Pharmaceutically acceptable excipients refer to the additives or carriers, which may contribute to stability of the antibody in formulation. The excipients may encompass stabilizers and tonicity modifiers. Examples of stabilizers and tonicity modifiers include, but not limited to, sugars, polyols, salts, amino acids or surfactants, and derivatives and combination thereof.

Sugars and polyols can be referred to monosaccharides, disaccharides, and polysaccharides. Examples of sugars include, but are not limited to, sucrose, trehalose, glucose, dextrose, raffinose and others. Additionally, polyol refers to an alcohol containing multiple hydroxyl groups. Examples of polyols include, but are not limited to, mannitol, sorbitol, and others.

Surfactant refers to pharmaceutically acceptable excipients used to protect the protein formulations against various stress conditions, like agitation, shearing, exposure to high temperature etc. The suitable surfactants include but are not limited to polyoxyethylensorbitan fatty acid esters such as Tween 20™ or Tween 80™, polyoxyethylene-polyoxypropylene copolymer (e.g. Poloxamer, Pluronic), sodium dodecyl sulphate (SDS) and the like or combination thereof.

Salts are used as tonicity modifiers and examples of salts include but not limited to sodium chloride, potassium chloride, magnesium chloride, arginine hydrochloride, sodium thiocyanate, ammonium thiocyanate, ammonium sulfate, ammonium chloride, calcium chloride, zinc chloride and/or sodium acetate.

One or more amino acids may also be part of an antibody formulation as stabilizer and can be selected from a basic amino acids or hydrophobic amino acids or a combination thereof.

The term "about" refers to a range of values that are similar to the stated reference value and includes a range of values that fall within 15% or less, of the stated reference value.

Certain specific aspects and embodiments of the invention are more fully described by reference to the following examples. However, these examples should not be construed as limiting the scope of the invention in any manner.

Detailed description of the embodiments

The present invention discloses a stable liquid antibody formulation comprising a dual buffer system comprising phosphate and amino acid as the buffer components. The ‘phosphate-amino acid’ based dual buffer system is suitable for formulating antibody at low, as well as high concentrations. Further, the buffer system enables the formulation to be of less viscous, even at high concentrations of the antibody. In addition, the disclosed buffer is advantageous in

CLAIMS

1. A stable liquid tocilizumab formulation stabilized in a phosphate – amino acid dual buffer system having pH of 6.0 to 6.5, wherein the concentration of tocilizumab stabilized is about 10 mg/ml to about 200 mg/ml.

2. The formulation according to the claim 1, is devoid of anti-oxidant.

3. The formulation according to claim 2, wherein the anti-oxidant is methionine.

4. The formulation according to the claim 1, further comprises one or more pharmaceutically acceptable excipients, the one or more pharmaceutically excipients comprise sugar, polyol, arginine, or surfactant.

5. The formulation according to claim 1 or 4, wherein the antibody formulated in the phosphate-amino acid buffer system remains stable and maintains at least 95% of monomeric content and/or contains less than 5% aggregates of the antibody, after storage under one of the following storage conditions:

at 2-8 ºC for at least 6 months, or

at 25 ºC for at least 6 months, or

at 40 ºC for at least 2 weeks.

6. The formulation according to claim 1, wherein the amino acid component acts as counter ion to the phosphate component of the buffer in the formulation.

7. The formulation according to claim 6, wherein the amino acid is histidine or glycine or aspartate.

8. The formulation according to claim 1, wherein the phosphate-amino acid dual buffer system is ‘phosphate-histidine’.

9. The formulation according to claim 1, wherein viscosity of the formulation is less than 10 cp.

10. The formulation according to claim 1 or 4, wherein the concentration of buffer and pharmaceutically acceptable excipients or its salts, in the said formulation is less than 100 mM.