.

44.21. An article of manufacture comprising a container enclosing the lyophilized formulation of claim 3717.

45.22. The article of manufacture of claim 18 or 2144, further comprising a second container enclosing a diluent.

46.23. A method of making a liquid formulation comprising adding a polypeptide and a surfactant to an aqueous solution, wherein at least 70% (wt%) of the surfactant are isosorbide POE fatty acid esters.

47.24. The method of claim 4623, wherein the isosorbide POE fatty acid esters comprises about 5-30 POE units.-, or

48. The method of claim 47, wherein the isosorbide POE fatty acid esters comprises about 20 POE units.

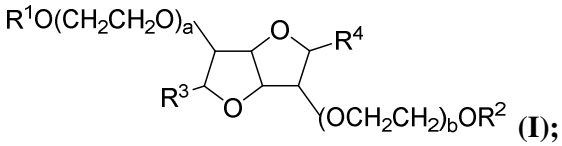
49.25. The method of any one of claims 4623 or 48 24, wherein the isosorbide POE fatty acid esters comprise fatty acid chains selected from the group consisting of an optionally substituted C_{4-28} alkyl and an optionally substituted C_{4-28} alkenyl, or wherein the isosorbide POE fatty acid esters are monoesters, diesters, or a mixture of the foregoing.

50.26. The method of any one of claims 4623 or 48 24, wherein the isosorbide POE fatty acid esters are monoesters.-, or

51. The method of claim 50, wherein the isosorbide POE fatty acid esters are the monoesters are selected from the group consisting of isosorbide POE monolaurate, isorsobide POE monomyristate, isosorbide POE monopalmitate, isosorbide POE monostearate, and isosorbide POE monooelate, or wherein the isosorbide POE fatty acid ester is isosorbide POE monolaurate.

~~52. The method of any one of claims 46-49, wherein the isosorbide POE fatty acid esters are monoesters, diesters, or a mixture of the foregoing.~~

~~53.~~27. The method of claim ~~46~~23, wherein the isosorbide POE fatty acid ester is a compound of Formula (I):



(I);

wherein:

a and b are independently integers from 2 to 28, provided that the sum of a and b is an integer from 5-30;

R^1 and R^2 are independently selected from the group consisting of hydrogen and

-C(O)R", wherein R" is an optionally substituted C_{3-27} alkyl or an optionally substituted C_{3-27} alkenyl; and

R^3 and R^4 are independently hydrogen.

~~54.~~28. The method of claim ~~53~~27, wherein the sum of a and b is 9~~.~~, or

~~55. The method of claim 53 or claim 54,~~ wherein R^1 is H and R^2 is -C(O)R"~~.~~, or

~~56. The method of claim 53 or claim 54, wherein~~ R^2 is -C(O)R" and R^1 is H~~.~~, or

~~57. The method of claim 53 or claim 54, wherein~~ both R^1 and R^2 are -C(O)R".

~~58.~~29. The method of ~~any one of~~ claim~~s 53-57~~27 or 28, wherein R~~"~~" is an unsubstituted C_{3-27} alkyl~~.~~, or

~~59. The method of claim 56,~~ wherein R" is an unsubstituted C_{11} alkyl.

~~60.~~30. The method of ~~any one of~~ claim~~s 53-57~~27 or 28, wherein R" is an unsubstituted C_{3-27} alkenyl~~.~~, or

~~61. The method of claim 60,~~ wherein R" is an unsubstituted C_{17} alkenyl.

~~62.~~31. The method of any one of claims ~~46~~23-~~61~~30, wherein the surfactant further comprises a POE fatty acid ester~~.~~, or

~~63. The method of claim 62,~~ wherein at least about 80% (wt%) of the surfactant are isosorbide POE fatty acid esters and POE fatty acid esters~~.~~, or

~~64. The method of claim 62 or claim 63,~~ wherein at least about 90% (wt%) of the surfactant are isosorbide POE fatty acid esters and POE fatty acid esters~~.~~, or

~~65.~~ ~~The method of any one of claims 62-64,~~ wherein the surfactant comprises a greater amount of isosorbide POE fatty acid esters than POE fatty acid esters~~.~~, or

~~66.~~ ~~The method of any one of claims 62-65,~~ wherein the surfactant further comprises a POE fatty acid ester that ~~the POE fatty acid ester~~ comprises a fatty acid chain selected from the group consisting of an optionally substituted C_{4-28} alkyl and an optionally substituted C_{4-28} alkenyl~~.~~, or

~~67.~~ ~~The method of claim 66,~~ wherein the surfactant further comprises a ~~the~~ POE fatty acid ester ~~is~~ selected from the group consisting of POE monolaurate, POE monomyristate, POE monopalmitate, POE monostearate, and POE monooelate~~.~~, or

~~68.~~ ~~The method of any one of claims 62-67,~~ wherein less than about 20% (wt%) of the surfactant are POE fatty acid esters~~.~~, or

~~69.~~ ~~The method of any one of claims 46-68,~~ wherein the surfactant further comprises a sorbitan POE fatty acid ester~~.~~, or

~~70.~~ ~~The method of any one of claims 46-69,~~ wherein the surfactant is about 0.0005% to 0.2% (w:v) of the liquid formulation.

~~71.~~32. The method of any one of claims ~~46~~23-~~70~~31, wherein the polypeptide is a protein~~.~~, or

~~72.~~ ~~The method of claim 71,~~ wherein the polypeptide is a protein that is an antibody~~.~~, or

~~73.~~ ~~The method of claim 72,~~ wherein the polypeptide is a protein that is an~~the~~ antibody ~~is~~ selected from the group consisting of a polyclonal antibody, a monoclonal antibody, a humanized antibody, a human antibody, a chimeric antibody, and an antibody fragment~~.~~, or

~~74.~~ ~~The method of claim 73,~~ wherein the polypeptide is a protein that is an~~the~~ antibody fragment ~~is~~ selected from the group consisting of Fab, Fab', $F(ab')_2$, and Fv fragments~~.~~, or

~~75.~~ ~~The method of any one of claims 72-74,~~ wherein the polypeptide is a protein that is~~the~~ an antibody at a concentration ~~is~~ of about 0.1 mg/mL to about 300 mg/mL~~.~~, or

~~76.~~ ~~The method of claim 75, wherein the antibody concentration is~~ about 100 mg/mL to about 300 mg/mL~~.~~, or

~~77.~~ ~~The method of claim 75 or claim 76,~~ wherein the liquid formulation is further diluted with an infusion solution to a concentration of about 0.1 mg/mL to about 2 mg/mL.

~~78.~~33. The method of any one of claims ~~46~~23-~~77~~32, further comprising lyophilizing the liquid formulation to make a lyophilized formulation~~.~~, or

~~79.~~ ~~The method of any one of claims 46-78,~~ wherein the liquid formulation is substantially free of aggregates~~.~~, or

~~80.~~ ~~The method of any one of claims 46-78, wherein the liquid formulation~~ comprises less free fatty acid particle formation.

~~81. The liquid formulation of any one of claims 1-4, wherein the isosorbide POE fatty acid ester is isosorbide POE monolaurate.~~

~~82. The method of any one of claims 46-48, wherein the isosorbide POE fatty acid ester is isosorbide POE monolaurate.~~