Claims

1. An aqueous pharmaceutical formulation comprising:

(a) an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof;

(b) a stabilizer;

(c) a chelator;

(d) a surfactant; and

(e) a buffer comprising histidine or a histidine salt;

wherein the pH of the aqueous pharmaceutical formulation ranges from 5.5 to about 6.5,

wherein the antibody or antigen binding fragment thereof comprises:

a heavy chain complementarity determining region (HCDR) 1 of SEQ ID NO: 42, an HCDR2 of SEQ ID NO:44, and an HCDR3 of SEQ ID NO:46; and

a light chain complementarity determining region (LCDR) 1 of SEQ ID NO:56, an LCDR2 of SEQ ID NO:58, and an LCDR3 of SEQ ID NO:60.

2. An aqueous pharmaceutical formulation comprising:

(a) an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof;

(b) a stabilizer;

(c) a chelator;

(d) a surfactant; and

(e) a buffer comprising histidine or a histidine salt;

wherein the pH of the aqueous pharmaceutical formulation ranges from 5.5 to about 6.5,

wherein the antibody or antigen binding fragment thereof comprises:

a heavy chain complementarity determining region (HCDR) 1 of SEQ ID NO: 36, an HCDR2 of SEQ ID NO:38, and an HCDR3 of SEQ ID NO:40; and

a light chain complementarity determining region (LCDR) 1 of SEQ ID NO:50, an LCDR2 of SEQ ID NO:52, and an LCDR3 of SEQ ID NO:54.

3. An aqueous pharmaceutical formulation comprising:

(a) an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof;

(b) a stabilizer;

(c) a chelator;

(d) a surfactant; and

(e) a buffer comprising histidine or a histidine salt;

wherein the pH of the aqueous pharmaceutical formulation ranges from 5.5 to about 6.5,

wherein the antibody or antigen binding fragment thereof comprises a VH domain comprising at least 80% identity to the amino acid sequence of SEQ ID NO: 34 and a VL domain having at least 80% identity to the amino acid sequence of SEQ ID NO: 48.

4. The aqueous pharmaceutical formulation of claim 1 or 2, wherein the antibody or antigen binding fragment comprises a VH domain comprising at least 80% identity to the amino acid sequence of SEQ ID NO: 34 and/or comprises a VL domain having at least 80% identity to the amino acid sequence of SEQ ID NO: 48.

5. The aqueous pharmaceutical formulation of any of claims 1-4, wherein

(i) the antibody or antigen binding fragment comprises a VH domain of SEQ ID NO: 34 and/or a VL domain of SEQ ID NO: 48; and/or

(ii) the antibody or antigen binding fragment comprises a heavy chain and/or a light chain, wherein the heavy chain amino acid sequence consists of the amino acid sequence of SEQ ID No: 62 and/or the light chain amino acid sequence consists of the amino acid sequence of SEQ ID No: 64; and/or

(iii) the antibody or antigen binding fragment thereof is amlitelimab or a variant thereof; and/or

(iv) the aqueous pharmaceutical formulation is suitable for parenteral administration to a mammalian subject; and/or

(v) the antibody or antigen binding fragment thereof is present at a concentration of 62.5 mg/mL; and/or

(vi) the antibody or antigen binding fragment thereof is present in a concentration of 125 mg/mL; and/or

(vii) the stabilizer is sucrose; and/or

(viii) the at least one stabilizer is sucrose, which is present in an amount of 220 mM; and/or

(ix) the surfactant is polysorbate 80; and/or

(x) the formulation comprises 0.02% (w/v) to 0.1% (w/v) polysorbate 80; and/or

(xi) the formulation comprises 0.02% (w/v) to 0.06% polysorbate 80; and/or

(xii) the formulation comprises 0.04% (w/v) or 0.06% polysorbate 80; and/or

(xiii) the buffer comprises 10 mM L-histidine or histidine hydrochloride; and/or

(xiv) the formulation comprises a chelator selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), diethylenetriamene pentaacetate (DTPA) and salts thereof, and any combinations thereof; and/or

(xv) the chelator comprises one or both of 10 μM EDTA and 10 μM DTPA.

6. The aqueous pharmaceutical formulation of claim 1, comprising:

28 mg/mL to 138 mg/mL of the antibody or antigen binding fragment thereof;

10 mM ± 1.5 mM L-histidine or histidine hydrochloride;

220 mM ± 33 mM sucrose,

0.06% (w/v) polysorbate 80; and

water;

with the pH of the aqueous pharmaceutical formulation between about 5.8 and about 6.2, optionally further comprising 10 μM EDTA or 10 μM DTPA.

7. The aqueous pharmaceutical formulation of any one of claims 1-6, which is comprised in a container and/or which is suitable for subcutaneously delivery.

8. A pharmaceutical unit dosage form suitable for parenteral administration to a mammalian subject which comprises the aqueous pharmaceutical formulation of any one of claims 1 to 7 in a suitable container, optionally wherein (i) the aqueous pharmaceutical formulation is suitable for intravenous, subcutaneous, or intramuscular administration; and/or (ii) the suitable container is a pre-filled syringe.

9. A sealed container comprising the aqueous pharmaceutical formulation of any one of claims 1-8, optionally wherein (i) the container is a vial, a syringe, a microinfusor, a pen delivery device, or an autoinjector and/or (ii) the container is a single or multi-chambered syringe.

10. A pre-filled syringe or a pre-filled pen comprising an aqueous pharmaceutical formulation comprising:

about 28 mg/mL to about 138 mg/mL of an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof;

about 10 mM L-histidine or histidine hydrochloride;

about 220 mM sucrose;

about 0.06% (w/v) polysorbate 80;

about 10 μM EDTA; and

water;

wherein the pH of the aqueous pharmaceutical is about 6.0.

11. An autoinjector comprising an aqueous pharmaceutical formulation comprising:

about 28 mg/mL to about 138 mg/mL of an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof;

about 10 mM L-histidine or histidine hydrochloride;

about 220 mM sucrose;

about 0.06% (w/v) polysorbate 80;

about 10 μM EDTA; and

water;

wherein the pH of the aqueous pharmaceutical is about 6.0.

12. The pre-filled syringe or the pre-filled pen of claim 10 or the autoinjector of claim 11, wherein:

(i) the antibody or antigen binding fragment thereof is present at a concentration of 62.5 mg/mL or 125 mg/mL; and/or

(ii) the anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment thereof, comprises:

(a) a heavy chain complementarity determining region (HCDR) 1 of SEQ ID NO: 42, an HCDR2 of SEQ ID NO:44, and an HCDR3 of SEQ ID NO:46; and a light chain complementarity determining region (LCDR) 1 of SEQ ID NO:56, an LCDR2 of SEQ ID NO:58, and an LCDR3 of SEQ ID NO:60; or

(b) a heavy chain complementarity determining region (HCDR) 1 of SEQ ID NO: 36, an HCDR2 of SEQ ID NO:38, and an HCDR3 of SEQ ID NO:40; and a light

chain complementarity determining region (LCDR) 1 of SEQ ID NO:50, an LCDR2 of SEQ ID NO:52, and an LCDR3 of SEQ ID NO:54; or

(c) a VH domain comprising at least 80% identity to the amino acid sequence of SEQ ID NO: 34 and a VL domain having at least 80% identity to the amino acid sequence of SEQ ID NO: 48; or

(d) a VH domain comprising at least 80% identity to the amino acid sequence of SEQ ID NO: 34 and/or comprises a VL domain having at least 80% identity to the amino acid sequence of SEQ ID NO: 48; or

(e) a heavy chain amino acid sequence consisting of the amino acid sequence of SEQ ID No: 62 and/or the light chain amino acid sequence consisting of the amino acid sequence of SEQ ID No: 64; and/or

(iii) pre-filled syringe or the pre-filled pen or the autoinjector comprises about 31 mg/mL to about 125 mg/mL amlitelimab or a variant thereof, preferably about 62.5mg/mL or about 125mg/mL amlitelimab or a variant thereof.

13. A kit comprising

(i) a sealed container of claim 9, a pre-filled syringe of claim 10 or 12 or a pre-filled pen of claim 10 or 12 or the autoinjector of claim 11 or 12; or

(ii) a sealed container comprising the aqueous pharmaceutical formulation of any one of claims 1-7; and at least one separate injection device for delivery the aqueous pharmaceutical formulation to a mammalian subject in need thereof, optionally wherein the injection device is a syringe, a microinfusor, a pen delivery device, or an autoinjector, and further optionally wherein the injection device is a single or multi-chambered syringes.

14. Use of the aqueous pharmaceutical formulation of any one of claims 1-7, the pharmaceutical unit dosage form of claim 8, the sealed container of claim 9, the pre-filled syringe or the pre-filled pen of claim 10 or 12, the autoinjector of claim 11 or 12 or the kit of claim 13 in the manufacture of a medicament for treating a disease or condition in a subject selected from the group consisting of an autoimmune disease or condition, an inflammatory disease or condition, a systemic inflammatory disease or condition, and a transplant rejection disease or condition mediated by hOX40L, optionally wherein the medicament is for treating atopic dermatitis or for treating asthma.

15. An aqueous pharmaceutical formulation comprising:

(a) an anti-OX40 ligand (OX40L) antagonist antibody or antigen binding fragment;

(b) a stabilizer;

(c) a chelator;

(d) a surfactant; and

(e) a buffer comprising histidine or a histidine salt;

wherein the pH of the aqueous pharmaceutical formulation ranges from 5.5 to about 6.5,

wherein the antibody or antigen binding fragment thereof comprises:

a VH domain which comprises the HCDR1 sequence of SEQ ID NO:36 or 42, the HCDR2 sequence of SEQ ID NO:38 or 44, and the HCDR3 sequence of SEQ ID NO:40 or 46, and

a VL domain which comprises the LCDR1 sequence of SEQ ID NO:50 or 56, the LCDR2 sequence of SEQ ID NO:52 or 58, and the LCDR3 sequence of SEQ ID NO:54 or 60; and

wherein the aqueous pharmaceutical formulation is suitable for parenteral administration to a mammalian subject, optionally wherein (i) the VL domain comprises the amino acid sequence of SEQ ID NO:48 and the VH domain comprises the amino acid sequence of SEQ ID NO:34 or (ii) the antibody comprises a heavy chain and a light chain, wherein the heavy chain amino acid sequence consists of the amino acid sequence of SEQ ID NO: 62 and the light chain amino acid sequence consists of the amino acid sequence of SEQ ID NO: 64.

16. The aqueous pharmaceutical formulation of any one of claims 1-7, the pharmaceutical unit dosage form of 8, the sealed container of claim 9, the pre-filled syringe or the pre-filled pen of claim 10 or 12, the autoinjector of claim 11 or 12 or the kit of claim 13 for use as a medicament.