WHAT IS CLAIMED IS:

~~1. A method of producing a cell population comprising natural killer cells, comprising the steps of:~~

~~(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;~~

~~(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells; and~~

~~(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking each of a stem cell mobilizing agent and low molecular weight heparin (LMWH), to produce a third population of cells;~~

~~wherein the third population of cells comprises natural killer cells that are CD56+, CD3-, and wherein at least 80% of the natural killer cells are viable.~~

~~2. The method of claim 1, wherein said third population of cells comprises natural killer cells that are CD94+ or CD16+.~~

~~3. The method of claim 1, wherein said third population of cells comprises natural killer cells that are CD94- or CD16-.~~

~~4. The method of claim 1, wherein said third population of cells comprises natural killer cells that are CD94+ and CD16+.~~

~~5. The method of claim 1, wherein said third population of cells comprises natural killer cells that are CD94- and CD16-.~~

~~6. A method of producing a cell population comprising natural killer cells, comprising the steps of:~~

~~(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;~~

~~(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells; and~~

(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking LMWH, to produce a third population of cells;

wherein the third population of cells comprises natural killer cells that are CD56+, CD3-, and CD11a+.

7. The method of claim 6, wherein the third medium lacks stem cell factor (SCF).

8. The method of claim 7, wherein the third medium lacks LMWH.

9. The method of claim 7, comprising a further step of (d) isolating CD11a+ cells from the third population of cells to produce a fourth population of cells;

wherein the fourth population of cells comprises natural killer cells that are CD56+, CD3-, and CD11a+.

10. The method of any one of claim 6-9, wherein said natural killer cells express perforin and EOMES.

11. The method of any one of claim 6-10, wherein said natural killer cells do not express either RORγt or IL1R1.

12. A method of producing a cell population comprising ILC3 cells, comprising the steps of:

(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;

(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells; and

(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking LMWH, to produce a third population of cells;

wherein the third population of cells comprises ILC3 cells that are CD56+, CD3-, and CD11a-.

13. The method of claim 12, wherein the third medium comprises a stem cell mobilizing agent.

14. The method of claim 12, wherein the third medium comprises SCF.

15. The method of claim 12, wherein the third medium comprises a stem cell mobilizing agent and SCF.

16. A method of producing a cell population comprising ILC3 cells, comprising the steps of:

(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;

(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells;

(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking each of a stem cell mobilizing agent and LMWH, to produce a third population of cells; and

(d) isolating CD11a- cells from the third population of cells to produce a fourth population of cells;

wherein the fourth population of cells comprises ILC3 cells that are CD56+, CD3-, and CD11a-.

17. The method of any one of claim 12-16, wherein said ILC3 cells express RORγt and IL1R1.

18. The method of any one of claim 12-17, wherein said ILC3 cells do not express either perforin or EOMES.

19. The method of any one of claims 1-18, wherein said third medium lacks desulphated glycosaminoglycans.

20. The method of any one of claim 1-19, wherein said hematopoietic stem or progenitor cells are mammalian cells.

21. The method of claim 20, wherein said hematopoietic stem or progenitor cells are human cells.

22. The method of claim 20, wherein said hematopoietic stem or progenitor cells are primate cells.

23. The method of claim 20, wherein said hematopoietic stem or progenitor cells are canine cells.

24. The method of claim 20, wherein said hematopoietic stem or progenitor cells are rodent cells.

~~25. The method of claim 20, wherein said hematopoietic stem or progenitor cells are cells from a mammal other than a human, primate, canine or rodent.~~

~~26. The method of any one of claims 1-25, wherein said hematopoietic stem or progenitor cells are CD34+ hematopoietic stem cells.~~

~~27. The method of any one of claims 1-26, wherein said hematopoietic stem or progenitor cells are placental cells.~~

~~28. The method of claim 27, wherein said placental cells are obtained from, or obtainable from, human placental perfusate.~~

~~29. The method of claim 27, wherein said placental cells are obtained from, or obtainable from, nucleated cells isolated from human placental perfusate.~~

~~30. The method of any one of claims 1-26, wherein said hematopoietic stem or progenitor cells are obtained from, or obtainable from, umbilical cord blood.~~

~~31. The method of any one of claims 1-26, wherein said hematopoietic stem or progenitor cells are fetal liver cells.~~

~~32. The method of any one of claims 1-26, wherein said hematopoietic stem or progenitor cells are mobilized peripheral blood cells.~~

~~33. The method of any one of claims 1-26, wherein said hematopoietic stem or progenitor cells are bone marrow cells.~~

~~34. The method of any one of claims 1-33, wherein said Tpo is present in the first medium at a concentration of from 1 ng/mL to 50 ng/mL.~~

~~35. The method of claim 34, wherein said Tpo is present in the first medium at a concentration of from 20 ng/mL to 30 ng/mL.~~

~~36. The method of claim 34, wherein said Tpo is present in the first medium at a concentration of about 25 ng/mL.~~

~~37. The method of any one of claims 1-36, wherein said IL-15 is present in said second medium at a concentration of from 1 ng/mL to 50 ng/mL.~~

~~38. The method of claim 37, wherein said IL-15 is present in said second medium at a concentration of from 10 ng/mL to 30 ng/mL.~~

~~39. The method of claim 37, wherein said IL-15 is present in said second medium at a concentration of about 20 ng/mL.~~

40. The method of any one of claims 1-39, wherein said IL-2 is present in said third medium at a concentration of from 10 U/mL to 10,000 U/mL and said IL-15 is present in said third medium at a concentration of from 1 ng/mL to 50 ng/mL.

41. The method of any one of claims 1-39, wherein said IL-2 is present in said third medium at a concentration of from 300 U/mL to 3,000 U/mL and said IL-15 is present in said third medium at a concentration of from 10 ng/mL to 30 ng/mL.

42. The method of any one of claims 1-39, wherein said IL-2 is present in said third medium at a concentration of about 1,000 U/mL and said IL-15 is present in said third medium at a concentration of about 20 ng/mL.

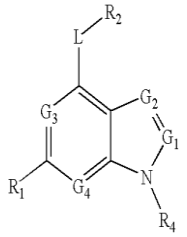
43. The method of any of claims 1-42, wherein said Tpo, IL-2, and IL-15 are not comprised within an undefined component of the first medium, second medium or third medium.

44. The method of any of claims 1-42, wherein said Tpo, IL-2, and IL-15 are not comprised within serum.

45. The method of any of claims 1-44, wherein said stem cell mobilizing agent is an aryl hydrocarbon receptor inhibitor.

46. The method of claim 45, wherein said aryl hydrocarbon receptor inhibitor is resveratrol.

47. The method of claim 45, wherein said aryl hydrocarbon receptor inhibitor is compound of the formula



in which:

G_1 is selected from N and CR_3;

G_2, G_3 and G_4 are independently selected from CH and N; with the proviso that at least 1 of G_3 and G_4 is N; with the proviso that G_1 and G_2 are not both N;

L is selected from --$NR_{5a}(CH_2)_{0-3}$--, --$NR_{5a}CH(C(O)OCH_3)CH_2$--, --$NR_{5a}(CH_2)_2NR_{5b}$--, --$NR_{5a}(CH_2)_2S$--, --$NR_{5a}CH_2CH(CH_3)CH_2$--, --$NR_{5a}CH_2CH(OH)$-- and --

$NR_{5a}CH(CH_3)CH_2$--; wherein R_{5a} and R_{5b} are independently selected from hydrogen and C_{1-4}alkyl;

R_1 is selected from hydrogen, phenyl, thiophenyl, furanyl, 1H-benzoimidazolyl, isoquinolinyl, 1H-imidazopyridinyl, benzothiophenyl, pyrimidinyl, 1H-pyrazolyl, pyridinyl, 1H-imidazolyl, pyrrolidinyl, pyrazinyl, pyridazinyl, 1H-pyrrolyl and thiazolyl; wherein said phenyl, thiophenyl, furanyl, 1H-benzoimidazolyl, isoquinolinyl, 1H-imidazopyridinyl, benzothiophenyl, pyrimidinyl, 1H-pyrazolyl, pyridinyl, 1H-imidazolyl, pyrrolidinyl, pyrazinyl, pyridazinyl, 1H-pyrrolyl or thiazolyl of R_1 can be optionally substituted by 1 to 3 radicals independently selected from cyano, hydroxy, C_{1-4}alkyl, C_{1-4}alkoxy, halo, halo-substituted-C_{1-4}alkyl, halo-substituted-C_{1-4}alkoxy, hydroxy, amino, --$C(O)R_{8a}$, --$S(O)_{0-2}R_{8a}$, --$C(O)OR_{8a}$ and --$C(O)NR_{8a}R_{8b}$; wherein R_{8a} and R_{8b} are independently selected from hydrogen and C_{1-4}alkyl; with the proviso that R_1 and R_3 are not both hydrogen;

R_2 is selected from --$S(O)_2NR_{6a}R_{6b}$, --$NR_{9a}C(O)R_{9b}$, --$NR_{6a}C(O)NR_{6b}R_{6c}$, phenyl, 1H-pyrrolopyridin-3-yl, 1H-indolyl, thiophenyl, pyridinyl, 1H-1,2,4-triazolyl, 2-oxoimidazolidinyl, 1H-pyrazolyl, 2-oxo-2,3-dihydro-1H-benzoimidazolyl and 1H-indazolyl; wherein R_{6a}, R_{6b} and R_{6c} are independently selected from hydrogen and C_{1-4}alkyl; wherein said phenyl, 1H-pyrrolopyridin-3-yl, 1H-indolyl, thiophenyl, pyridinyl, 1H-1,2,4-triazolyl, 2-oxoimidazolidinyl, 1H-pyrazolyl, 2-oxo-2,3-dihydro-1H-benzoimidazolyl or 1H-indazolyl of R_2 is optionally substituted with 1 to 3 radicals independently selected from hydroxy, halo, methyl, methoxy, amino, --$O(CH_2)_nNR_{7a}R_{7b}$, --$S(O)_2NR_{7a}R_{7b}$, --$OS(O)_2NR_{7a}R_{7b}$ and --$NR_{7a}S(O)_2R_{7b}$; wherein R_{7a} and R_{7b} are independently selected from hydrogen and C_{1-4}alkyl;

R_3 is selected from hydrogen, C_{1-4}alkyl and biphenyl; and

R_4 is selected from C_{1-10}alkyl, prop-1-en-2-yl, cyclohexyl, cyclopropyl, 2-(2-oxopyrrolidin-1-yl)ethyl, oxetan-3-yl, benzhydryl, tetrahydro-2H-pyran-3-yl, tetrahydro-2H-pyran-4-yl, phenyl, tetrahydrofuran-3-yl, benzyl, (4-pentylphenyl)(phenyl)methyl and 1-(1-(2-oxo-6,9,12-trioxa-3-azatetradecan-14-yl)-1H-1,2,3-triazol-4-yl)ethyl; wherein said alkyl, cyclopropyl, cyclohexyl, 2-(2-oxopyrrolidin-1-yl)ethyl, oxetan-3-yl, oxetan-2-yl, benzhydryl, tetrahydro-2H-pyran-2-yl, tetrahydro-2H-pyran-3-yl, tetrahydro-2H-pyran-4-yl, phenyl, tetrahydrofuran-3-yl, tetrahydrofuran-

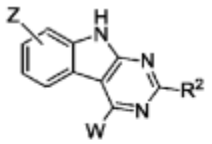
2-yl, benzyl, (4-pentylphenyl)(phenyl)methyl or 1-(1-(2-oxo-6,9,12-trioxa-3-azatetradecan-14-yl)-1H-1,2,3-triazol-4-yl)ethyl can be optionally substituted with 1 to 3 radicals independently selected from hydroxy, C_{1-4}alkyl and halo-substituted-C_{1-4}alkyl; or a salt thereof.

48. The method of claim 45, wherein said aryl hydrocarbon receptor inhibitor is StemRegenin-1 (SR-1) (4-(2-(2-(benzo[b]thiophen-3-yl)-9-isopropyl-9H-purin-6-ylamino)ethyl)phenol).

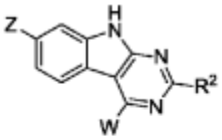
49. The method of claim 45, wherein said aryl hydrocarbon receptor inhibitor is the compound CH223191 (1-Methyl-N-[2-methyl-4-[2-(2-methylphenyl)diazenyl]phenyl-1H-pyrazole-5-carboxamide].

50. The method of any claims 1-44, wherein the stem cell mobilizing agent is a pyrimido(4,5-b)indole derivative.

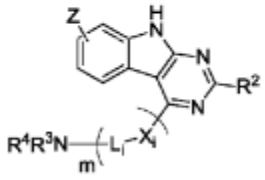
51. The method of claim 50, wherein said pyrimido(4,5-b)indole derivative is one or more of:



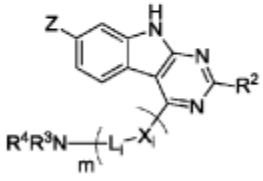
I



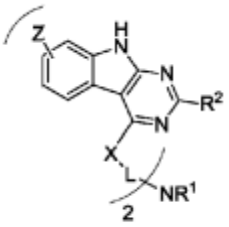
II



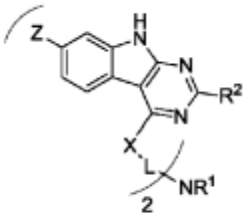
III



IV



V



VI

or a salt or a prodrug thereof, wherein:

Z is

1) P(O) (OR<1>) (OR<1>),

2) C(0)OR<1>,

3) C(0)NHR<1>,

4) C(0)N(R)R<1>,

5) C(0)R<1>,

6) CN,

7) SR ,

8) S(0)2NH2,

9) S(0)2NHR<1>,

10) S(0)2N(R)R<1>,

1 1) S(0)R<1>,

12) S(0)2R<1>,

13) L,

14) benzyl optionally substituted with 1 , 2 or 3 R<A> or R<1> substituents,

15) L heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and the heteroaryl groups,

16) L heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either one or both the L and the heterocyclyl groups, 17) L aryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and the heteroaryl groups,

18) heteroaryl optionally substituted with one or more R<A> or R<1> substituents, or

19) aryl optionally substituted with one or more R<A> or R<1> substituents,

and wherein each substituent is optionally attached to the L group if it is not already present, and wherein, when (R<1>) and R<1> are attached to a nitrogen atom, optionally they join together with the nitrogen atom to form a 3 to 7-membered ring which optionally includes one or more other heteroatom selected from N, 0 and S, optionally the is substituted with one or more R<1> or R<A>;

W is

1) H,

2) halogen,

3) OR<1>,

4) L OH,

5) L OR<1>,

6) SR<1>,

7) CN,

8) P(0)(OR<1>)(OR<1>),

9) NHR<1>,

10) N(R<1>)R<1>,

1 1) L NH2,

12) L NHR<1>,

13) L N(R<1>)R<1>,

14) L SR<1>,

15) L S(0)R<1>,

16) L S(0)2R<1>,

17) L P(0)(OR<1>)(OR<1>

18) C(0)OR<1>,

19) C(0)NH2,

20) C(0)NHR<1>,

21) C(0)N(R<1>)R<1>,

22) NHC(0)R<1>,

23) NR1C(0)R<1>, NHC(0)0R<1>,

NR1C(0)0R<1>,

0C(0)NH2,

-0C(0)NHR<1>,

-0C(0)N(R)R<1>,

-0C(0)R<1>,

-C(0)R<1>,

-NHC(0)NH2,

-NHC(0)NHR<1>,

-NHC(0)N(R)R<1>,

-NR C(0)NH2,

-NR C(0)NHR<1>,

-NR C(0)N(R)R<1>,

-NHS(0)2R<1>,

-NR S(0)2R<1>,

-S(0)2NH2,

-S(0)2NHR<1>,

-S(0)2N(R)R<1>,

-S(0)R<1>,

-S(0)2R<1>,

-0S(0)2R1 ,

-S(0)20R<1>,

-benzyl optionally substituted with 1 , 2 or 3 R<A> or R<1> substituents,

-L heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and the heteroaryl groups,

-L heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and the heterocyclyl goups,

-L aryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and aryl groups,

-L NR<1>(R<1>),

-L)2 NR<1>,

-L (N(R1) L)n - N(R1)R1 , -L (N(R<1>) L)n - heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heteroaryl groups,

-L-(N(R<1>)-L)n - heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heterocyclyl groups,

-L-(N(R<1>)-L)n - aryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and aryl groups,

-0-L-N(R)R<1> ,

-0-L- heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heteroaryl groups,

-0-L- heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heterocyclyl groups,

-0-L- aryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and aryl groups,

-0-L)2-NR<1>,

-0-L-(N(R)-L)n - N(R)R<1> ,

-0-L-(N(R<1>)-L)n - heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heteroaryl groups,

-0-L-(N(R<1>)-L)n - heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and heterocyclyl groups,

-0-L-(N(R<1>)-L)n- aryl optionally substituted with one or more R<A> or R<1> substituents,

-S-L- heteroaryl optionally substituted with one or more R<A> or R<1> substituents,

-S-L- heterocyclyl optionally substituted with one or more R<A> or R<1> substituents,

-S-L- aryl optionally substituted with one or more R<A> or R<1> substituents attached on either or both the L and aryl groups,

-S-L)2-NR1 ,

-S-L-(N(R1)-L)"- N(R1)R1,

-S-L-(N(R<1>)-L)n - heteroaryl optionally substituted with one or more R<A> substituents, -S-L-(N(R<1>)-L)n - heterocyclyl optionally substituted with one or more R<A> substituents, -S-L-(N(R<1>)-L)n - aryl optionally substituted with one or more R<A> substituents,

-NR<1>(R<1>),

-(N(R1)-L)n - N(R1)R1 ,

-N(R1)L)2 -NR1 , 76) -(N(R1) L)" -N(R1)RA,

77) -(N(R<1>) L)n - heteroaryl optionally substituted with one or more R<A> or R<1> substituents,

78) -(N(R<1>) L)n - heterocyclyl optionally substituted with one or more R<A> or R<1> substituents,

79) -(N(R<1>) L)n - aryl optionally substituted with one or more R<A> or R<1> substituents,

80) -heteroaryl optionally substituted with one or more R<A> substituents, or

81) -aryl optionally substituted with one or more R<A> substituents,

and wherein each substituent is optionally attached to the L group if it is not already present, and wherein when two R<1> substituents are present on the same nitrogen atom, then each R<1> substituent is independently selected from the list of R<1> values described thereafter,

and wherein n is an integer equal to either 0, 1 , 2, 3, 4, or 5,

and wherein, when (R<1>) and R<1> are attached to a nitrogen atom, optionally they join together with the nitrogen atom to form a 3 to 7-membered ring which optionally includes one or more other heteroatom selected from N, 0 and S, optionally the ring is substituted with one or more R<1> or R<A>;

L is

1) -Ci-6 alkyl,

2) -C2-6 alkenyl,

3) -C2-6 alkynyl,

4) -C3-7 cycloalkyi,

5) -C3-7 cycloalkenyl,

6) heterocyclyl,

7) -Ci-6 alkyl-C3-7 cycloalkyi,

8) -Ci-6 alkyl-heterocyclyl,

9) aryl, or

10) heteroaryl,

and wherein the alkyl, the alkenyl, the alkynyl, the cycloalkyi, the cycloalkenyl, the heterocyclyl, the aryl and the heteroaryl groups are each independently optionally substituted with one or two R<A> substituent;

Ri is

1) H,

2) C1-6 alkyl,

3) C2-6 alkenyl,

4) C2-6 alkynyl, 5) C3-7 cycloalkyl,

6) C3-7 cycloalkenyl,

7) C1-5 perfluorinated,

8) heterocydyl,

9) aryl,

10) heteroaryl,

11) benzyl, or

12) 5-[(3aS,4S,6aR)-2-oxohexahydro-1 H-thieno[3,4-d]imidazol-4-yl]pentanoyl,

and wherein the alkyi, the alkenyl, the alkynyl, the cycloalkenyl, the perfluorinated alkyi, the heterocydyl, the aryl, the heteroaryl and the benzyl groups are each independently optionally substituted with 1 , 2 or 3 R<A> or R<1> substituents;

R2 is

1) H,

2) C1-6 alkyi,

3) SR ,

4) C(0)R1,

5) S(0)R1,

6) S(0)2R<1>,

7) benzyl optionally substituted with 1 , 2 or 3 R<A> or R<1> substituents,

8) -L-heteroaryl optionally substituted with one or more R<A> or R<1> substituents attached on either one or both the L and the heteroaryl groups,

9) -L-heterocyclyl optionally substituted with one or more R<A> or R<1> substituents attached on either one or both the L and the heterocydyl groups,

10) L-aryl optionally substituted with one or more R<A> or R<1> substituents attached on either one or both the L and the aryl groups,

11) heteroaryl optionally substituted with one or more R<A> or R<1> substituents, or

12) aryl optionally substituted with one or more R<A> or R<1> substituents,

and wherein each substituent is optionally attached to the L group if it is not already present;

R<A> is

1) halogen,

2) CFs, 3) OH,

4) OR<1>,

5) L-OH,

6) L-OR<1>,

7) OCFs,

8) SH,

9) SR1 ,

10) CN,

11) NO2,

12) NH2,

13) NHR<1>,

14) NR<1>R<1>,

15) L-NH2,

16) L-NHR<1>,

17) L-NR<4>R<1>,

18) L-SR<1>,

19) L-S(0)R<1>,

20) L-S(0)2R<1>,

21) C(0)OH,

22) C(0)OR<1>,

23) C(0)NH2,

24) C(0)NHR<1>,

25) C(0)N(R<1>)R<1>,

~~26) -NHC(0)R<1>,~~

~~27) -NR1C(0)R<1>,~~

~~28) -NHC(0)OR<1>,~~

~~29) -NR1C(0)0R<1>,~~

~~30) -OC(0)NH2,~~

~~31) -OC(0)NHR<1>,~~

~~32) -OC(0)N(R)R<1>,~~

~~33) -OC(0)R<1>,~~

~~34) -C(0)R1, 35) -NHC(0)NH2,~~

~~36) -NHC(0)NHR1,~~

~~37) -NHC(0)N(R)R<1>,~~

~~38) -NR C(0)NH2,~~

~~39) -NR C(0)NHR<1>,~~

~~40) -NR1C(0)N(R1)R1,~~

~~41) -NHS(0)2R<1>,~~

~~42) -NR S(0)2R<1>,~~

~~43) -S(0)2NH2,~~

~~44) -S(0)2NHR<1>,~~

~~45) -S(0)2N(R)R<1>,~~

~~46) -S(0)R<1>,~~

~~47) -S(0)2R<1>,~~

~~48) -0S(0)2R<1>,~~

~~49) -S(0)20R<1>,~~

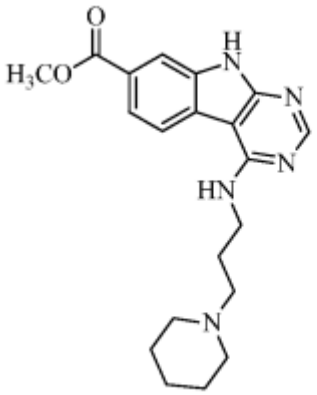
~~50) -benzyl,~~

~~51) -N3, or~~

~~52) -C(-N=N-)(CF3),~~

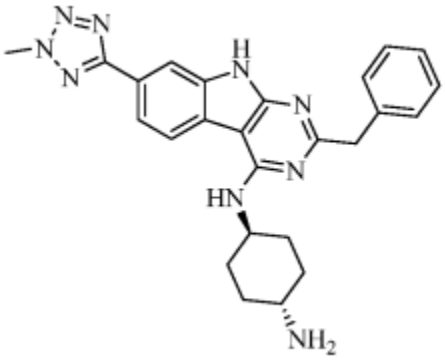
~~and wherein the benzyl group is optionally substituted with 1 , 2 or 3 R<A> or R<1> substituents.~~

~~52. The method of claim 50, wherein said pyrimido(4,5-b)indole derivative has the chemical structure~~



(UM729).

~~53. The method of claim 50, wherein said pyrimido(4,5-b)indole derivative has the chemical structure~~



(UM171).

~~54. The method of any of claims 1-53, wherein said first medium additionally comprises one or more of LMWH, Flt-3 Ligand (Flt-3L), stem cell factor (SCF), IL-6, IL-7, granulocyte colony-stimulating factor (G-CSF), or granulocyte-macrophage-stimulating factor (GM-CSF).~~

~~55. The method of any of claims 1-54, wherein said first medium does not comprise LMWH.~~

~~56. The method of claim 55, wherein said first medium does not comprise a desulphated glycosaminoglycan.~~

~~57. The method of claim 54, wherein said first medium comprises each of LMWH, Flt-3L, SCF, IL-6, IL-7, G-CSF, and GM-CSF.~~

58. The method of claim 55 or 56, wherein said first medium comprises each of Flt-3L, SCF, IL-6, IL-7, G-CSF, and GM-CSF.

59. The method of claim 54 or claim 57, wherein in the first medium the LMWH is present at a concentration of from 1U/mL to 10U/mL; the Flt-3L is present at a concentration of from 1 ng/mL to 50 ng/mL; the SCF is present at a concentration of from 1 ng/mL to 50 ng/mL; the IL-6 is present at a concentration of from 0.01 ng/mL to 0.1 ng/mL; the IL-7 is present at a concentration of from 1 ng/mL to 50 ng/mL; the G-CSF is present at a concentration of from 0.01 ng/mL to 0.50 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.1 ng/mL.

60. The method of claim 54 or claim 57, wherein in the first medium the LMWH is present in the first medium at a concentration of from 4U/mL to 5U/mL; the Flt-3L is present at a concentration of from 20 ng/mL to 30 ng/mL; the SCF is present at a concentration of from 20 ng/mL to 30 ng/mL; the IL-6 is present at a concentration of from 0.04 ng/mL to 0.06 ng/mL; the IL-7 is present at a concentration of from 20 ng/mL to 30 ng/mL; the G-CSF is present at a concentration of from 0.20 ng/mL to 0.30 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.5 ng/mL.

61. The method of claim 54 or claim 57, wherein in the first medium the LMWH is present in the first medium at a concentration of about 4.5U/mL; the Flt-3L is present at a concentration of about 25 ng/mL; the SCF is present at a concentration of about 27 ng/mL; the IL-6 is present at a concentration of about 0.05 ng/mL; the IL-7 is present at a concentration of about 25 ng/mL; the G-CSF is present at a concentration of about .25 ng/mL; and the GM-CSF is present at a concentration of about 0.01 ng/mL.

62. The method of claim 55 or claim 58, wherein in the first medium the Flt-3L is present at a concentration of from 1 ng/mL to 50 ng/mL; the SCF is present at a concentration of from 1 ng/mL to 50 ng/mL; the IL-6 is present at a concentration of from 0.01 ng/mL to 0.1 ng/mL; the IL-7 is present at a concentration of from 1 ng/mL to 50 ng/mL; the G-CSF is present at a concentration of from 0.01 ng/mL to 0.50 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.1 ng/mL.

63. The method of claim 55 or claim 58, wherein in the first medium the Flt-3L is present at a concentration of from 20 ng/mL to 30 ng/mL; the SCF is present at a concentration of from 20 ng/mL to 30 ng/mL; the IL-6 is present at a concentration of from 0.04 ng/mL to 0.06

ng/mL; the IL-7 is present at a concentration of from 20 ng/mL to 30 ng/mL; the G-CSF is present at a concentration of from 0.20 ng/mL to 0.30 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.5 ng/mL.

64. The method of claim 55 or claim 58, wherein in the first medium the Flt-3L is present at a concentration of about 25 ng/mL; the SCF is present at a concentration of about 27 ng/mL; the IL-6 is present at a concentration of about 0.05 ng/mL; the IL-7 is present at a concentration of about 25 ng/mL; the G-CSF is present at a concentration of about .25 ng/mL; and the GM-CSF is present at a concentration of about 0.01 ng/mL.

65. The method of any of claims 1-64, wherein said second medium additionally comprises one or more of LMWH, Flt-3, SCF, IL-6, IL-7, G-CSF, and GM-CSF.

66. The method of any of claims 1-65, wherein said second medium does not comprise LMWH.

67. The method of claim 66, wherein said second medium does not comprise a desulphated glycosaminoglycan.

68. The method of any of claims 1-65, wherein said second medium additionally comprises each of LMWH, Flt-3, SCF, IL-6, IL-7, G-CSF, and GM-CSF.

69. The method of any of claims 1-66, wherein said second medium additionally comprises each of Flt-3, SCF, IL-6, IL-7, G-CSF, and GM-CSF.

70. The method of claim 65 or claim 68, wherein in the second medium the LMWH is present at a concentration of from 1U/mL to 10U/mL; the Flt-3L is present at a concentration of from 1 ng/mL to 50 ng/mL; the SCF is present at a concentration of from 1 ng/mL to 50 ng/mL; the IL-6 is present at a concentration of from 0.01 ng/mL to 0.1 ng/mL; the IL-7 is present at a concentration of from 1 ng/mL to 50 ng/mL; the G-CSF is present at a concentration of from 0.01 ng/mL to 0.50 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.1 ng/mL.

71. The method of claim 65 or claim 68, wherein in the second medium the LMWH is present in the second medium at a concentration of from 4U/mL to 5U/mL; the Flt-3L is present at a concentration of from 20 ng/mL to 30 ng/mL; the SCF is present at a concentration of from 20 ng/mL to 30 ng/mL; the IL-6 is present at a concentration of from 0.04 ng/mL to 0.06 ng/mL; the IL-7 is present at a concentration of from 20 ng/mL to 30 ng/mL; the G-CSF is present at a

~~concentration of from 0.20 ng/mL to 0.30 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.5 ng/mL.~~

~~72. The method of claim 65 or claim 68, wherein in the second medium the LMWH is present in the second medium at a concentration of about 4.5U/mL; the Flt-3L is present at a concentration of about 25 ng/mL; the SCF is present at a concentration of about 27 ng/mL; the IL-6 is present at a concentration of about 0.05 ng/mL; the IL-7 is present at a concentration of about 25 ng/mL; the G-CSF is present at a concentration of about 0.25 ng/mL; and the GM-CSF is present at a concentration of about 0.01 ng/mL.~~

~~73. The method of claim 66 or claim 69, wherein in the second medium the Flt-3L is present at a concentration of from 1 ng/mL to 50 ng/mL; the SCF is present at a concentration of from 1 ng/mL to 50 ng/mL; the IL-6 is present at a concentration of from 0.01 ng/mL to 0.1 ng/mL; the IL-7 is present at a concentration of from 1 ng/mL to 50 ng/mL; the G-CSF is present at a concentration of from 0.01 ng/mL to 0.50 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.1 ng/mL.~~

~~74. The method of claim 66 or claim 69, wherein in the second medium the Flt-3L is present at a concentration of from 20 ng/mL to 30 ng/mL; the SCF is present at a concentration of from 20 ng/mL to 30 ng/mL; the IL-6 is present at a concentration of from 0.04 ng/mL to 0.06 ng/mL; the IL-7 is present at a concentration of from 20 ng/mL to 30 ng/mL; the G-CSF is present at a concentration of from 0.20 ng/mL to 0.30 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.5 ng/mL.~~

~~75. The method of claim 66 or claim 69, wherein in the second medium the Flt-3L is present at a concentration of about 25 ng/mL; the SCF is present at a concentration of about 27 ng/mL; the IL-6 is present at a concentration of about 0.05 ng/mL; the IL-7 is present at a concentration of about 25 ng/mL; the G-CSF is present at a concentration of about 0.25 ng/mL; and the GM-CSF is present at a concentration of about 0.01 ng/mL.~~

~~76. The method of any of claims 1-75, wherein said third medium additionally comprises one or more of IL-6, IL-7, G-CSF, or GM-CSF.~~

~~77. The method of claim 76, wherein said third medium comprises each of IL-6, IL-7, G-CSF, and GM-CSF.~~

~~78. The method of claim 76 or claim 77, wherein in the third medium the IL-6 is present at a concentration of from 0.01 ng/mL to 0.1 ng/mL; the IL-7 is present at a concentration of from~~

1 ng/mL to 50 ng/mL; the G-CSF is present at a concentration of from 0.01 ng/mL to 0.50 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.1 ng/mL.

79. The method of claim 76 or claim 77, wherein in the third medium the IL-6 is present at a concentration of from 0.04 ng/mL to 0.06 ng/mL; the IL-7 is present at a concentration of from 20 ng/mL to 30 ng/mL; the G-CSF is present at a concentration of from 0.20 ng/mL to 0.30 ng/mL; and the GM-CSF is present at a concentration of from 0.005 ng/mL to 0.5 ng/mL.

80. The method of claim 76 or claim 77, wherein in the third medium the IL-6 is present at a concentration of about 0.05 ng/mL; the IL-7 is present at a concentration of about 20 ng/mL; the G-CSF is present at a concentration of about 0.25 ng/mL; and the GM-CSF is present at a concentration of about 0.01 ng/mL.

81. The method of any one of claims 6-11 and 19-33, wherein the third medium comprises 100 ng/mL IL-7, 1000 ng/mL IL-2, 20 ng/mL IL-15, and 10 µM SR1 and lacks SCF.

82. The method of any one of claims 6-11 and 19-33, wherein the third medium comprises 20 ng/mL IL-7, 1000 ng/mL IL-2, 20 ng/mL IL-15, and 10 µM SR1 and lacks SCF.

83. The method of any one of claims 6-11 and 19-33, wherein the third medium comprises 20 ng/mL IL-7, 20 ng/mL IL-15, and 10 µM SR1 and lacks SCF.

84. The method of any one of claims 12-33, wherein the third medium comprises 100 ng/mL IL-7, 22 ng/mL SCF, 1000 ng/mL IL-2, and 20 ng/mL IL-15 and lacks SR1.

85. The method of any one of claims 12-33, wherein the third medium comprises 22 ng/mL SCF, 1000 ng/mL IL-2, and 20 ng/mL IL-15 and lacks SR1.

86. The method of any one of claims 12-33, wherein the third medium comprises 20 ng/mL IL-7, 22 ng/mL SCF, 1000 ng/mL IL-2, and 20 ng/mL IL-15 and lacks SR1.

87. The method of any one of claims 12-33, wherein the third medium comprises 20 ng/mL IL-7, 22 ng/mL SCF, and 1000 ng/mL IL-2 and lacks SR1.

88. The method of any of claims 54-87, wherein said LMWH, Flt-3, SCF, IL-6, IL-7, G-CSF, and/or GM-CSF are not comprised within an undefined component of the first medium, second medium or third medium.

89. The method of any of claims 54-87, wherein said LMWH, Flt-3, SCF, IL-6, IL-7, G-CSF, and/or GM-CSF are not comprised within serum.

90. The method of any of claims 1-89, wherein any of said first medium, second medium or third medium comprises human serum AB.

91. The method of claim 90, wherein any of said first medium, second medium or third medium comprises 1% to 20% human serum AB.

92. The method of claim 90, wherein any of said first medium, second medium or third medium comprises 5% to 15% human serum AB.

93. The method of claim 90, wherein any of said first medium, second medium or third medium comprises about 10% human serum AB.

94. The method of any of claims 1 93, wherein any of said first medium, second medium or third medium comprises 2 mercaptoethanol.

95. The method of any of claims 1 94, wherein any of said first medium, second medium or third medium comprises gentamycin.

96. The method of any of claims 1 95, wherein said method comprises culturing the hematopoietic stem cells in the first medium for 7 13 days.

97. The method of claim 96, wherein said method comprises culturing the hematopoietic stem cells in the first medium for 8 12 days.

98. The method of claim 96, wherein said method comprises culturing the hematopoietic stem cells in the first medium for about 10 days.

99. The method of any of claims 1 95, wherein said method comprises culturing said first population of cells in said second medium for 2 6 days.

100. The method of any of claims 1 95, wherein said method comprises culturing said first population of cells in said second medium for 3 5 days.

101. The method of any of claims 1 95, wherein said method comprises culturing said first population of cells in said second medium for about 4 days.

102. The method of any of claims 1 101, wherein said method comprises culturing said second population of cells in said third medium for 10 30 days.

103. The method of any of claims 1 101, wherein said method comprises culturing said second population of cells in said third medium for 15 25 days.

104. The method of any of claims 1 101, wherein said method comprises culturing said second population of cells in said third medium for about 21 days.

105. The method of any of claims 1 104, wherein said culturing in said first medium, second medium and third medium are all done under static culture conditions.

~~106. The method of any of claims 1-104, wherein said culturing in at least one of said first medium, second medium or third medium are done in a spinner flask.~~

~~107. The method of any of claims 1-104, wherein said culturing in said first medium and said second medium is done under static culture conditions, and said culturing in said third medium is done in a spinner flask.~~

~~108. The method of any of claims 1-107, wherein said hematopoietic cells are initially inoculated into said first medium from 1 x 10^4 to 1 x 10^5 cells/mL.~~

~~109. The method of claim 108, wherein said hematopoietic cells are initially inoculated into said first medium at about 3 x 10^4 cells/mL.~~

~~110. The method of any of claims 1-109, wherein said first population of cells are initially inoculated into said second medium from 5 x 10^4 to 5 x 10^5 cells/mL.~~

~~111. The method of any of claim 110, wherein said first population of cells is initially inoculated into said second medium at about 1 x 10^5 cells/mL.~~

~~112. The method of any of claims 1-111, wherein said second population of cells is initially inoculated into said third medium from 1 x 10^5 to 5 x 10^6 cells/mL.~~

~~113. The method of claim 112, wherein said second population of cells is initially inoculated into said third medium from 1 x 10^5 to 1 x 10^6 cells/mL.~~

~~114. The method of claim 112, wherein said second population of cells is initially inoculated into said third medium at about 5 x 10^5 cells/mL.~~

~~115. The method of claim 112, wherein said second population of cells is initially inoculated into said third medium at about 3 x 10^5 cells/mL.~~

~~116. The method of any of claims 1-11, 19-83, and 88-115, wherein said method produces at least 5000-fold more natural killer cells as compared to the number of hematopoietic stem cells initially inoculated into said first medium.~~

~~117. The method of claim 116, wherein said method produces at least 10,000-fold more natural killer cells.~~

~~118. The method of claim 116, wherein said method produces at least 50,000-fold more natural killer cells.~~

~~119. The method of claim 116, wherein said method produces at least 75,000-fold more natural killer cells.~~

~~120. The method of any of claims 12-80 and 84-115, wherein said method produces at least 5000-fold more ILC3 cells as compared to the number of hematopoietic stem cells initially inoculated into said first medium.~~

~~121. The method of claim 120, wherein said method produces at least 10,000-fold more ILC3 cells.~~

~~122. The method of claim 120, wherein said method produces at least 50,000-fold more ILC3 cells.~~

~~123. The method of claim 120, wherein said method produces at least 75,000-fold more ILC3 cells.~~

~~124. The method of any of claims 1-5, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 20% CD56+CD3- natural killer cells.~~

~~125. The method of any of claims 1-5, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 40% CD56+CD3- natural killer cells.~~

~~126. The method of any of claims 1-5, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 60% CD56+CD3- natural killer cells.~~

~~127. The method of any of claims 1-5, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 80% CD56+CD3- natural killer cells.~~

~~128. The method of any of claims 1-11, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 20% CD56+CD3- CD11a+ natural killer cells.~~

~~129. The method of any of claims 1-11, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 40% CD56+CD3- CD11a+ natural killer cells.~~

~~130. The method of any of claims 1-11, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 60% CD56+CD3- CD11a+ natural killer cells.~~

~~131. The method of any of claims 1-11, 19-83, and 88-119, wherein said method produces natural killer cells that comprise at least 80% CD56+CD3- CD11a+ natural killer cells.~~

~~132. The method of any of claims 12-80, 84-115, and 120-123, wherein said method produces ILC3 cells that comprise at least 20% CD56+CD3- CD11a- ILC3 cells.~~

~~133. The method of any of claims 12-80, 84-115, and 120-123, wherein said method produces ILC3 cells that comprise at least 40% CD56+CD3- CD11a- ILC3 cells.~~

~~134. The method of any of claims 12-80, 84-115, and 120-123, wherein said method produces ILC3 cells that comprise at least 60% CD56+CD3- CD11a- ILC3 cells.~~

~~135. The method of any of claims 12-80, 84-115, and 120-123, wherein said method produces natural killer cells that comprise at least 80% CD56+CD3- CD11a- ILC3 cells.~~

~~136. The method of any of claims 1-11, 19-83, 88-119, and 124-131, wherein said natural killer cells exhibit at least 20% cytotoxicity against K562 cells when said natural killer cells and said K562 cells are co-cultured *in vitro* at a ratio of 10:1.~~

~~137. The method of claim 136, wherein said natural killer cells exhibit at least 35% cytotoxicity against the K562 cells.~~

~~138. The method of claim 136, wherein said natural killer cells exhibit at least 45% cytotoxicity against the K562 cells.~~

~~139. The method of claim 136, wherein said natural killer cells exhibit at least 60% cytotoxicity against the K562 cells.~~

~~140. The method of claim 136, wherein said natural killer cells exhibit at least 75% cytotoxicity against the K562 cells.~~

~~141. The method of any of claims 12-80, 84-115, 120-123, and 132-135, wherein said ILC3 cells exhibit at least 20% cytotoxicity against K562 cells when said ILC3 cells and said K562 cells are co-cultured *in vitro* at a ratio of 10:1.~~

~~142. The method of claim 141, wherein said ILC3 cells exhibit at least 35% cytotoxicity against the K562 cells.~~

~~143. The method of claim 141, wherein said ILC3 cells exhibit at least 45% cytotoxicity against the K562 cells.~~

~~144. The method of claim 141, wherein said ILC3 cells exhibit at least 60% cytotoxicity against the K562 cells.~~

~~145. The method of claim 141, wherein said ILC3 cells exhibit at least 75% cytotoxicity against the K562 cells.~~

~~146. The method of any of claims 1-5, 19-83, 88-119, 124-131, and 136-140, wherein viability of said natural killer cells is determined by 7-aminoactinomycin D (7AAD) staining.~~

~~147. The method of any of claims 1-5, 19-83, 88-119, 124-131, and 136-140, wherein viability of said natural killer cells is determined by annexin-V staining.~~

~~148. The method of any of claims 1-5, 19-83, 88-119, 124-131, and 136-140, wherein viability of said natural killer cells is determined by both 7-AAD staining and annexin-V staining.~~

~~149. The method of any of claims 1-5, 19-83, 88-119, 124-131, and 136-140, wherein viability of said natural killer cells is determined by trypan blue staining.~~

~~150. The method of any of claims 1-149, additionally comprising cryopreserving said population of cells after step (c) or step (d).~~

~~151. The method of any of claims 1-149, additionally comprising cryopreserving said population of cells after step (c).~~

~~152. The method of any of claims 1-149, wherein said first medium and/or said second medium lack leukemia inhibiting factor (LIF) and/or macrophage inflammatory protein-1 alpha (MIP-1α).~~

~~153. The method of any of claims 1-149, wherein said third medium lacks LIF, MIP-1α, and FMS-like tyrosine kinase-3 ligand (Flt-3L).~~

~~154. The method of any of claims 1-149, wherein said first medium and said second medium lack LIF and MIP-1α, and said third medium lacks LIF, MIP-1α, and Flt3L.~~

~~155. The method of any of claims 1-149, wherein none of the first medium, second medium or third medium comprises a desulphated glycosaminoglycan.~~

~~156. The method of any of claims 1-149, wherein the first medium, second medium or third medium comprises heparin.~~

~~157. The method of claim 156, wherein said heparin is low-molecular weight heparin (LMWH).~~

~~158. The method of any of claims 1-5, 19-83, 88-119, 124-131, 136-140, and 146-149, additionally comprising cryopreserving said natural killer cells after step (c) or step (d).~~

~~159. A population of natural killer cells produced by the method of any of claims 1-5, 19-83, 88-119, 124-131, 136-140, and 146-149.~~

~~160. A population of cells comprising natural killer cells, wherein the population of cells is produced by the method of any of claims 1-5, 19-83, 88-119, 124-131, 136-140, and 146-149.~~

~~161. A population of ILC3 cells produced by the method of any of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~162. A population of cells comprising ILC3 cells, wherein the population of cells is produced by the method of any of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~163. A population of cells comprising the third population of cells of any one of claims 1-8 and 10-15.~~

~~164. A population of cells comprising the fourth population of cells of claim 9 or claim 16.~~

~~165. A method of suppressing the proliferation of tumor cells comprising contacting the tumor cells with a plurality of natural killer cells, wherein the natural killer cells are produced by the method of any one of claims 1-5, 19-83, 88-119, 124-131, 136-140, and 146-149.~~

~~166. The method of claim 165, wherein said contacting takes place *in vitro*.~~

~~167. The method of claim 165, wherein said contacting takes place *in vivo*.~~

~~168. The method of claim 167, wherein said contacting takes place in a human individual.~~

~~169. The method of claim 167, wherein said method comprises administering said natural killer cells to said individual.~~

~~170. The method of any of claims 165-169, wherein said tumor cells are multiple myeloma cells.~~

~~171. The method of any of claims 165-169, wherein said tumor cells are acute myeloid leukemia (AML) cells.~~

~~172. The method of claim 171, wherein said individual has relapsed/refractory AML.~~

~~173. The method of claim 171, wherein said individual has AML that has failed at least one non-innate lymphoid cell (ILC) therapeutic against AML.~~

~~174. The method of claim 165, wherein said individual is 65 years old or greater, and is in first remission.~~

~~175. The method of any of claims 165-168, wherein said individual has been conditioned with fludarabine, cytarabine, or both, prior to administering said natural killer cells.~~

~~176. The method of any of claims 159-163, wherein said tumor cells are breast cancer cells, head and neck cancer cells, or sarcoma cells.~~

~~177. The method of any of claims 159-163, wherein said tumor cells are primary ductal carcinoma cells, leukemia cells, acute T-cell leukemia cells, chronic myeloid lymphoma (CML) cells, chronic myelogenous leukemia (CML) cells, lung carcinoma cells, colon adenocarcinoma cells, histiocytic lymphoma cells, colorectal carcinoma cells, colorectal adenocarcinoma cells, or retinoblastoma cells.~~

~~178. The method of any of claims 165-169, wherein said tumor cells are solid tumor cells.~~

~~179. The method of any of claims 165-169, wherein said tumor cells are liver tumor cells.~~

~~180. The method of any of claims 165-169, wherein said tumor cells are lung tumor cells.~~

~~181. The method of any of claims 165-169, wherein said tumor cells are pancreatic tumor cells.~~

~~182. The method of any of claims 165-169, wherein said tumor cells are renal tumor cells.~~

~~183. The method of any of claims 165-169, wherein said tumor cells are glioblastoma multiforme (GBM) cells.~~

~~184. The method of any one of claims 165-183, wherein said natural killer cells are administered with an anti-CD33 antibody.~~

~~185. The method of any one of claims 165-183, wherein said natural killer cells are administered with an anti-CD20 antibody.~~

~~186. The method of any one of claims 165-183, wherein said natural killer cells are administered with an anti-CD138 antibody.~~

~~187. The method of any one of claims 165-183, wherein said natural killer cells are administered with an anti-CD32 antibody.~~

~~188. The method of any of claims 165-187, wherein said natural killer cells have been cryopreserved prior to said contacting or said administering.~~

~~189. The method of any of claims 165-187, wherein said natural killer cells have not been cryopreserved prior to said contacting or said administering.~~

~~190. A method of suppressing the proliferation of tumor cells comprising contacting the tumor cells with a plurality of ILC3 cells, wherein the ILC3 cells are produced by the method of any one of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~191. The method of claim 190, wherein said contacting takes place in vitro.~~

~~192. The method of claim 190, wherein said contacting takes place in vivo.~~

~~193. The method of claim 192, wherein said contacting takes place in a human individual.~~

~~194. The method of claim 192, wherein said method comprises administering said natural killer cells to said individual.~~

~~195. The method of any of claims 190-194, wherein said tumor cells are multiple myeloma cells.~~

~~196. The method of any of claims 190-194, wherein said tumor cells are acute myeloid leukemia (AML) cells.~~

~~197. The method of claim 196, wherein said individual has relapsed/refractory AML.~~

~~198. The method of claim 196, wherein said individual has AML that has failed at least one non-innate lymphoid cell (ILC) therapeutic against AML.~~

~~199. The method of claim 196, wherein said individual is 65 years old or greater, and is in first remission.~~

~~200. The method of any of claims 196-199, wherein said individual has been conditioned with fludarabine, cytarabine, or both prior to administering said ILC3 cells.~~

~~201. The method of any of claims 190-194, wherein said tumor cells are breast cancer cells, head and neck cancer cells, or sarcoma cells.~~

~~202. The method of any of claims 190-194, wherein said tumor cells are primary ductal carcinoma cells, leukemia cells, acute T-cell leukemia cells, chronic myeloid lymphoma (CML) cells, chronic myelogenous leukemia (CML) cells, lung carcinoma cells, colon adenocarcinoma cells, histiocytic lymphoma cells, colorectal carcinoma cells, colorectal adenocarcinoma cells, or retinoblastoma cells.~~

~~203. The method of any of claims 190-194, wherein said tumor cells are solid tumor cells.~~

~~204. The method of any of claims 190-194, wherein said tumor cells are liver tumor cells.~~

~~205. The method of any of claims 190-194, wherein said tumor cells are lung tumor cells.~~

~~206. The method of any of claims 190-194, wherein said tumor cells are pancreatic tumor cells.~~

~~207. The method of any of claims 190-194, wherein said tumor cells are renal tumor cells.~~

~~208. The method of any of claims 190-194, wherein said tumor cells are glioblastoma multiforme (GBM) cells.~~

~~209. The method of any one of claims 190-208, wherein said natural killer cells are administered with an anti-CD33 antibody.~~

~~210. The method of any one of claims 190-208, wherein said natural killer cells are administered with an anti-CD20 antibody.~~

~~211. The method of any one of claims 190-208, wherein said natural killer cells are administered with an anti-CD138 antibody.~~

~~212. The method of any one of claims 190-208, wherein said natural killer cells are administered with an anti-CD32 antibody.~~

~~213. The method of any of claims 190-212, wherein said ILC3 cells have been cryopreserved prior to said contacting or said administering.~~

~~214. The method of any of claims 190-212, wherein said ILC3 cells have not been cryopreserved prior to said contacting or said administering., A method of repairing the gastrointestinal tract after chemotherapy comprising administering to an individual a plurality of ILC3 cells, wherein the ILC3 cells are produced by the method of any one of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~215. A method of protecting an individual against radiation comprising administering to an individual a plurality of ILC3 cells, wherein the ILC3 cells are produced by the method of any one of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~216. The method of claim 210, wherein said ILC3 cells are used as an adjunct to bone marrow transplantation.~~

~~217. A method of reconstituting the thymus of an individual comprising administering to an individual a plurality of ILC3 cells, wherein the ILC3 cells are produced by the method of any one of claims 12-80, 84-115, 120-123, 132-135, and 141-145.~~

~~218. A population of natural killer cells that is CD56+CD3- CD117+CD11a+, wherein said natural killer cells express perforin and/or EOMES, and do not express one or more of RORγt, aryl hydrocarbon receptor, and IL1R1.~~

~~219. The population of claim 219, wherein said natural killer cells express perforin and EOMES, and do not express any of RORγt, aryl hydrocarbon receptor, or IL1R1.~~

~~220. The population of claim 219 or 220, wherein said natural killer cells additionally express T-bet, GZMB, NKp46, NKp30, and NKG2D.~~

221. The population of any one of claims 219-221, wherein said natural killer cells express CD94.

222. The population of any one of claims 219-221, wherein said natural killer cells do not express CD94.

223. A population of ILC3 cells that is CD56+CD3- CD117+CD11a-, wherein said ILC3 cells express one or more of RORγt, aryl hydrocarbon receptor, and IL1R1, and do not express one or more of CD94, perforin, and EOMES.

224. The population of claim 224, wherein said ILC3 cells express RORγt, aryl hydrocarbon receptor, and IL1R1, and do not express any of CD94, perforin, or EOMES.

225. The population of claim 224 or 225, wherein said ILC3 cells additionally express CD226 and/or 2B4.

226. The population of any one of claims 224-226, wherein said ILC3 cells additionally express one or more of IL-22, TNFα, and DNAM-1.

227. The population of any one of claims 224-227, wherein said ILC3 cells express CD226, 2B4, IL-22, TNFα, and DNAM-1.

228. A method of producing a cell population comprising natural killer cells and ILC3 cells, comprising the steps of:

(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;

(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells;

(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking each of a stem cell mobilizing agent and LMWH, to produce a third population of cells; and

(d) separating CD11a+ cells and CD11a- cells from the third population of cells; and

(e) combining the CD11a+ cells with the CD11a- cells in a ratio of 50:1, 40:1, 30:1, 20:1, 10:1, 5:1, 4:1, 3:1, 2:1, 1:1, 1:2, 1:3, 1:4, 1:5, 1:10, 1:20, 1:30, 1:40, or 1:50 to produce a fourth population of cells.

~~229. The method of claim 229, wherein said first medium and/or said second medium lack LIF nd/or MIP-1α.~~

~~230. The method of claim 229, wherein said third medium lacks LIF, MIP-1α, and Flt-3L.~~

~~231. The method of claim 229, wherein said first medium and said second medium lack LIF and MIP-1α, and said third medium lacks LIF, MIP-1α, and Flt3L.~~

~~232. The method of any of claims 229-232, wherein none of the first medium, second medium or third medium comprises a desulphated glycosaminoglycan.~~

~~233. The method of any of claims 229-232 wherein the first medium, second medium or third medium comprises heparin.~~

~~234. The method of claim 234, wherein said heparin is low molecular weight heparin (LMWH).~~

~~235. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 50:1.~~

~~236. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 20:1.~~

~~237. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 10:1.~~

~~238. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 5:1.~~

~~239. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 1:1.~~

~~240. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 1:5.~~

~~241. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 1:10.~~

~~242. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 1:20.~~

~~243. The fourth population of cells of claim 229, wherein the CD11a+ cells and CD11a- cells are combined in a ratio of 1:50.~~

1. A method of producing a cell population comprising natural killer cells and/or ILC3 cells, comprising the steps of:

(a) culturing hematopoietic stem or progenitor cells in a first medium comprising a stem cell mobilizing agent and thrombopoietin (Tpo) to produce a first population of cells;

(b) culturing the first population of cells in a second medium comprising a stem cell mobilizing agent and interleukin-15 (IL-15), and lacking Tpo, to produce a second population of cells; and

(c) culturing the second population of cells in a third medium comprising IL-2 and IL-15, and lacking low molecular weight heparin (LMWH), to produce a third population of cells;

wherein said method comprises culturing the hematopoietic stem cells in the first medium for 7-13 days; culturing said first population of cells in said second medium for 2-6 days; and culturing said second population of cells in said third medium for 10-30 days;

wherein:

(i) the method is a method of producing a cell population comprising natural killer cells, the third medium lacks a stem cell mobilizing agent, and the third population of cells comprises natural killer cells that are CD56+, CD3-, and wherein at least 80% of the natural killer cells are viable; or

(ii) wherein the method is a method of producing a cell population comprising ILC3 cells, the third medium lacks a stem cell mobilizing agent, and the method further comprises the step of:

(d) isolating CD11a- cells from the third population of cells to produce a fourth population of cells

wherein the fourth population of cells comprises ILC3 cells that are CD56+, CD3-, and CD11a-; or

(iii) wherein the method is a method of producing a cell population comprising natural killer cells and ILC3 cells, the third medium lacks a stem cell mobilizing agent, and the method further comprises the steps of:

(e) separating CD11a+ cells and CD11a- cells from the third population of cells; and

(f) combining the CD11a+ cells with the CD11a- cells in a ratio of 50:1, 40:1; 30:1, 20:1, 10:1, 5:1, 4:1, 3:1, 2:1, 1:1, 1:2, 1:3, 1:4, 1:5, 1:10, 1:20, 1:30, 1:40, or 1:50 to produce a fourth population of cells; wherein said stem cell mobilizing agent is an aryl hydrocarbon receptor inhibitor, wherein: said aryl hydrocarbon receptor inhibitor is StemRegenin-1 (SR-I) (4-(2-(2-(benzo[b]thiophen-3-yl)-9-isopropyl-9H-purin- 6ylamino)ethyl)phenol), or the compound CH223191 (l -Methyl-N-[2-methyl-4-[2-(2-methylphenyl)diazenyl]phenyl-1H-pyrazole-5-carboamide].

2. The method of claim 1(i), wherein said third population of cells comprises natural killer cells that are (i) CD94+ or CD16+, (ii)CD94- or CD16-, (iii) CD94+ and CD16+, or (iv) CD94- and CD16-.

3 The method of claim 1(ii), wherein: (i) said ILC3 cells express RORγt and IL1R1 and/or (ii) wherein said ILC3 cells do not express either perforin or EOMES.

4. The method of any one of claims 1-3, wherein said hematopoietic stem or progenitor cells are mammalian cells, preferably wherein said hematopoietic stem or progenitor cells are human cells.

5 The method of any one of claims 1-4, wherein said hematopoietic stem or progenitor cells are CD34+ hematopoietic stem cells.

6. The method of any one of claims 1-5, wherein said hematopoietic stem or progenitor cells are:

(i) placental cells, optionally wherein:

(a) said placental cells are obtained from, or obtainable from, human placental perfusate, or

(b) said placental cells are obtained from, or obtainable from, nucleated cells isolated from human placental perfusate; or

(ii) obtained from, or obtainable from, umbilical cord blood, or

(iii) fetal liver cells, or

(iv) mobilized peripheral blood cells, or

(v) bone marrow cells.

7. The method of any of claims 1-6, wherein said Tpo, IL-2, and IL-15 are not comprised within an undefined component of the first medium, second medium or third medium, or wherein said Tpo, IL-2, and IL-15 are not comprised within serum.

8 The method of any of claims 1-7, wherein said first or second medium additionally comprises one or more of LMWH, Flt-3 Ligand (Flt-3L), stem cell factor (SCF), IL-6, IL-7, granulocyte colony-stimulating factor (G-CSF), or granulocyte-macrophage-stimulating factor (GM-CSF).

9. The method of any of claims 1-8, wherein said first or second medium does not comprise LMWH, and/or wherein said first medium does not comprise a desulphated glycosaminoglycan.

10. The method of any of claims 1-9, wherein said third medium additionally comprises one or more of IL-6, IL-7, G-CSF, or GM-CSF

11. The method of any of claims 1-10, wherein:

(a) said method comprises culturing the hematopoietic stem cells in the first medium for 8-12 days, in particular for about 10 days; or

(b) said method comprises culturing said first population of cells in said second medium for 3-5 days, in particular for about 4 days; and/or

(c) said method comprises culturing said second population of cells in said third medium for 15-25 days, in particular for about 21 days; and/or

(d) said culturing in said first medium, second medium and third medium are all done under static culture conditions, or wherein said culturing in at least one of said first medium, second medium or third medium are done in a spinner flask, or wherein said culturing in said first medium and said second medium is done under static culture conditions, and said culturing in said third medium is done in a spinner flask; and/or

(e) said hematopoietic cells are initially inoculated into said first medium from 1×10^4 to 1×10^5 cells/mL, in particular wherein said hematopoietic cells are initially inoculated into said first medium at about 3×10^4 cells/mL; and/or

(f) said first population of cells are initially inoculated into said second medium from 5×10^4 to 5×10^5 cells/mL, in particular at about 1×10^5 cells/mL; and/or

(g) said second population of cells is initially inoculated into said third medium from 1×10^5 to 5×10^6 cells/mL, in particular from 1×10^5 to 1×10^6 cells/mL, in particular at about 5×10^5 cells/mL or about 3×10^5 cells/mL.

12. The method of claim 1(iii), wherein.

(a) said first medium and/or said second medium lack LIF and/or MIP- 1α, and/or

(b) said third medium lacks LIF, MIP-1α, and Flt-3L, and/or

(c) said first medium and said second medium lack LIF and MIP-1α, and said third medium lacks LIF, MIP-Iα, and Flt3L, and/or

(d) none of the first medium, second medium or third medium comprises a desulphated glycosaminoglycan, and/or

(e) the first medium, second medium or third medium comprises heparin, optionally wherein said heparin is low-molecular weight heparin (LMWH), and/or

(f) in the fourth population of cells, the CD11a+ cells and CD11a- cells are combined in a ratio of 50:1, 20:1, 10:1, 5:1, 1:1, 1:5, 1:10, 1:20, or 1:50