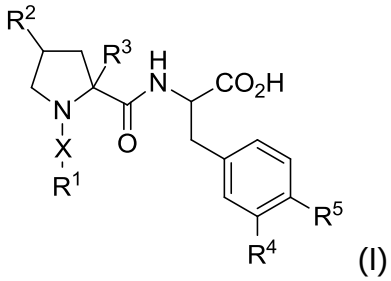
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A use of an effective amount of an antagonist of an α_9 integrin or an active portion thereof, preferably an $\alpha_9\beta_1$ integrin or an active portion thereof, more preferably in combination with an antagonist of α_4 integrin, more preferably an $\alpha_4\beta_1$ antagonist, or an active portion thereof and a CXCR4 antagonist or an active portion thereof for enhancing dislodgement and preferably release and/or mobilization of haematopoietic stem cells (HSC) and their precursors and progenitors thereof, preferably long term repopulating HSC and their precursors and progenitors and optionally selected from the group including $CD34^+$ cells, CD38+, CD90+, CD133+, $CD34^+CD38^-$ cells, lineage-committed $CD34^-$ cells, or $CD34^+CD38^+$ cells; optionally $CD34^+$ or $CD34^+CD38^-$ cells from a bone marrow (BM) stem cell binding ligand to a BM stem cell niche, and/or enhances release of HSC and their precursors and progenitors thereof from the BM stem cell niche, and/or enhances mobilization of the HSC from the BM stem cell niche *in vivo* or *ex vivo*, preferably in the absence of G-CSF.

2. A use according to claim 1 wherein the antagonist is a compound of Formula (I) or a pharmaceutically acceptable salt thereof having the following formula:



(I)

wherein

X is selected from the group consisting of a bond and $–SO_2–$;

R^1 is selected from the group consisting of H, alkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably R^1 is optionally substituted phenyl; or preferably the phenyl is optionally substituted with at least one halogen group; or preferably R^1 is optionally substituted pyridyl;

R^2 is selected from the group consisting of H and a substituent group;

R^3 is selected from the group consisting of H and C_1-C_4 alkyl;

R^4 is selected from the group consisting of H and –OR^6; preferably R^4 is H;

R^5 is selected from the group consisting of H and –OR^7; preferably R^5 is –OR^7;

provided that when R^4 is H then R^5 is –OR^7 and when R^4 is –OR^6 then R^5 is H;

R^6 is selected from the group consisting of H, C_1-C_4 alkyl, –$(CH_2)_n$-R^8, –$C(O)R^9$ and –$C(O)NR^{10}R^{11}$;

R^7 is selected from the group consisting of H, C_1-C_4 alkyl, –$(CH_2)_n$-R^{12}, –$C(O)R^{13}$ and –$C(O)NR^{14}R^{15}$; preferably R^7 is selected from C_1-C_4 alkyl, –$(CH_2)_n$-R^{12}, –$C(O)R^{13}$ and –$C(O)NR^{14}R^{15}$;

R^8 is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN;

R^9 is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl and optionally substituted heteroaryl;

R^{10} and R^{11}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring;

R^{12} is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN; preferably R^{12} is selected from the group consisting of C_1-C_4 alkyl, –CN, –O(C_1-C_4 alkyl) and optionally substituted heteroaryl; preferably 5-tetrazolyl;

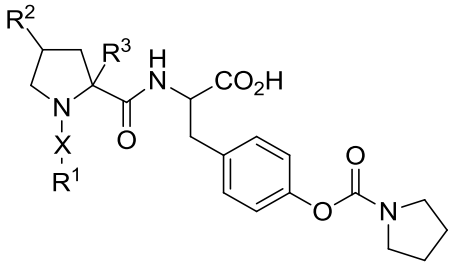
R^{13} is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably 2-pyrrolyl;

R^{14} and R^{15} are each independently selected from the group consisting of C_1-C_4 alkyl and optionally substituted aryl; preferably C_1–C_4 alkyl; or

R^{14} and R^{15}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring; preferably an optionally substituted pyrrolidinyl or morpholinyl ring; and

n at each occurrence is an integer in the range of from 1 to 3; preferably n is 1 or 2.

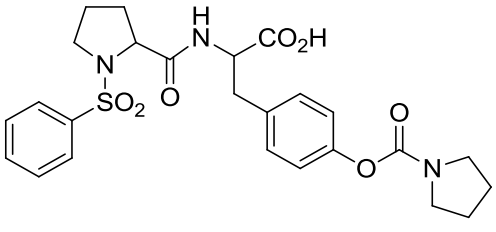
3. A use according to claim 2 wherein the compound of Formula (I) has the following Formula (Ia):



(Ia)

or a pharmaceutically acceptable salt thereof; or

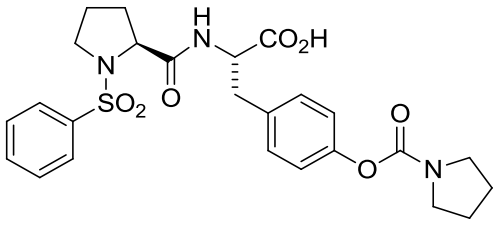
the compound of Formula (I) has the following Formula (Ib):



(Ib)

or a pharmaceutically acceptable salt thereof; or

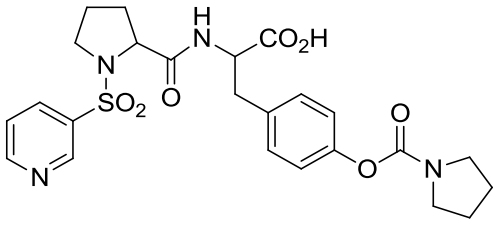
the compound of formula (I) has the following Formula (Ic):



(Ic)

or a pharmaceutically acceptable salt thereof; or

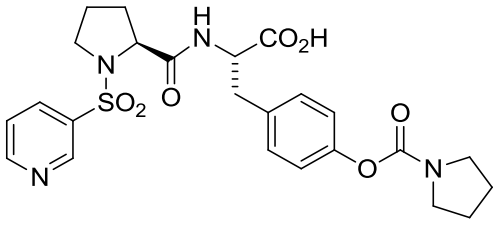
the compound of Formula (I) has the following Formula (Id):



(Id)

or a pharmaceutically acceptable salt thereof; or

the compound of formula (I) has the following Formula (Ie):



(Ie)

or a pharmaceutically acceptable salt thereof.

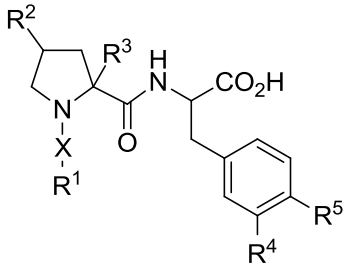
4. A use according to any one of claims 1 to 3 wherein the CXCR4 antagonist or an active portion thereof is selected from the group including bicyclam derivatives, tetrahydroquinoline derivatives, cyclic peptides, para-xylyl-enediamine-based derivatives, isothiourea derivatives and POL6326, POL5551, CCTE-9908 and TG-0054 and optionally, the CXCR4 antagonist is AMD3100.

5. A use according to any one of claims 1 to 4 wherein the antagonist of an α_9 integrin or an active portion thereof and the CXCR4 antagonist or an active portion thereof is administered in combination, simultaneously or sequentially.

6. A composition for enhancing dislodgement of HSC and their precursors and progenitors thereof, preferably long term repopulating HSC and their precursors and progenitors and optionally selected from the group including $CD34^+$ cells, CD38+, CD90+, CD133+, $CD34^+CD38^-$ cells, lineage-committed $CD34^-$ cells, or $CD34^+CD38^+$ cells; optionally $CD34^+$ or $CD34^+CD38^-$ cells from a BM stem cell binding ligand to a BM stem cell niche and/or enhances release of HSC and their precursors and

progenitors thereof from the BM stem cell niche, and/or enhances mobilization of the HSC from the BM stem cell niche, preferably in the absence of G-CSF, said composition comprising an antagonist of α_9 integrin, preferably $\alpha_9\beta_1$ integrin or an active portion thereof, more preferably in combination with an antagonist of α_4 integrin, preferably $\alpha_4\beta_1$ integrin or an active portion thereof, and a CXCR4 antagonist or an active portion thereof.

7. A composition according to claim 6 wherein the α_9 integrin antagonist is a compound of Formula (I) or a pharmaceutically acceptable salt thereof having the formula:



(I)

wherein

X is selected from the group consisting of a bond and $–SO_2–$;

R^1 is selected from the group consisting of H, alkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably R^1 is optionally substituted phenyl; or preferably the phenyl is optionally substituted with at least one halogen group; or preferably R^1 is optionally substituted pyridyl;

R^2 is selected from the group consisting of H and a substituent group;

R^3 is selected from the group consisting of H and C_1-C_4 alkyl;

R^4 is selected from the group consisting of H and $–OR^6$; preferably R^4 is H;

R^5 is selected from the group consisting of H and $–OR^7$; preferably R^5 is $–OR^7$;

provided that when R^4 is H then R^5 is $–OR^7$ and when R^4 is $–OR^6$ then R^5 is H;

R^6 is selected from the group consisting of H, C_1-C_4 alkyl, $–(CH_2)_n$-R^8, $–C(O)R^9$ and $–C(O)NR^{10}R^{11}$;

R^7 is selected from the group consisting of H, C_1-C_4 alkyl, $–(CH_2)_n$-R^{12}, $–C(O)R^{13}$ and $–C(O)NR^{14}R^{15}$; preferably R^7 is selected from C_1-C_4 alkyl, $–(CH_2)_n$-R^{12}, $–C(O)R^{13}$ and $–C(O)NR^{14}R^{15}$;

R^8 is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN;

R^9 is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl and optionally substituted heteroaryl;

R^{10} and R^{11}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring;

R^{12} is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN; preferably R^{12} is selected from the group consisting of C_1-C_4 alkyl, –CN, –O(C_1-C_4 alkyl) and optionally substituted heteroaryl; preferably 5-tetrazolyl;

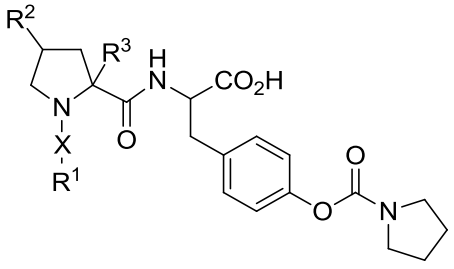
R^{13} is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably 2-pyrrolyl;

R^{14} and R^{15} are each independently selected from the group consisting of C_1-C_4 alkyl and optionally substituted aryl, preferably C_1–C_4 alkyl; or

R^{14} and R^{15}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring; preferably an optionally substituted pyrrolidinyl or morpholinyl ring; and

n at each occurrence is an integer in the range of from 1 to 3; preferably n is 1 or 2.

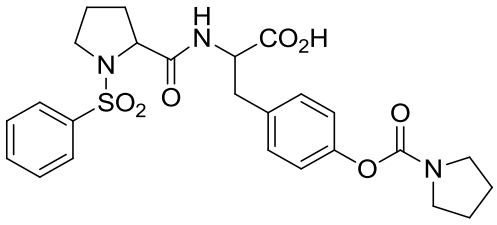
8. A composition according to claims 6 or 7 wherein the compound of Formula (I) has the following Formula (Ia):



(Ia)

or a pharmaceutically acceptable salt thereof; or

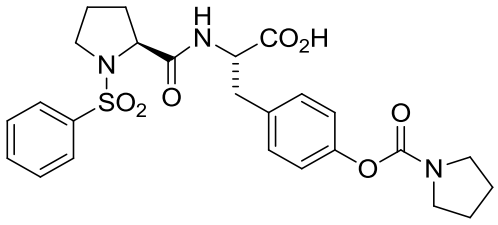
the compound of Formula (I) has the following Formula (Ib):



(Ib)

or a pharmaceutically acceptable salt thereof; or

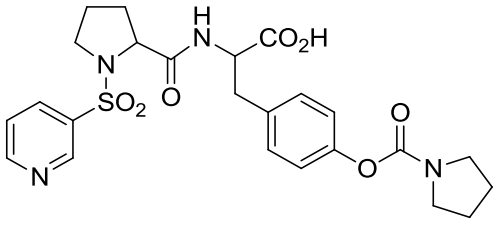
the compound of formula (I) has the following Formula (Ic):



(Ic)

or a pharmaceutically acceptable salt thereof; or

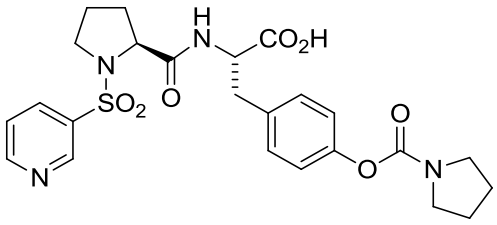
the compound of Formula (I) has the following Formula (Id):



(Id)

or a pharmaceutically acceptable salt thereof; or

the compound of formula (I) has the following Formula (Ie):

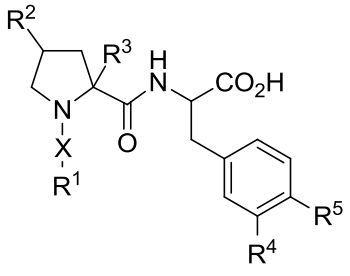


(Ie)

or a pharmaceutically acceptable salt thereof.

9. A use of an effective amount of an antagonist of an α_9 integrin or an active portion thereof, preferably an $\alpha_9\beta_1$ integrin or an active portion thereof, more preferably in combination with an antagonist of α4 integrin, more preferably $\alpha4\beta_1$ integrin or an active portion thereof, and a CXCR4 antagonist or an active portion thereof, preferably in the absence of G-CSF for harvesting HSC from a subject wherein said effective amount enhances dislodgement of HSC and their precursors and progenitors thereof from a BM stem cell binding ligand in a BM stem cell niche prior to harvesting the HSC.

10. A use according to claim 9 wherein the α_9 antagonist is a compound of Formula (I) or a pharmaceutically acceptable salt thereof having the formula:



(I)

wherein

X is selected from the group consisting of a bond and $–SO_2–$;

R^1 is selected from the group consisting of H, alkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably R^1 is optionally substituted phenyl; or preferably the phenyl is optionally substituted with at least one halogen group; or preferably R^1 is optionally substituted pyridyl;

R^2 is selected from the group consisting of H and a substituent group;

R^3 is selected from the group consisting of H and C_1-C_4 alkyl;

R^4 is selected from the group consisting of H and $–OR^6$; preferably R^4 is H;

R^5 is selected from the group consisting of H and $–OR^7$; preferably R^5 is $–OR^7$;

provided that when R^4 is H then R^5 is $–OR^7$ and when R^4 is $–OR^6$ then R^5 is H;

R^6 is selected from the group consisting of H, C_1-C_4 alkyl, $–(CH_2)_n$-R^8, $–C(O)R^9$ and $–C(O)NR^{10}R^{11}$;

R^7 is selected from the group consisting of H, C_1-C_4 alkyl, $–(CH_2)_n$-R^{12}, $–C(O)R^{13}$ and $–C(O)NR^{14}R^{15}$; preferably R^7 is selected from C_1-C_4 alkyl, $–(CH_2)_n$-R^{12}, $–C(O)R^{13}$ and $–C(O)NR^{14}R^{15}$;

R^8 is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, $–O(C_1$-C_4 alkyl), $–C(O)$-$(C_1$-C_4 alkyl), $–C(O)O$-$(C_1$-C_4 alkyl) and –CN;

R^9 is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl and optionally substituted heteroaryl;

R^{10} and R^{11}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring;

R^{12} is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, $–O(C_1$-C_4 alkyl), $–C(O)$-$(C_1$-C_4 alkyl), $–C(O)O$-$(C_1$-C_4 alkyl) and –CN; preferably R^{12} is selected from the group consisting of C_1-C_4 alkyl, –CN, $–O(C_1$-C_4 alkyl) and optionally substituted heteroaryl; preferably 5-tetrazolyl;

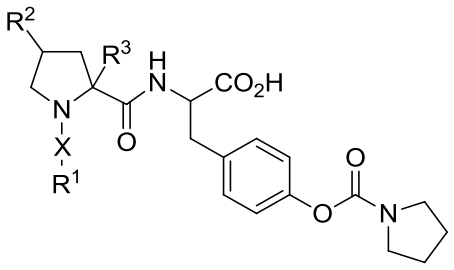
R^{13} is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably 2-pyrrolyl;

R^{14} and R^{15} are each independently selected from the group consisting of C_1-C_4 alkyl and optionally substituted aryl; preferably C_1–C_4 alkyl; or

R^{14} and R^{15}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring; preferably an optionally substituted pyrrolidinyl or morpholinyl ring; and

n at each occurrence is an integer in the range of from 1 to 3; preferably n is 1 or 2.

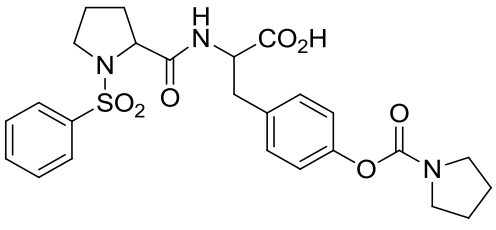
11. A use according to claim 9 or 10 wherein the compound of Formula (I) has the following Formula (Ia):



(Ia)

or a pharmaceutically acceptable salt thereof; or

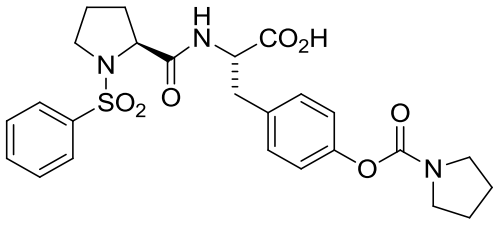
the compound of Formula (I) has the following Formula (Ib):



(Ib)

or a pharmaceutically acceptable salt thereof; or

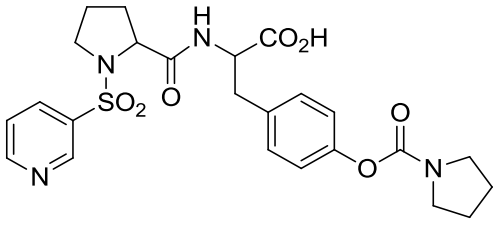
the compound of formula (I) has the following Formula (Ic):



(Ic)

or a pharmaceutically acceptable salt thereof; or

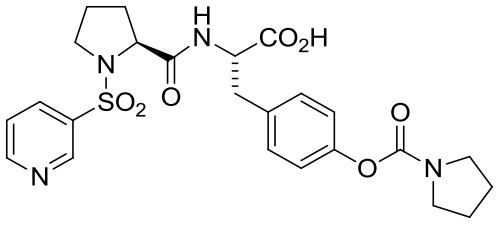
the compound of Formula (I) has the following Formula (Id):



(Id)

or a pharmaceutically acceptable salt thereof; or

the compound of formula (I) has the following Formula (Ie):



(Ie)

or a pharmaceutically acceptable salt thereof.

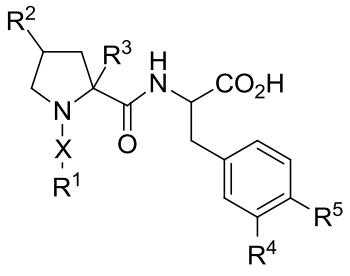
12. A use according to any one of claims 9 to 11 wherein the CXCR4 antagonist or an active portion thereof is selected from the group including bicyclam derivatives, tetrahydroquinoline derivatives, cyclic peptides, para-xylyl-enediamine-based derivatives, isothiourea derivatives and POL6326, POL5551, CCTE-9908 and TG-0054 and optionally, the CXCR4 antagonist is AMD3100.

13. A use according to any one of claims 1 to 5 or 9 to 12 wherein the HSC/HPC are further mobilized by the use of other HSC mobilizing agents selected from the group comprising interleukin-17, cyclophosphamide (Cy), Docetaxel and granulocyte-colony stimulating factor (G-CSF).

14. A use of an effective amount of an antagonist of an α_9 integrin, preferably an $\alpha_9\beta_1$ integrin or an active portion thereof, more preferably in combination with an antagonist of α4 integrin, preferably $\alpha4\beta_1$ integrin or an active portion thereof, and a CXCR4 antagonist or an active portion thereof, preferably in the absence of G-CSF, in the preparation of a medicament for the treatment of haematological disorders, preferably wherein the haematological disorder is selected from the group including immunosuppression, chronic illness, traumatic injury, degenerative disease, infection,

or combinations thereof; a disease or condition of the skin, digestive system, nervous system, lymph system, cardiovascular system, endocrine system, or combinations thereof; osteoporosis, Alzheimer's disease, cardiac infarction, Parkinson's disease, traumatic brain injury, multiple sclerosis, cirrhosis of the liver, or combinations thereof; neuroblastoma, myelodysplasia, myelofibrosis, breast cancer, renal cell carcinoma, or multiple myeloma; haematopoietic neoplastic disorder; autoimmune disease; or non-malignant disorder, preferably the haematological disorder is acute lymphoblastic leukemia (ALL) selected form the group including B-lineage ALL and T-lineage ALL, chronic lymphocytic leukemia (CLL), prolymphocytic leukemia (PLL), hairy cell leukemia (HLL) and Waldenstrom's macroglobulinemia (WM).

15. A use according to claim 14 wherein the α_9 antagonist is a compound of Formula (I) or a pharmaceutically acceptable salt thereof having the formula:



(I)

wherein

X is selected from the group consisting of a bond and $–SO_2–$;

R^1 is selected from the group consisting of H, alkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably R^1 is optionally substituted phenyl; or preferably the phenyl is optionally substituted with at least one halogen group; or preferably R^1 is optionally substituted pyridyl;

R^2 is selected from the group consisting of H and a substituent group;

R^3 is selected from the group consisting of H and C_1-C_4 alkyl;

R^4 is selected from the group consisting of H and $–OR^6$; preferably R^4 is H;

R^5 is selected from the group consisting of H and $–OR^7$; preferably R^5 is $–OR^7$;

provided that when R^4 is H then R^5 is $–OR^7$ and when R^4 is $–OR^6$ then R^5 is H;

R^6 is selected from the group consisting of H, C_1-C_4 alkyl, $–(CH_2)_n$-R^8, $–C(O)R^9$ and $–C(O)NR^{10}R^{11}$;

R^7 is selected from the group consisting of H, C_1-C_4 alkyl, –$(CH_2)_n$-R^{12}, –C(O)R^{13} and –C(O)N$R^{14}R^{15}$; preferably R^7 is selected from C_1-C_4 alkyl, –$(CH_2)_n$-R^{12}, –C(O)R^{13} and –C(O)N$R^{14}R^{15}$;

R^8 is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN;

R^9 is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted heterocycloalkyl, optionally substituted aryl and optionally substituted heteroaryl;

R^{10} and R^{11}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring;

R^{12} is selected from the group consisting of optionally substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, –O(C_1-C_4 alkyl), –C(O)-(C_1-C_4 alkyl), –C(O)O-(C_1-C_4 alkyl) and –CN; preferably R^{12} is selected from the group consisting of C_1-C_4 alkyl, –CN, –O(C_1-C_4 alkyl) and optionally substituted heteroaryl; preferably 5-tetrazolyl;

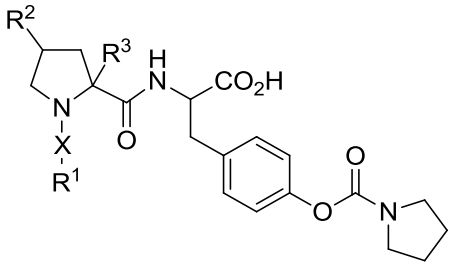
R^{13} is selected from the group consisting of optionally substituted cycloalkyl, optionally substituted aryl and optionally substituted heteroaryl; preferably 2-pyrrolyl;

R^{14} and R^{15} are each independently selected from the group consisting of C_1-C_4 alkyl and optionally substituted aryl; preferably C_1–C_4 alkyl; or

R^{14} and R^{15}, together with the nitrogen to which they are attached, form an optionally substituted heterocycloalkyl ring; preferably an optionally substituted pyrrolidinyl or morpholinyl ring; and

n at each occurrence is an integer in the range of from 1 to 3; preferably n is 1 or 2.

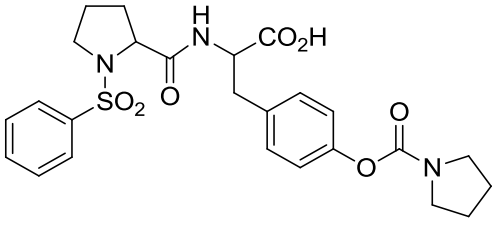
16. A use according to claim 15 wherein the compound of Formula (I) has the following Formula (Ia):



(Ia)

or a pharmaceutically acceptable salt thereof; or

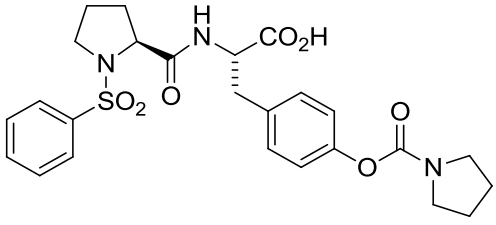
the compound of Formula (I) has the following Formula (Ib):



(Ib)

or a pharmaceutically acceptable salt thereof; or

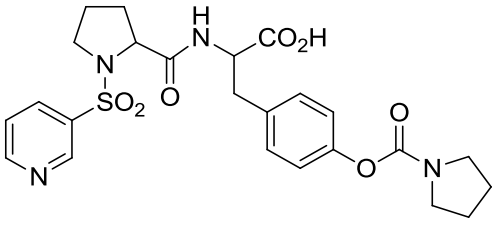
the compound of formula (I) has the following Formula (Ic):



(Ic)

or a pharmaceutically acceptable salt thereof; or

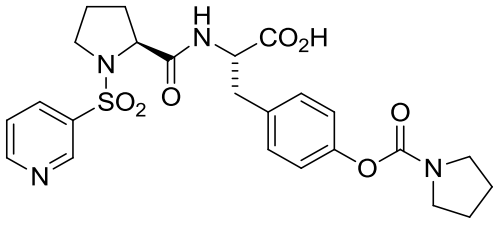
the compound of Formula (I) has the following Formula (Id):



(Id)

or a pharmaceutically acceptable salt thereof; or

the compound of formula (I) has the following Formula (Ie):



(Ie)

or a pharmaceutically acceptable salt thereof.

17. A use according to any one of claims 14 to 16 wherein the CXCR4 antagonist or an active portion thereof is selected from the group including bicyclam derivatives, tetrahydroquinoline derivatives, cyclic peptides, para-xylyl-enediamine-based derivatives, isothiourea derivatives and POL6326, POL5551, CCTE-9908 and TG-0054 and optionally, the CXCR4 antagonist is AMD3100.

18. A use according to any one of claims 14 to 17 further including transplanting HSC, preferably long term repopulating HSC/HPC and optionally selected from the group including $CD34^+$ cells, CD38+, CD90+, CD133+, $CD34^+CD38^-$ cells, lineage-committed $CD34^-$ cells, or $CD34^+CD38^+$ cells; optionally $CD34^+$ or $CD34^+CD38^-$ cells, into a patient, said method comprising

administering an α_9 integrin antagonist and a CXCR4 antagonist or an active portion thereof to a subject to dislodge HSC from a BM stem cell binding ligand;

releasing and mobilizing the HSC from the BM to the PB;

harvesting HSC from the subject; and

transplanting the HSC to the patient for the treatment of the haematological disorder.