

What is claimed is:

1. A bispecific humanized antibody or antigen binding fragment thereof that binds to human FLT3 and human CD3, wherein the antibody or fragment comprises:

(i) a first light chain variable region (VL1) comprising VL1 complementarity determining region (CDR) 1, VL1 CDR2 and VL1 CDR3, said VL1 CDR1, VL1 CDR2 and VL1 CDR3 being the CDRs of a light chain variable region (VL) that comprises the amino acid sequence of SEQ ID NO:9; and

(ii) a first heavy chain variable region (VH1) comprising VH1 complementarity determining region (CDR) 1, VH1 CDR2 and VH1 CDR3, said VH1 CDR1, VH1 CDR2 and VH1 CDR3 being the CDRs of a heavy chain variable region (VH) that comprises the amino acid sequence of SEQ ID NO:10;

wherein the VL1 and the VH1 bind to human FLT3; and

further comprising a second VL (VL2) and a second VH (VH2) that bind to human CD3.

2. The bispecific humanized antibody or fragment of claim 1, wherein:

a) the VL1 CDR1 comprises the amino acid sequence QEISGY (SEQ ID NO:31), the VL1 CDR2 comprises the amino acid sequence AAS (SEQ ID NO:32), and the VL1 CDR3 comprises the amino acid sequence LQYASYPLT (SEQ ID NO:37); and

the VH1 CDR1 comprises the amino acid sequence GFSLSRSTMG (SEQ ID NO:38), the VH1 CDR2 comprises the amino acid sequence IKWNDSK (SEQ ID NO:39), and the VH1 CDR3 comprises the amino acid sequence ARIVYYSTYVG YFDV (SEQ ID NO:36); or

b) the VL1 CDR1 comprises the amino acid sequence RASQEISGYLS (SEQ ID NO:71), the VL1 CDR2 comprises the amino acid sequence AASTLHS (SEQ ID NO:72), and the VL1 CDR3 comprises the amino acid sequence LQYASYPLT (SEQ ID NO:37); and

the VH1 CDR1 comprises the amino acid sequence GFSLSRSTMGVG (SEQ ID NO:73), the VH1 CDR2 comprises the amino acid sequence HIKWNDSKYYPALKS (SEQ ID NO:74), and the VH1 CDR3 comprises the amino acid sequence IVYYSTYVG YFDV (SEQ ID NO:75).

3. The bispecific humanized antibody or fragment of claim 1 or 2, wherein:

(iii) the VL2 comprises VL2 CDR1, VL2 CDR2 and VL2 CDR3, said VL2 CDR1, VL2 CDR2 and VL2 CDR3 being the CDRs of a VL that comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:24, and SEQ ID NO:29; and

(iv) the VH2 comprises VH2 CDR1, VH2 CDR2 and VH2 CDR3, said VH2 CDR1, VH2 CDR2 and VH2 CDR3 being the CDRs of a VH that comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:12, SEQ ID NO:18, SEQ ID NO:20 and SEQ ID NO:22;

wherein the VL2 and the VH2 bind to human CD3.

4. The bispecific humanized antibody or fragment of claim 3, wherein:

a) the VL2 CDR1 comprises the amino acid sequence of TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence of GTN (SEQ ID NO:41), and the VL2 CDR3 comprises an amino acid sequence selected from the group consisting of: ALWYSNLWV (SEQ ID NO:42), ALWFSNHWV (SEQ ID NO:46), and ALWYSNHWV (SEQ ID NO:47); and

the VH2 CDR1 comprises the amino acid sequence of GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence of IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises an amino acid sequence selected from the group consisting of: HGNFGNSYVSWFAY (SEQ ID NO:83), HGNFGTSYVSWFAY (SEQ ID NO:84), HGHFGTSYVSWFAY (SEQ ID NO:85), HGMFGTSYVSWFAY (SEQ ID NO:86), and HGQFGTSYVSWFAY (SEQ ID NO:87);

b) the VL2 CDR1 comprises the amino acid sequence of GSSTGAVTTSNYAN (SEQ ID NO:76), the VL2 CDR2 comprises an amino acid sequence selected from the group consisting of: GTNKRSS (SEQ ID NO:77), GTNKRVS (SEQ ID NO:78), and GTNKRSS (SEQ ID NO:79) and GTNKRAS (SEQ ID NO:80); and the VL2 CDR3; and the VL2 CDR3 comprises an amino acid sequence selected from the group consisting of: ALWYSNLWV (SEQ ID NO:42), ALWFSNHWV (SEQ ID NO:46), and ALWYSNHWV (SEQ ID NO:47); and

the VH2 CDR1 comprises the amino acid sequence of GFTFNTYAMN (SEQ ID NO:81), the VH2 CDR2 comprises the amino acid sequence of RIRSKYNNYATYYADSVKKG (SEQ ID

NO:82), and the VH2 CDR3 comprises an amino acid sequence selected from the group consisting of: HGNFGNSYVSWFAY (SEQ ID NO:83), HGNFGTSYVSWFAY (SEQ ID NO:84), HGHFGTSYVSWFAY (SEQ ID NO:85), HGMFGTSYVSWFAY (SEQ ID NO:86), and HGQFGTSYVSWFAY (SEQ ID NO:87);

c) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:4, and/or the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL2 CDR3 comprises the amino acid sequence ALWYSNLWV (SEQ ID NO:42); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:5, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence HGNFGNSYVSWFAY (SEQ ID NO:83);

d) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:4, and/or the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWYSNLWV (SEQ ID NO:42); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:12, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGNFGTSYVSWFAY (SEQ ID NO:48);

e) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises an amino acid sequence of SEQ ID NO:14 or SEQ ID NO:16, and/or the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid

sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWFSNHWV (SEQ ID NO:46); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:12, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGNFGTSYVSWFAY (SEQ ID NO:45);

f) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:14, and/or the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWFSNHWV (SEQ ID NO:46); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:18, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGHFGTSYVSWFAY (SEQ ID NO:49);

g) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:14, and/or the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWFSNHWV (SEQ ID NO:46); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:20, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGMFGTSYVSWFAY (SEQ ID NO:50);

h) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:14, and/or the VL2 CDR1 comprises the amino acid sequence TGA VTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWFSNHWV (SEQ ID NO:46); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:22, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGQFGTSYVSWFAY (SEQ ID NO:51); or

i) the VL2 CDR1, VL2 CDR2 and VL2 CDR3 are the CDRs of a VL that comprises the amino acid sequence of SEQ ID NO:24 or SEQ ID NO:29, and/or the VL2 CDR1 comprises the amino acid sequence TGA VTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL CDR3 comprises the amino acid sequence ALWYSNHWV (SEQ ID NO:47); and

the VH2 CDR1, VH2 CDR2 and VH2 CDR3 are the CDRs of a VH that comprises the amino acid sequence of SEQ ID NO:5, and/or the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises the amino acid sequence VRHGNFGNSYVSWFAY (SEQ ID NO:45).

5. A bispecific humanized antibody or antigen binding fragment thereof that binds to human FLT3 and human CD3, wherein the antibody or fragment comprises:

a VL2 comprising VL2 CDR1, VL2 CDR2 and VL2 CDR3, said VL2 CDR1, VL2 CDR2 and VL2 CDR3 being the CDRs of a VL that comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:24, and SEQ ID NO:29; and

a VH2 comprising VH2 CDR1, VH2 CDR2 and VH2 CDR3, said VH2 CDR1, VH2 CDR2 and VH2 CDR3 being the CDRs of a VH that comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:12, SEQ ID NO:18, SEQ ID NO:20, and SEQ ID NO:22;

wherein the VL2 and the VH2 bind to human CD3; and

further comprising a VL1 and a VH1 that bind to human FLT3.

6. The bispecific humanized antibody or fragment of claim 5, wherein:

the VL2 CDR1 comprises the amino acid sequence TGAVTTSNY (SEQ ID NO:40), the VL2 CDR2 comprises the amino acid sequence GTN (SEQ ID NO:41), and the VL2 CDR3 comprises the amino acid sequence ALWFSNHWV (SEQ ID NO:46) or ALWYSNHWV (SEQ ID NO:47); and

the VH2 CDR1 comprises the amino acid sequence GFTFNTYA (SEQ ID NO:43), the VH2 CDR2 comprises the amino acid sequence IRSKYNNYAT (SEQ ID NO:44), and the VH2 CDR3 comprises an amino acid sequence selected from the group consisting of: VRHGNFGTSYVSFAY (SEQ ID NO:48), VRHGHFGTSYVSFAY (SEQ ID NO:49), VRHGMFGTSYVSFAY (SEQ ID NO:50), and VRHGQFGTSYVSFAY (SEQ ID NO:51).

7. The bispecific humanized antibody or fragment of any one of claims 1-6, wherein the VL1 comprises the amino acid sequence of SEQ ID NO:9.

8. The bispecific humanized antibody or fragment of any one of claims 1-7, wherein the VH1 comprises the amino acid sequence of SEQ ID NO:10.

9. The bispecific humanized antibody or fragment of any one of claims 1-8, which comprises a single chain variable fragment (scFv), wherein the scFv comprises the VL1 and the VH1, and wherein the scFv comprises the amino acid sequence of SEQ ID NO:52.

10. The bispecific humanized antibody or fragment of any one of claims 1-9, wherein the antibody or fragment comprise a heavy chain (HC) and a light chain (LC), wherein the HC comprises the VL1, the VH1, and the VH2.

11. The bispecific humanized antibody or fragment of claim 10, wherein the VL1 is joined to the VH1 by a first linker, and wherein the VH1 is joined to the VH2 by a second linker; optionally, wherein the C-terminus of the VL1 is joined to the N-terminus of the VH1 by a first

linker, and wherein the C-terminus of the VH1 is joined to the N-terminus of the VH2 by a second linker.

12. The bispecific humanized antibody or fragment of claim 11, wherein i) the first linker and the second linker have the formula $(\text{Gly}_{3-4}\text{-Ser})_{1-4}$, optionally wherein the first linker has the formula $(\text{Gly}_4\text{-Ser})_4$ and/or the second linker has the formula $(\text{Gly}_4\text{-Ser})_3$.

13. The bispecific humanized antibody or fragment of claim 10, wherein the HC comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:53, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56 and SEQ ID NO:57; optionally wherein the HC comprises the amino acid sequence of SEQ ID NO: 53, SEQ ID NO: 54, SEQ ID NO: 55, SEQ ID NO: 56 or SEQ ID NO: 57.

14. The bispecific humanized antibody or fragment of any one of claims 10-13, wherein the LC comprises the VH2;

optionally wherein the LC comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:4, SEQ ID NO:14, SEQ ID NO:16, SEQ ID NO:24 and SEQ ID NO:29, further optionally wherein the LC comprises the amino acid sequence of SEQ ID NO: 4, SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 24 or SEQ ID NO: 29.

15. A bispecific humanized antibody or antigen binding fragment thereof that binds to human FLT3 and human CD3, wherein the antibody or fragment comprises:

(i) a first light chain variable region (VL1), wherein the VL1 comprises the amino acid sequence of SEQ ID NO:1; and/or

(ii) a first heavy chain variable region (VH1), wherein the VH1 comprises the amino acid sequence of SEQ ID NO:2;

wherein the VL1 and the VH1 bind to human FLT3; and

further comprising a second light chain variable region (VL2) and a second heavy chain variable region (VH2) that bind to human CD3.

16. The bispecific humanized antibody or fragment of claim 15, wherein:
a) the VL1 has the amino acid sequence of SEQ ID NO:1, and the VH1 has the amino acid sequence of SEQ ID NO:2; or
b) wherein the bispecific humanized antibody or fragment comprises a single chain variable fragment (scFv), wherein the scFv comprises the VL1 and the VH1, and wherein the scFv comprises the amino acid sequence of SEQ ID NO:3.

17. The bispecific humanized antibody or fragment of claim 15 or 16, wherein:
(iii) the VL2 comprises the amino acid sequence of SEQ ID NO:4 or SEQ ID NO:6; and
(iv) the VH2 comprises the amino acid sequence of SEQ ID NO:5 or SEQ ID NO:7.

18. The bispecific humanized antibody or fragment of claim 17, wherein:
a) the VL2 has the amino acid sequence of SEQ ID NO:4, and the VH2 has the amino acid sequence of SEQ ID NO:5; or
b) the VL2 has the amino acid sequence of SEQ ID NO:6, and the VH2 has the amino acid sequence of SEQ ID NO:7.

19. A bispecific humanized antibody or antigen binding fragment thereof that binds to human FLT3 and human CD3, wherein the antibody or fragment comprises:
(i) a VL1 that comprises the amino acid sequence of SEQ ID NO:4 or SEQ ID NO:6; and
(ii) a VH1 that comprises the amino acid sequence of SEQ ID NO:5 or SEQ ID NO:7;
wherein the VL1 and the VH1 bind to human CD3; and
further comprising a VL2 and a VH2 that bind to human FLT3.

20. The bispecific humanized antibody or fragment of claim 19, wherein:
a) the VL1 has the amino acid sequence of SEQ ID NO:4 and the VH1 has the amino acid sequence of SEQ ID NO:5; or
b) the VL1 has the amino acid sequence of SEQ ID NO:6 and the VH1 has the amino acid sequence of SEQ ID NO:7.

21. The bispecific humanized antibody or fragment of any one of claims 15-20, wherein the antibody or fragment comprise a heavy chain (HC) and a light chain (LC).

22. The bispecific humanized antibody or fragment of any one of claims 10-14 and 21, wherein the LC comprises a constant domain, optionally where the constant domain comprises the amino acid sequence of SEQ ID NO:58.

23. The bispecific humanized antibody or fragment of any one of claims 10-14 and 21-22, wherein the HC comprises an Fc region;

optionally wherein:

i) the Fc region is an IgG, further optionally wherein the IgG is a human IgG1, a human IgG2, a human IgG3, or a human IgG4; or

ii) the Fc region comprises the amino acid sequence of SEQ ID NO:59 or SEQ ID NO: 27.

24. The bispecific humanized antibody of claim 1 or 3, wherein:
a) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:8, and an HC comprising the amino acid sequence of SEQ ID NO:11;

b) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:8, and an HC comprising the amino acid sequence of SEQ ID NO:13;

c) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:15, and an HC comprising the amino acid sequence of SEQ ID NO:13;

d) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:17, and an HC comprising the amino acid sequence of SEQ ID NO:13;

e) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:17, and an HC comprising the amino acid sequence of SEQ ID NO:19;

f) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:17, and an HC comprising the amino acid sequence of SEQ ID NO:21;

g) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:17, and an HC comprising the amino acid sequence of SEQ ID NO:23;

h) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:25, and an HC comprising the amino acid sequence of SEQ ID NO:28; or

i) the antibody comprises an LC comprising the amino acid sequence of SEQ ID NO:30, and an HC comprising the amino acid sequence of SEQ ID NO:28.

25. The bispecific humanized antibody or fragment of any one of claims 1-24, which is a monoclonal antibody.

26. The bispecific humanized antibody or fragment of any one of claims 1-25, wherein the antibody or fragment is purified.

27. The bispecific humanized antibody or fragment of any one of claims 1-26, wherein the antibody or fragment has half-life of 1 day to 14 days in a human, optionally wherein the antibody or fragment has half-life of 4 days to 7 days in a human.

28. A pharmaceutical composition comprising a therapeutically effective amount of the antibody or fragment of any one of claims 1-27 and a pharmaceutically acceptable excipient.

29. The pharmaceutical composition of claim 28, which further comprises an anti-tumor agent.

30. Use of a therapeutically effective amount of: (i) an antibody or fragment of any one of claims 1-27, or (ii) the pharmaceutical composition of claim 28 or 29, in the manufacture of a

medicament for treating a hematologic cancer in a subject in need thereof, wherein the medicament is to be administered to the subject.

31. The use of claim 30, wherein:

i) the hematologic cancer is acute myeloid leukemia (AML), acute lymphoblastic leukemia (ALL), chronic myeloid leukemia (CML), chronic lymphocytic leukemia (CLL), peripheral T cell lymphoma, follicular lymphoma, diffuse large B cell lymphoma, Hodgkin lymphoma, non-Hodgkin lymphoma, neuroblastoma, a non-malignant inherited or acquired marrow disorder, multiple myeloma, a dendritic cell neoplasm, or blastic plasmacytoid dendritic cell neoplasm (BPDCN); optionally wherein the hematologic cancer is AML, a dendritic cell neoplasm or blastic plasmacytoid dendritic cell neoplasm (BPDCN); or

ii) the hematologic cancer is a non-malignant inherited or acquired marrow disorder, and wherein the non-malignant inherited or acquired marrow disorder is selected from sickle anemia, beta-thalassemia major, refractory Diamond-Blackfan anemia, myelodysplastic syndrome, idiopathic severe aplastic anemia, paroxysmal nocturnal hemoglobinuria, pure red cell aplasia, Fanconi anemia, amegakaryocytosis, or congenital thrombocytopenia.

32. Use of a therapeutically effective amount of: (i) an antibody or fragment of any one of claims 1-27, or (ii) the pharmaceutical composition of claim 28 or 29, in the manufacture of a medicament for preparing or conditioning a subject in need thereof for hematopoietic cell transplantation; wherein the medicament is to be administered to the subject prior to the hematopoietic cell transplantation.

33. The use of claim 32, wherein the medicament reduces the cell population expressing one or more of CD34, FLT3, CD33, CD11b, CD16, CD15, and CD66b by at least 90%.

34. The use of claim 32, wherein the medicament reduces the cell population expressing FLT3 and CD34 by at least 90%.

35. The use of claim 32 or 34, wherein the subject in need thereof has a hematologic cancer; optionally wherein:

i) the hematologic cancer is acute myeloid leukemia (AML), acute lymphoblastic leukemia (ALL), chronic myeloid leukemia (CML), chronic lymphocytic leukemia (CLL), peripheral T cell lymphoma, follicular lymphoma, diffuse large B cell lymphoma, Hodgkin lymphoma, non-Hodgkin lymphoma, neuroblastoma, a non-malignant inherited or acquired marrow disorder, multiple myeloma, a dendritic cell neoplasm, or blastic plasmacytoid dendritic cell neoplasm (BPDCN); further optionally wherein the hematologic cancer is AML, a dendritic cell neoplasm or blastic plasmacytoid dendritic cell neoplasm (BPDCN); or

ii) the hematologic cancer is a non-malignant inherited or acquired marrow disorder, and wherein the non-malignant inherited or acquired marrow disorder is selected from sickle anemia, beta-thalassemia major, refractory Diamond-Blackfan anemia, myelodysplastic syndrome, idiopathic severe aplastic anemia, paroxysmal nocturnal hemoglobinuria, pure red cell aplasia, Fanconi anemia, amegakaryocytosis, or congenital thrombocytopenia.

36. The use of any one of claims 32-35, hematopoietic cell transplantation to the subject is to be further performed after the administration, optionally wherein:

i) the hematopoietic cell transplantation comprises transplantation to the subject of hematopoietic stem cells; and/or

ii) the hematopoietic progenitor cells and/or the hematopoietic cell transplantation occurs 5 days to 5 weeks after the administration; further optionally wherein the hematopoietic cell transplantation occurs about 2 to 3 weeks after the administration.

37. The use of any one of claims 30-36, wherein the therapeutically effective amount is an amount of the antibody or fragment from about 0.01 mg/kg to about 2 mg/kg; optionally wherein the therapeutically effective amount is an amount of the antibody or fragment from about 0.1 mg/kg to about 0.3 mg/kg.

38. The use of any one of claims 30-37, wherein:

a) the administration is once a single dose;

b) the administration is every 1-14 days for about 1 to 4 weeks; or

c) the administration is every 3-7 days for 2 to 3 weeks.

39. The use of any one of claims 30-38, wherein the administration is intravenous administration, optionally wherein the intravenous administration is by infusion into the subject.

40. The use of any one of claims 30-39, wherein a checkpoint inhibitor is to be further administered; optionally

wherein the checkpoint inhibitor is an anti-PD1 antagonist, an anti-PD-L1 antagonist and/or an anti-CTLA4 antagonist, further optionally wherein the checkpoint inhibitor is an anti-PD1 antibody.

41. The use of claim 40, wherein the medicament is to be administered concomitant with or after the administration of the checkpoint inhibitor.

42. The use of any one of claims 30-41, wherein the subject is a human.