

CLAIMS

What is claimed is:

1. A pharmaceutical formulation comprising: (i) an anti-human Activin A antibody, or antigen-binding portion thereof; (ii) a buffer at pH of 6.3 ± 0.3 ; (iii) an organic cosolvent; and (iv) one or more thermal stabilizers.
2. The pharmaceutical formulation of claim 1, wherein the antibody, or the antigen-binding portion thereof, comprises the following six CDR sequences:
 - (a) an HCDR1 having the sequence GGSFSSHF (SEQ ID NO.: 1);
 - (b) an HCDR2 having the sequence ILYTGGT (SEQ ID NO.: 2);
 - (c) an HCDR3 having the sequence ARARSGITFTGIIVPGSFDI (SEQ ID NO.: 3);
 - (d) an LCDR1 having the sequence QSVSSSY (SEQ ID NO.: 4);
 - (e) an LCDR2 having the sequence GAS (SEQ ID NO.: 5); and
 - (f) an LCDR3 having the sequence QQYGSSPWT (SEQ ID NO.: 6).
3. The pharmaceutical formulation of claim 1 or claim 2, wherein the antibody has a molecular weight of about 145,235.3 Da.
4. The pharmaceutical formulation of any one of claims 1-3, wherein the antibody, or the antigen-binding portion thereof, concentration is $60 \text{ mg/mL} \pm 6 \text{ mg/mL}$.
5. The pharmaceutical formulation of any one of claims 1-4, wherein the buffer is a histidine buffer.
6. The pharmaceutical formulation of claim 5, wherein the histidine concentration is $10 \text{ mM} \pm 2 \text{ mM}$.
7. The pharmaceutical formulation of any one of the previous claims, wherein the organic cosolvent is polysorbate 20.
8. The pharmaceutical formulation of claim 7, wherein the polysorbate 20 concentration is $0.05\% \text{ w/v} \pm 0.025\%$.
9. The pharmaceutical formulation of any one of the previous claims, wherein the one or more thermal stabilizers comprise sucrose and arginine.

10. The pharmaceutical formulation of claim 9, wherein the sucrose concentration is $5\% \pm 1\%$ (w/v) and the Arginine concentration is $70 \text{ mM} \pm 14 \text{ mM}$.
11. The pharmaceutical formulation of any one of the previous claims, comprising $60 \text{ mg/mL} \pm 6 \text{ mg/mL}$ antibody, $10 \text{ mM} \pm 2 \text{ mM}$ histidine, $\text{pH } 6.3 \pm 0.3$, $0.05\% \text{ w/v} \pm 0.025\%$ polysorbate 20, $5\% \text{ w/v} \pm 1\%$ sucrose, and $70 \text{ mM} \pm 14 \text{ mM}$ Arginine.
12. The pharmaceutical formulation of any one of the previous claims, wherein after 56 days of storage at 40°C and 75% relative humidity (RH), at least 90% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 30% of the antibody, or the antigen-binding portion thereof, is the main charge form.
13. The pharmaceutical formulation of any one of the previous claims, wherein after 56 days of storage at 40°C and 75% RH, at least 93% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 34.5% of the antibody, or the antigen-binding portion thereof, is the main charge form.
14. The pharmaceutical formulation of any one of the previous claims, wherein after 56 days of storage at 40°C and 75% RH, at least 97% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 45% of the antibody, or the antigen-binding portion thereof, is the main charge form.
15. The pharmaceutical formulation of any one of claims 1-11, wherein after six months of storage at 25°C and 60% RH, at least 90% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 40% of the antibody, or the antigen-binding portion thereof, is the main charge form.
16. The pharmaceutical formulation of any one of claims 1-11, wherein after six months of storage at 25°C and 60% RH, at least 95% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 45% of the antibody, or the antigen-binding portion thereof, is the main charge form.
17. The pharmaceutical formulation of any one of claims 1-11, wherein after six months of storage at 25°C and 60% RH, at least 98% of the antibody, or the antigen-binding portion thereof, has native conformation, or at least 50% of the antibody, or the antigen-binding portion thereof, is the main charge form.

18. The pharmaceutical formulation of any one of claims 1-11, wherein after 12 months of storage at 2-8°C, at least 94% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 45% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 100% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

19. The pharmaceutical formulation of any one of claims 1-11, wherein after 12 months of storage at 2-8°C, at least 96% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 50% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 100% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

20. The pharmaceutical formulation of any one of claims 1-11, wherein after 12 months of storage at 2-8°C, at least 98% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 55% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 100% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

21. The pharmaceutical formulation of any one of claims 1-11, wherein after 18 months of storage at 2-8°C, at least 94% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 45% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 95% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

22. The pharmaceutical formulation of any one of claims 1-11, wherein after 18 months of storage at 2-8°C, at least 96% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 50% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 95% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

23. The pharmaceutical formulation of any one of claims 1-11, wherein after 18 months of storage at 2-8°C, at least 98% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 55% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 95% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.

24. The pharmaceutical formulation of any one of claims 1-11, wherein after 24 months of storage at 2-8°C, at least 94% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 45% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 99% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.
25. The pharmaceutical formulation of any one of claims 1-11, wherein after 24 months of storage at 2-8°C, at least 96% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 50% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 99% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.
26. The pharmaceutical formulation of any one of claims 1-11, wherein after 24 months of storage at 2-8°C, at least 98% of the antibody, or the antigen-binding portion thereof, has native conformation, at least 55% of the antibody, or the antigen-binding portion thereof, is the main charge variant, and/or the antibody retains at least 99% of the potency of the antibody, or the antigen-binding portion thereof, prior to storage.
27. A pharmaceutical formulation comprising (a) 60 mg/mL $\pm$ 10 mg/mL of an anti-human Activin A antibody, or antigen-binding portion thereof (b) 10 mM $\pm$ 2 mM histidine, pH 6.3 $\pm$ 0.3, (c) 0.05% $\pm$ 0.025% polysorbate 20, (d) 70 mM $\pm$ 14 mM Arginine, and (e) 5% $\pm$ 1% sucrose, wherein the antibody, or the antigen-binding portion thereof, comprises an heavy chain variable region comprising SEQ ID NO: 7 and a light chain variable region comprising SEQ ID NO: 8.
28. The pharmaceutical formulation of any one of the previous claims, wherein the formulation is contained in a container.
29. The pharmaceutical formulation of claim 28, wherein the container is a vial.
30. The pharmaceutical formulation of claim 29, wherein the vial is glass.
31. The pharmaceutical formulation of claim 30, wherein the glass is Type 1 borosilicate glass with a FluroTec® coated 4432/50 butyl rubber stopper.

32. The pharmaceutical formulation of any one of the previous claims, wherein the formulation is suitable for intravenous administration to a human subject in need thereof.
33. The pharmaceutical formulation of any one of claims 1-31, wherein the formulation is suitable for subcutaneous administration to a human subject in need thereof.
34. The pharmaceutical formulation of any one of the previous claims, wherein the formulation is a liquid formulation.
35. The pharmaceutical formulation of any one of claims 1-33, wherein the formulation is a lyophilized formulation.
36. A kit comprising a pharmaceutical formulation of any one of the previous claims, a container, and instructions of use thereof.
37. The kit of claim 36, wherein the container is a glass vial fitted with a FluroTec® coated chlorobutyl stopper.
38. A method of treating a disease or disorder associated with Activin A activity, the method comprising administration of a therapeutically effective amount of the pharmaceutical composition of any one of claims 1-35 to a subject in need thereof.
39. The method of claim 38, wherein the disease or disorder associated with Activin A activity is Fibrodysplasia ossificans progressiva (FOP).