CLAIMS

1. A method of manufacturing an extended release pharmaceutical composition comprising a protein particle coated with a biodegradable polymer, said method comprising:

a. atomizing an aqueous solution comprising a protein, wherein the protein is an antibody or receptor-Fc-fusion protein;

b. applying heat to the atomized aqueous solution to form a population of protein particles;

c. suspending said population of protein particles in an organic solution comprising a biodegradable polymer and an organic solvent, wherein the biodegradable polymer is polyorthoester (POE) or ethyl cellulose (EC); and

d. spray drying the suspension to form a population of protein polymer microparticles that release the antibody or receptor-Fc-fusion protein for a duration of at least 30 days.

2. The method of claim 1, wherein each protein particle of said population of protein particles comprises less than 3% (w/w) water.

3. The method of claim 1, wherein said organic solvent is ethyl acetate.

4. The method of claim 1, wherein said protein is a VEGF-Trap.

5. The method of claim 1, wherein said spray drying the suspension (d) comprises atomizing said suspension and then applying heat to the atomized suspension at a temperature greater than the flash point of said organic solvent to evaporate said organic solvent to form said population of protein polymer microparticles.

6. The method of claim 5, wherein the median diameter of said population of protein polymer microparticles is about 15 microns to about 30 microns.

7. The method of claim 1, wherein each protein particle of said population of protein particles has an equivalent circular diameter of about 2 microns to about 14 microns.

8. A method of providing an extended release coating for a pharmaceutical protein comprising:

a. atomizing an aqueous solution comprising an antibody or receptor-Fc-fusion protein;

b. applying heat at a temperature greater than the boiling point of water to the

atomized aqueous solution to form a population of protein microparticles;

c. coating each protein microparticle of said population protein microparticles with a biodegradable polymer to form a population of protein polymer microparticles that release for a duration of at least 30 days, wherein the biodegradable polymer is polyorthoester (POE) or ethyl cellulose (EC).

9. The method of claim 8, wherein said population of protein microparticles is dry.

10. The method of claim 9, wherein said population of protein microparticles comprises less than 3% water.

11. The method of claim 8, wherein said aqueous solution comprises about 10 mg/mL - 100 mg/mL of said protein.

12. The method of claim 8, wherein said aqueous solution further comprises about 1 % and 20% (w/v) sucrose.

13. The method of claim 8, wherein said aqueous solution further comprises about 0.05% and 5% (w/v) of polysorbate.

14. The method of claim 8, wherein said aqueous solution further comprises about 5 mM to 50 mM of phosphate.

15. The method of claim 8, further comprising combining an organic solvent, said biodegradable polymer to a concentration of between about 10 mg/mL and 300 mg/mL, and said population of protein microparticles to a concentration of between about 10 mg/mL and 100 mg/mL to form a slurry; and spray drying said slurry to form said plurality of protein polymer microparticles at step (c).

16. A method of manufacturing an extended release pharmaceutical composition comprising a protein particle coated with a biodegradable polymer, said method comprising:

a. atomizing an aqueous solution comprising:

i. about 25 mg/mL-50 mg/mL of VEGF-trap,

ii. about 5 mM-50 mM phosphate,

iii. about 1%-20% (w/v) sucrose, and

iv. about 0.05%-5% (w/v) polysorbate;

b. applying heat to said atomized aqueous solution at a temperature greater than the boiling point of water to form a plurality of dry protein particles without lyophilization;

c. combining:

i. ethyl acetate,

ii. about 50 mg/mL of said plurality of dry protein particles, and

iii. about 50 mg/mL-100 mg/ml of ethyl cellulose or 50 mg/mL - 250 mg/mL polyorthoester to form a suspension; and

d. atomizing said suspension; and

e. applying heat to said atomized suspension at a temperature greater than the flash point of ethyl acetate to form a plurality of protein polymer microparticles.

17. The method of claim 16, wherein said aqueous solution comprises about 50mg/ml VEGF-trap,10 mM phosphate, about 2% sucrose, and about 0.1 % polysorbate, at a pH of about 6.2.

18. The method of any one of claims 1-15, wherein the protein is released for a duration of at least 40 days.

19. The method of any one of claims 1-15, wherein the protein is released for a duration of at least 50 days.

20. The method of any one of claims 1-15, wherein the protein is released for a duration of at least 60 days.

21. The method of any one of claims 1-15, wherein the protein is released for a duration of at least 60 days when in an aqueous environment.

22. The method of any one of claims 1-15, wherein the protein is released for a duration of at least 60 days when in vitreous humor.