CLAIMS

1. A dimeric protein comprising a first and a second polypeptide, each polypeptide comprising at least C_H2 and C_H3 regions of a human IgG1, IgG2, IgG3 or IgG4 heavy chain, wherein at least one of the polypeptides comprises a binding region that specifically binds to a target, wherein in said first and second polypeptide the amino acids in the positions corresponding to E345, E430 and S440 in a human IgG1 heavy chain are R, G and Y, respectively; or alternatively K, G and Y, respectively; or alternatively R, S and Y, respectively; or alternatively R, G and W, respectively, which is predominantly in oligomeric form, in a phosphate buffer at a pH of about 6.8, which is predominantly in monomeric form at a pH of less than 6.0, wherein the amino acids are numbered according to the Eu numbering as set forth in Kabat.

2. The dimeric protein of any one of the preceding claims, wherein at least one of the polypeptides comprises a binding region that specifically binds to a target, the target is a molecule present on a cell, bacterium or virion.

3. The dimeric protein of any one of the preceding claims, which is an antibody.

4. The dimeric protein of claim 3, wherein each of the first and second polypeptides comprises an immunoglobulin heavy-chain variable region associated with an immunoglobulin light chain sequence comprising light chain variable and constant regions to form a first and a second antigen-binding region, optionally binding the same antigen.

5. The dimeric protein of any one of the preceding claims, wherein in said first and second polypeptide the amino acid in the position corresponding to K439 is not K e.g. E or D.

6. The dimeric protein according to claim 5, wherein in both polypeptides, e.g. each polypeptide, the amino acids in the positions corresponding to E345, E430, K439 and S440 are R, G, E and Y.

7. The dimeric protein of any one of the preceding claims, wherein in said first and second polypeptide the amino acid residue in the position corresponding to K447 is D or E and/or the amino acid in the position corresponding to Q386 is K.

8. The dimeric protein of any one of claims 1 to 7, wherein in said first and second polypeptide the amino acid residue in the position corresponding to K447 is K, R or H and the polypeptide(s) comprise

a) an amino acid residue in position 448 which is P; or

b) an amino acid residue in position 448 which is K, R or H and an amino acid residue in position 449 which is P.

9. The dimeric protein of any one of the preceding claims, comprising a drug, toxin, radiolabel, radioopaque agent, paramagnetic agent, fluorescent agent, phosphorescent agent, ultrasound enhancing agent or polyethyleneglycol (PEG), optionally conjugated to at least one of the polypeptides via a linker.

10. The dimeric protein of any one of the preceding claims, which is a homodimer or a heterodimer.

11. The dimeric protein of claim 10, wherein said first and second polypeptide are of the same isotype each comprise a CH2, CH3 and hinge regions of an human IgG1, IgG2, IgG3 or IgG4 heavy chain, and wherein

the amino acid in a position selected from K409, T366, L368, K370, D399, F405, and Y407 is not K, T, L, K, D, F and Y, respectively, in the first polypeptide e.g. K409 is R, and

the amino acid in a position selected from F405, T366, L368, K370, D399, Y407, and K409 is not F, T, L, K, D, Y and K, respectively, in the second polypeptide e.g. F405 is L.

12. A hexamer comprising six non-covalently associated dimeric proteins, each according to any one of claims 1 to 11.

13. A hexamer comprising six non-covalently associated molecules, at least one of which is a dimeric protein according to any one of claims 1 to 11 and at least one of which is an antibody comprising an Fc domain comprising at least CH2, CH3 and hinge regions, wherein the antibody is a monoclonal or polyclonal antibody.

14. A composition comprising the dimeric protein of any one of claims 1 to 11 and/or the hexamer of any one of claims 12 to 13, and a pharmaceutically acceptable carrier.

15. A composition comprising a first dimeric protein according to any one of claims 1 to 11, a second dimeric protein according to any one of claims 1 to 11, and optionally a pharmaceutically acceptable carrier.

16.A composition comprising a first and second polypeptide of a first dimeric protein, wherein the amino acids at the positions corresponding to E345, E430, K439 and S440 in human IgG1 heavy chain are R, G, E and Y, respectively, and

a first and second polypeptide of a second dimeric protein, wherein the amino acids at the positions corresponding to E345, E430, Y436 and S440 in a human IgG1 heavy chain are R, G, I and K, respectively, which is predominantly in oligomeric form, in a phosphate buffer at a pH of about 6.8, which is predominantly in monomeric form at a pH of less than 6.0.

17. The composition of claim 15, wherein both the first and the second dimeric proteins comprise first and second polypeptides, wherein in said first and second polypeptides of said first and second dimeric proteins the amino acids at the positions corresponding to E345, E430 and S440 in a human IgG1 heavy chain are R, G and Y, respectively; or alternatively K, G and Y, respectively; or alternatively R, S and Y, respectively; or alternatively R, G and W, respectively.

18. The composition of claim 15, wherein in both of said first and second polypeptides of said first and second dimeric protein the amino acids at the positions corresponding to E345, E430 and S440 in a human IgG1 heavy chain, are R, G and Y, respectively.

19. The composition of any one of claims 15 to 18, wherein

in said first and/or second polypeptide of the first dimeric protein the amino acid at the position corresponding to K447 is D or E, and

in said first and/or second polypeptide of the second dimeric protein the amino acid at the position corresponding to K447 is K, R or H; an amino acid at the position corresponding to 448 is P, K, R or H; and/or an amino acid at the position corresponding to 449 is P.

20. The composition of any one of claims 15 to 19, wherein at least one of the first and second dimeric proteins is an antibody.

21. The composition of claim 20, wherein the first and second antibodies bind to different antigens or to different epitopes on the same antigen.

22. The composition of any one of claims 15 to 21, wherein the pharmaceutically acceptable carrier is an aqueous buffered solution e.g. wherein the pH of the aqueous buffered solution is at least about 6.5, such as from 6.5 to about 9.0, such as from about 7.0 to about 8.0, such as about 7.4.

23. The composition of claim 21, comprising a phosphate buffer system e.g. wherein the pH of the aqueous buffered solution is less than pH 6.5, such as from about 4.0 to 6.4, such as from about 5.0 to about 6.0.

24. The composition of claim 23, comprising an acetate, histidine, glycine, citrate, nicotinate, lactate, and/or succinate buffer system.

25. A method of increasing oligomerization in solution of a dimeric protein comprising a first and second polypeptide, each comprising at least CH2 and CH3 regions of a human IgG1, IgG2, IgG3 or IgG4 heavy chain, the method comprising introducing into said first and second polypeptide, amino acid substitutions in at least the positions corresponding to E345, E430 and S440 in a human IgG1 heavy chain are R, G and Y, respectively; or alternatively K, G and Y, respectively; or alternatively R, S and Y, respectively; or alternatively R, G and W, respectively, wherein the amino acids are numbered according to the Eu numbering as set forth in Kabat.

26. The method of claim 25, wherein the dimeric protein is an antibody.

27. A kit-of-parts comprising a first dimeric protein according to any one of claims 1 to 11 and a second dimeric protein according to any one of claims 1 to 11 for simultaneous, separate or sequential use in imaging, diagnostics or therapy.

28. Use of the dimeric protein, hexamer, composition or kit-of-parts according to any one of claims 1 to 24 and 27, in the manufacture of a medicament for the treatment of a disease, such as a bacterial, viral or parasitic infection, autoimmune disease, cancer, inflammation, and/or reducing the risk for septic shock caused by a bacterial infection.

29. The dimeric protein, hexamer, composition or kit-of-parts of any one of claims 1 to 24, 27 and 28, wherein the dimeric protein comprises a binding region specifically binding to a lipopolysaccharide (LPS), a lipooligosaccharide (LOS), a delta endotoxin, Botulinum toxin, Corynebacterium diphtheriae exotoxin, a bacterial superantigen, a heat-stable enterotoxin, cytolysin, a channel-forming toxin, an enzymatically active toxin, or a mycotoxin.

30. The dimeric protein, hexamer, composition or kit-of-parts according to any one of the claims 1 to 24, 28 and 29, for use in imaging at least a part of the body of a human or other mammal.

31. The dimeric protein, hexamer, composition or kit-of-parts according to any one of the claims 1 to 24, 28, 29 and 30 for use in treatment of a bacterial, viral or parasitic infection, for imaging of at least a part of the body of human or other mammal, or for modulating clearance of a target molecule from the body of a human or other mammal.

32. Use of the dimeric protein, hexamer, composition, kit-of-parts according to any one of the claims 1 to 24 and 28 in the manufacture of a medicament for the treatment of cancer, auto-immune diseases, organ transplant rejections, and C1q depletion in the humoral system in a human.