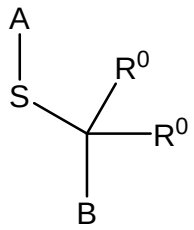
WHAT IS CLAIMED IS:

1. A compound ~~having a structure~~ according to formula I:

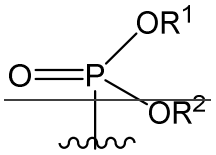


formula I;

or a pharmaceutically acceptable salt~~, solvate, hydrate,~~ or ~~polymorph~~ stereoisomer thereof, ~~or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt,~~ wherein:~~;~~

each R^0 is independently hydrogen~~,~~ or (C1-C3)alkyl;~~, or SH;~~

A is Hselected from hydrogen; and~~, Moiety A^1, Moiety A^2 or Moiety A^3:~~



Moiety A^1 ;

~~wherein each of R^1 and R^2 is independently selected from the group consisting of hydrogen, $(CH(R^6))$ O C(O)R^{10}, $(CH(R^6))_m$ S C(O)R^{10} and CH_2 $(C(R^{11})_2)$ C(O) CH_2 S C(O)R^{10};~~

~~wherein m is an integer selected from the group consisting of 0, 1, 2, 3, and 4;~~

~~or R^1 and R^2, one of which is CH_2 or the other of which is CH_2CH_2, taken with the O P O linkage to which they are attached form a 6-membered heterocycloalkyl ring that is independently substituted with 1-2 R^a and 0-3 R^b;~~

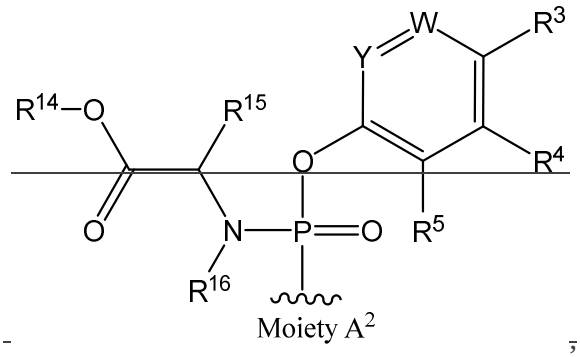
wherein each R^a is independently hydrogen, (C1-C6)alkyl, (C6-C10)aryl- or a 5- to 10-membered heteroaryl-, wherein said alkyl, aryl and heteroaryl is substituted with 0-3 R^e; provided that at least one R^a group is (C6-C10)aryl- or a 5- to 10-membered heteroaryl-;

wherein when present, each R^b is -(C1-C3)alkyl;

wherein when present each R^e is independently selected from the group consisting of halogen, (C1-C3)alkyl, -CN, -O-(C1-C3)alkyl, -S-(C1-C3)alkyl, -C(O)O-(C1-C3)alkyl, -$N(R')_2$, $-CF_3$ and $-OCF_3$;

wherein each R^6 is independently hydrogen or (C1-C3)alkyl;wherein each R^{10} is selected from the group consisting of -(C1-C6)alkyl, -O-(C1-C6)alkyl, -O-(C6-C10)aryl, -(C6-C10)aryl, (5- to 10-membered)heteroaryl, (4- to 10-membered)heterocycloalkyl, (C3-C10)cycloalkyl, -O-(5- to 10-membered)heteroaryl, -O-(4- to 10-membered)heterocycloalkyl, -O-(C3-C10)cycloalkyl, -O-(4- to 20-membered)heteroalkyl, -(4- to 20-membered)heteroalkyl, $-[(CH_2)_yO]_z$-R, $-CH_2$-O-$[(CH_2)_yO]_z$-R and -O-$[(CH_2)_yO]_z$-R, wherein each of said heteroalkyl, heterocycloalkyl and heteroaryl independently have 1-6 oxygen atoms, wherein y is an integer between 1 and 4, wherein z is an integer between 1 and 10, wherein R is hydrogen or (C1-C6)alkyl, and wherein each R^{10} is independently substituted with 0-3 R^e;

each R^{11} is independently selected from the group consisting of hydrogen, -(C1-C6)alkyl, $-CH_2$-O-C(O)R'', -C(O)-OR'', -(4- to 20-membered)heteroalkyl, -O-(4- to 20-membered)heteroalkyl, $-[(CH_2)_yO]_z$-R, $-CH_2$-O-$[(CH_2)_yO]_z$-R and -O-$[(CH_2)_yO]_z$-R, wherein each of said heteroalkyl independently has 1-6 oxygen atoms, wherein y is an integer between 1 and 4, wherein z is an integer between 1 and 10, and wherein R is hydrogen or (C1-C6)alkyl;



wherein W and Y are independently selected from N or CH;

wherein R^3 is hydrogen, halogen, (C1-C6)alkyl, (C3-C7)cycloalkyl, (5- to 8-membered)heterocycloalkyl, -O-(C1-C6)alkyl, -O-(C3-C7)cycloalkyl, -O-(5- to 8-membered)heterocycloalkyl, (C2-C6)alkenyl, $-CH_2OH$, phenyl, (5- to 6-membered)heteroaryl, or (5- to 6-membered)heterocycloalkyl, wherein R^3 is substituted with 0-3 substituents selected from the group consisting of halogen, oxo, cyano, -(C1-C6)alkyl, -O-(C1-C6)alkyl, and -C(O)O(C1-C3)alkyl;

wherein R^4 is hydrogen, -CN, (C1-C6)alkyl, -O-(C1-C6)alkyl, -(C2-C6)alkenyl or $-CH_2OH$; or R^4 and R^3 are taken together with the carbon atoms to which they are attached to form a (C5-C6)cycloalkyl, (C6-C10)aryl, (5- to 10-membered)heterocycloalkyl or (5- to 10-membered)heteroaryl;

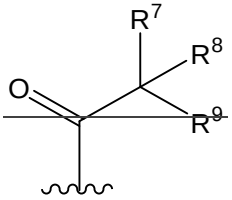
wherein R^5 is hydrogen, halogen, (C1-C6)alkyl or -O-(C1-C6)alkyl; or R^5 and R^4 are taken together with the carbon atoms to which they are attached to form a (C5-C6)cycloalkyl, phenyl, (5- or 6-membered)heterocycloalkyl, or (5- or 6-membered)heteroaryl;

wherein R^{14} is -(C1-C6)alkyl;

wherein R^{15} is hydrogen, -(C1-C6)alkyl, $-CH_2$-phenyl, or $-CH_2$-(5-to 10-membered)heteroaryl, wherein the -(C1-C6)alkyl, $-CH_2$-phenyl, or $-CH_2$-(5-to 10-

~~membered)heteroaryl are substituted with 0-3 substituents selected from the group consisting of –OH, –SH, –SCH_3, –$C(O)NH_2$, –C(O)OH, –NH_2 and –NH–$C(=NH)NH_2$;~~

~~R^{16} is hydrogen or –(C1-C6)alkyl;~~



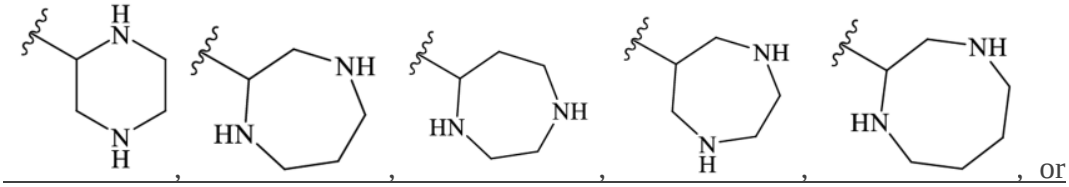
Moiety A^3 ,

~~wherein R^7 is selected from the group consisting of –(C1-C3)alkyl, –(C3-C6)cycloalkyl, and –(4- to 6-membered)heterocycloalkyl, wherein R^7 is substituted with 0-3 R'';~~

~~wherein R^8 and R^9 are independently selected from the group consisting of hydrogen, –(C1-C3)alkyl, –(C3-C6)cycloalkyl, and –(4- to 6-membered)heterocycloalkyl, wherein R^8 and R^9 are independently substituted with 0-3 R'';~~

~~wherein R'' is hydrogen, halogen, –(C1-C6)alkyl, –O–(C2-C6)alkyl, or –(4- to 20-membered)heteroalkyl, wherein said heteroalkyl has 1-6 oxygen atoms;~~

~~wherein~~ B is:



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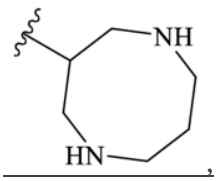

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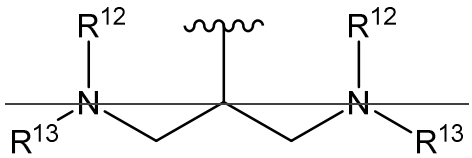
wherein the piperazin-2-yl is substituted with 1, 2, or 3 substituents independently selected from the group consisting of (C2-C4)alkyl, (C2-C4)alkenyl, (C2-C4)alkynyl, (C1-

C4)acyl, ~~a (6- to 8-membered)heterocycloalkyl containing two N atoms, Moiety B[1], or Moiety B[2], wherein B is substituted with a (C1-C4)alkyl,~~ cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, aryl, and heteroaryl;

wherein the 1,4-diazepan-2-yl, 1,4-diazepan-5-yl, 1,4-diazepan-6-yl, 1,4-diazocan-2-yl, or 1,5-diazocan-3-yl is optionally substituted with 1, 2, or 3 substituents independently selected from the group consisting of ~~so as to form a bicyclic ring, and/or substituted with 0-3~~ (C1-C4)alkyl, (C2-C4)alkenyl, (C2-C4)alkynyl, (C1-C4)acyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, aryl, and heteroaryl; and~~, (C1-C6)aryl, (C5 to C6)heteroaryl, (C1-C4)acyl, (C1-C4)alkenyl and (C1-C4)alkynyl,~~

wherein ~~the~~ each (C1-C4)alkyl, (C2-C4)alkyl, (C~~1~~2-C4)alkenyl, and (C~~1~~2-C4)alkynyl ~~are~~ substituent is optionally and independently substituted with 1, 2, or~~-~~ 3 substituents independently selected from the group consisting of halogen, ~~or~~ O(C1-C4)alkyl~~oxy~~, and SH.~~;~~

~~wherein Moiety B[1] has the structure:~~



Moiety B[1]

~~,~~

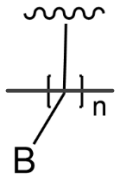
~~wherein each occurrence of R[12] and R[13] is independently selected from the group consisting of hydrogen, (C1-C10)alkyl, (C3-C10)cycloalkyl, (4- to 10-membered)heteroaryl, and (4- to 10-membered)heterocycloalkyl, wherein each of R[12] and R[13] is independently substituted with 0-3 R'; or~~

~~wherein two R[13] groups taken with the nitrogen atoms to which they are attached combine to form a (7- to 8-membered)heterocycloalkyl, wherein the (7- to 8-membered)heterocycloalkyl is substituted with a (C1-C4)alkyl, cyclopropyl, cyclobutyl,~~

~~cyclopentyl, cyclohexyl, so as to form a bicyclic ring, and/or substituted with 0-3 (C1-C4)alkyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, heteroaryl, (C1-C6)aryl, (C5 to C6)heteroaryl, (C1-C4)acyl, (C1-C4)alkenyl and (C1-C4)alkynyl, wherein the (C1-C4)alkyl, (C1-C4)alkenyl and (C1-C4)alkynyl are optionally substituted with 1-3 halogen or (C1-C4)alkoxy;~~

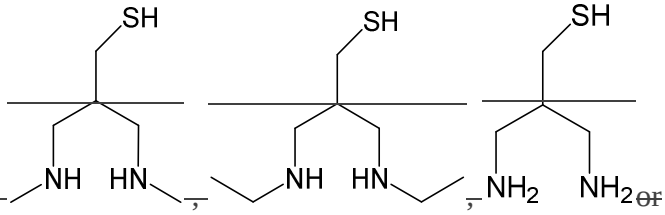
~~wherein R^{2} is selected from hydrogen, halogen, (C1-C4)alkyl, or -O-(C1-C4)alkyl; and~~

~~wherein Moiety B^{2} has the structure:~~

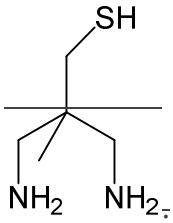


~~Moiety B^{2}~~

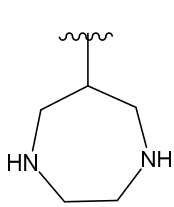
~~wherein n is an integer selected from the group consisting of 1, 2, 3, and 4; and~~

~~provided that the compound is not~~ 

~~or~~



2. The compound according to claim 1, or a pharmaceutically acceptable salt or stereoisomer~~, solvate, hydrate, or polymorph~~ thereof, ~~or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt,~~ wherein B is: ~~a heterocycle selected from the group consisting of~~



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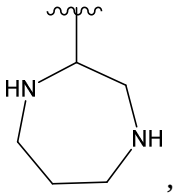

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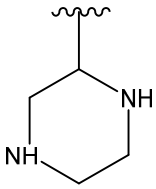

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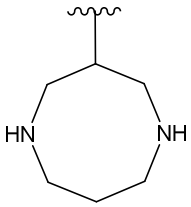
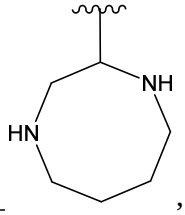


, ~~and~~ or


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wherein the piperazin-2-yl is substituted with 1, 2, or 3 substituents independently selected from the group consisting of~~B is optionally substituted with a~~ (C~~1~~2-C4)alkyl, (C2-C4)alkenyl, (C2-C4)alkynyl, (C1-C4)acyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, aryl, and heteroaryl; ~~so as to form a bicyclic ring, and/or~~

wherein the 1,4-diazepan-2-yl, 1,4-diazepan-6-yl, 1,4-diazocan-2-yl, or 1,5-diazocan-3-yl is optionally substituted with ~~0~~ 1, 2, or 3 substituents independently selected from the group consisting of (C1-C4)alkyl, (C2-C4)alkenyl, (C2-C4)alkynyl, (C1-C4)acyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, aryl, and heteroaryl; and~~,~~ ~~(C1-C6)aryl, (C5 to C6)heteroaryl, (C1-C4)acyl, (C1-C4)alkenyl and (C1-C4)alkynyl,~~

wherein ~~the~~each (C1-C4)alkyl, (C2-C4)alkyl, (C~~1~~2-C4)alkenyl and (C~~1~~2-C4)alkynyl ~~are~~ substituent is optionally and independently substituted with 1, 2, or ~~-~~ 3 substituents independently selected from the group consisting of halogen, ~~or~~ O(C1-C4)alkyl~~oxy~~, and SH.

3. A pharmaceutical composition comprising the compound according to claim 1, or a pharmaceutically acceptable salt or stereoisomer thereof, and a pharmaceutically acceptable carrier.

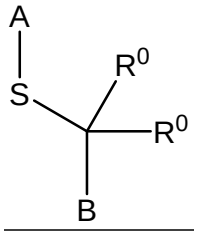
4. The pharmaceutical composition according to claim 3, wherein the pharmaceutical composition is formulated for oral administration.

5. The pharmaceutical composition according to claim 3, wherein the pharmaceutical composition is for parenteral administration.

6. The pharmaceutical composition according to claim 5, wherein the parenteral administration is subcutaneous, intravenous, intramuscular, or intrathecal.

7. The pharmaceutical composition according to claim 3, wherein the pharmaceutical composition further comprises an antioxidant.

8. A compound according to formula I:



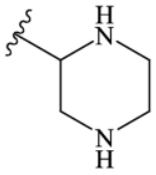
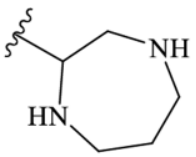
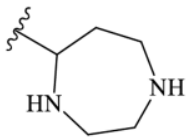
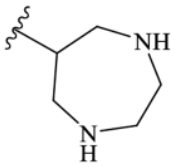
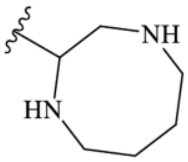
formula I;

or a pharmaceutically acceptable salt or stereoisomer thereof, wherein:

each R^0 is independently hydrogen or (C1-C3)alkyl;

A is H; and

B is: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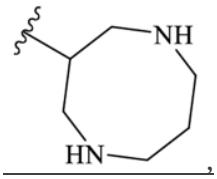
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wherein the piperazin-2-yl, 1,4-diazepan-2-yl, 1,4-diazepan-5-yl, 1,4-diazepan-6-yl, 1,4-diazocan-2-yl, or 1,5-diazocan-3-yl is optionally substituted with 1, 2, or 3 substituents independently selected from the group consisting of (C1-C4)alkyl, (C2-C4)alkenyl, (C2-C4)alkynyl, (C1-C4)acyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, aryl, and heteroaryl; and

wherein each (C1-C4)alkyl, (C2-C4)alkenyl, and (C2-C4)alkynyl substituent is optionally and independently substituted with 1, 2, or 3 substituents independently selected from the group consisting of halogen, O(C1-C4)alkyl, and SH.

9. A pharmaceutical composition comprising the compound according to claim 8, or a pharmaceutically acceptable salt or stereoisomer thereof, and a pharmaceutically acceptable carrier.

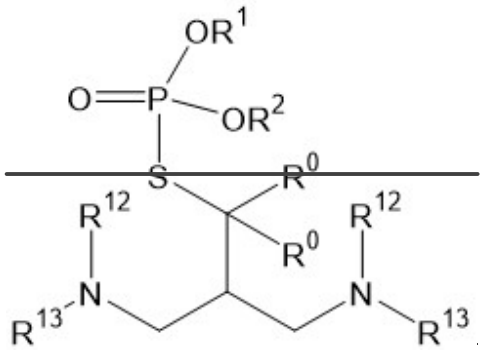
10. The pharmaceutical composition according to claim 9, wherein the pharmaceutical composition is formulated for oral administration.

11. The pharmaceutical composition according to claim 9, wherein the pharmaceutical composition is formulated for parenteral administration.

12. The pharmaceutical composition according to claim 11, wherein the parenteral administration is subcutaneous, intravenous, intramuscular, or intrathecal.

13. The pharmaceutical composition according to claim 9, wherein the pharmaceutical composition further comprises an antioxidant.

~~3. The compound according to claim 1, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein the compound has a structure according to formula II:~~



~~formula II~~

~~or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt.~~

~~4. The compound according to claim 3, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:~~

~~each R^0 is hydrogen;~~

wherein each of R^1 and R^2 is independently hydrogen or -$(CH(R^6))$-O-C(O)R^{10};

wherein each R^6 is independently hydrogen or (C1-C3)alkyl; and

wherein each R^{10} is independently selected from the group consisting of -(C1-C6)alkyl, -O-(C1-C6)alkyl, -(C6-C10)aryl, -(4- to 20-membered)heteroalkyl, -O-(4- to 20-membered)heteroalkyl, -$[(CH_2)_yO]_z$-R, -CH_2-O-$[(CH_2)_yO]_z$-R and -O-$[(CH_2)_yO]_z$-R, wherein each of said heteroalkyl independently has 1-6 oxygen atoms, wherein y is an integer between 1 and 4, wherein z is an integer between 1 and 10, wherein R is hydrogen or (C1-C6)alkyl, and wherein each R^{10} is independently substituted with 0-3 R^e groups;

wherein R^e is selected from the group consisting of halogen, (C1-C3)alkyl, -CN, -O-(C1-C3)alkyl, -S-(C1-C3)alkyl, and -O-C(O)(C1-C3)alkyl;

wherein each R^{12} is hydrogen; and

wherein each R^{13} is (C1-C3)alkyl.

5. The compound according to claim 3, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

each R^0 is hydrogen;

wherein each of R^1 and R^2 is independently hydrogen, -$(CH(R^6))_m$-S-C(O)R^{10} or -CH_2-$(C(R^{11})_2)$-C(O)-CH_2-S-C(O)R^{10};

wherein each R^{12} is hydrogen;

wherein each R^{13} is a (C1-C3)alkyl;

wherein each R^6 is hydrogen;

wherein R^{10} is selected from the group consisting of (C1-C6)alkyl, and (C6-C10)aryl, wherein each R^{10} is substituted with 0-3 R^e;

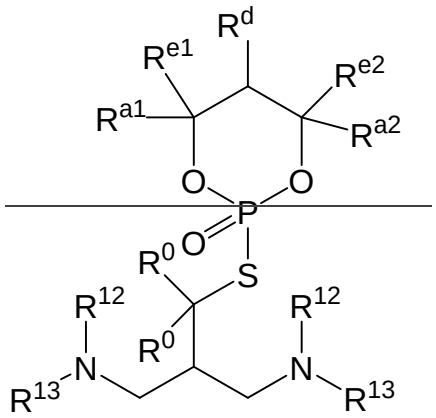
each R^{11} is independently selected from the group consisting of hydrogen, -(C1-C6)alkyl, -CH_2-O-C(O)R'' and -C(O)-OR'';

each R^e is (C1-C3)alkyl or -C(O)O-(C1-C3)alkyl;

R'' is hydrogen, (C1-C6)alkyl, or -(4- to 20-membered)heteroalkyl, wherein said heteroalkyl has 1-6 oxygen atoms; and

m is an integer selected from the group consisting of 0, 1, 2, 3 and 4.

6. The compound according to claim 1, wherein the compound has a structure according to formula III:



formula III,

or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

R^{a1} and R^{a2} are independently selected from hydrogen, (C1-C6)alkyl, (C6-C10)aryl or a 5- to 10-membered heteroaryl, wherein said alkyl, aryl and heteroaryl are substituted with 0-3 R^e, provided that at least one of R^{a1} and R^{a2} is (C6-C10)aryl or a 5- to 10-membered heteroaryl;

wherein each R^e is independently selected from the group consisting of halogen, (C1-C3)alkyl, -CN, -O-(C1-C3)alkyl, -S-(C1-C3)alkyl, -C(O)O-(C1-C3)alkyl, -N(R')$_2$, -CF_3 and -OCF_3;

wherein R^d is hydrogen or (C1-C3)alkyl; and

wherein R^{e1} and R^{e2} are independently hydrogen or (C1-C3)alkyl, provided that when R^{a1} is (C6-C10)aryl or a 5- to 10-membered heteroaryl, R^{e1} is hydrogen, and that when R^{a2} is (C6-C10)aryl or a 5- to 10-membered heteroaryl, R^{e2} is hydrogen.

7. The compound according to claim 6, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt wherein:

each R^0 is independently hydrogen;

wherein each R^{12} and R^{13} is independently selected from the group consisting of hydrogen, -(C1-C3)alkyl, -(C3-C10)cycloalkyl, -(4- to 10-membered)heteroaryl, and -(4- to 10-membered)heterocycloalkyl, wherein each of R^{12} and R^{13} is independently substituted with 0-3 R';

wherein R^{a1} and R^{a2} is independently hydrogen, (C1-C6)alkyl, (C6-C10)aryl or a 5- to 10-membered heteroaryl, wherein said alkyl, aryl and heteroaryl are substituted with 0-3 R^e, provided that at least one of R^{a1} and R^{a2} is (C6-C10)aryl or a 5- to 10-membered heteroaryl;

wherein R^e is selected from the group consisting of hydrogen, halogen, (C1-C3)alkyl, -CN, -O-(C1-C3)alkyl, -S-(C1-C3)alkyl, -C(O)O-(C1-C3)alkyl, -N(R')$_2$, -CF_3 and -OCF_3;

wherein R^d is hydrogen or (C1-C3)alkyl;

~~wherein R^{e1} and R^{e2} are independently hydrogen or (C1-C3)alkyl, provided that when R^{a1} is (C6-C10)aryl or a 5- to 10-membered heteroaryl, R^{e1} is hydrogen, and that when R^{a2} is (C6-C10)aryl or a 5- to 10-membered heteroaryl, R^{e2} is hydrogen; and~~

~~wherein R' is hydrogen or (C1-C4)alkyl.~~

~~8. The compound according to claim 7, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:~~

~~each R^0 is hydrogen;~~

~~wherein each R^{12} is hydrogen;~~

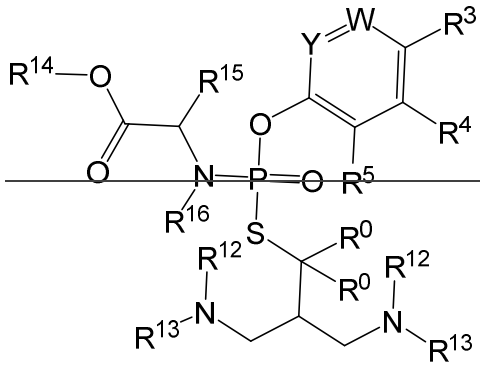
~~wherein each R^{13} is (C1-C3)alkyl;~~

~~wherein one of R^{a1} and R^{a2} is (C6-C10)aryl or a 5- to 10-membered heteroaryl, and the other is hydrogen, wherein said aryl or heteroaryl is substituted with 1-3 R^c;~~

~~wherein each R^c is halogen or (C1-C3)alkyl; and~~

~~wherein each of R^d, R^{e1} and R^{e2} is hydrogen.~~

~~9. The compound according to claim 1, wherein the compound has a structure according to formula IV:~~



~~IV,~~

~~or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:~~

~~R^3 is substituted with 0-3 substituents selected from the group consisting of halogen, oxo, -(C1-C5)alkyl, -O-(C2-C4)alkyl, and -C(O)O(C1-C3)alkyl;.~~

~~10. The compound according to claim 9, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:~~

~~each R^0 is independently hydrogen or (C1-C3)alkyl;~~

~~wherein each R^{12} and R^{13} is independently selected from the group consisting of hydrogen, -(C1-C4)alkyl, -(C3-C10)cycloalkyl, -(4- to 10-membered)heteroaryl, and -(4- to 6-membered)heterocycloalkyl, wherein each R^{12} and R^{13} is independently substituted with 0-3 R';~~

~~wherein R^3 is hydrogen, halogen, (C1-C6)alkyl, (C3-C7)cycloalkyl, (5- to 8-membered)heterocycloalkyl, -O-(C1-C6)alkyl, -O-(C3-C7)cycloalkyl, -O-(5- to 8-membered)heterocycloalkyl, (C2-C6)alkenyl, $-CH_2OH$, phenyl, (5- or 6-membered)heteroaryl, or (5- or 6-membered)heterocycloalkyl, wherein R^3 is substituted~~

with 0-3 substituents selected from the group consisting of halogen, oxo, -(C1-C5)alkyl, -O-(C2-C4)alkyl, and -C(O)O(C1-C3)alkyl;

R^4 is hydrogen, -CN, (C1-C6)alkyl, -O-(C1-C6)alkyl, (C2-C6)alkenyl or $-CH_2OH$; or

R^4 and R^3 are taken together with the carbon atoms to which they are attached to form a (C5-C6)cycloalkyl, (C6-C10)aryl, (5- to 10-membered)heterocycloalkyl or (5- to 10-membered)heteroaryl;

R^5 is hydrogen, halogen, (C1-C6)alkyl or -O-(C1-C6)alkyl; or

R^5 and R^4 are taken together with the carbon atoms to which they are attached to form a (C5-C6)cycloalkyl, phenyl, (5- or 6-membered)heterocycloalkyl, or (5- or 6-membered)heteroaryl;

R^{14} is (C1-C6)alkyl;

R^{15} is hydrogen, -(C1-C6)alkyl, $-CH_2$-phenyl, or $-CH_2$-(5-to 10-membered)heteroaryl, wherein the -(C1-C6)alkyl, $-CH_2$-phenyl, or $-CH_2$-(5-to 10-membered)heteroaryl are substituted with 0-3 substituents selected from the group consisting of -OH, -SH, $-SCH_3$, $-C(O)NH_2$, -C(O)OH, $-NH_2$ and $-NH-C(=NH)NH_2$;

R^{16} is hydrogen or -(C1-C6)alkyl; and

$R^{'}$ is selected from hydrogen, halogen, (C1-C4)alkyl, or -O-(C1-C4)alkyl.

11. The compound according to claim 10, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

each R^0 is hydrogen;

each R^{12} is H;

each R^{13} is independently hydrogen or -(C1-C10)alkyl;

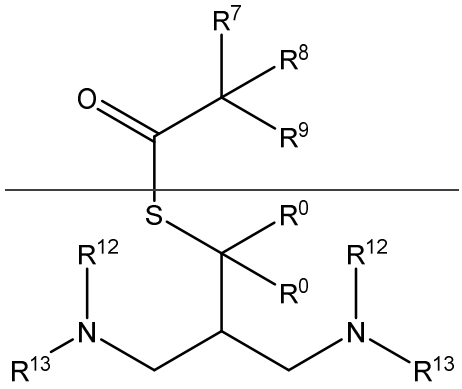
R^3, R^4 and R^5 are H;

R^{14} is (C1-C3)alkyl;

R^{15} is (C1-C3)alkyl; and

R^{16} is H.

12. The compound according to claim 1, wherein the compound has a structure according to formula V:



V,

or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

R' is halogen, -(C1-C4)alkyl, or -O-(C1-C4)alkyl; and

R'' is halogen, -(C1-C6)alkyl or -O-(C2-C6)alkyl.

13. The compound according to claim 12, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

each R^9 is independently hydrogen or (C1-C3)alkyl;

wherein each R^{12} and R^{13} is independently selected from the group consisting of hydrogen, -(C1-C3)alkyl, -(C3-C10)cycloalkyl, -(4- to 10-membered)heteroaryl, and -(4- to 10-membered)heterocycloalkyl, wherein each R^{12} and R^{13} is independently substituted with 0-3 R';

wherein R^7 is selected from the group consisting of -(C1-C3)alkyl, -(C3-C6)cycloalkyl, and -(4- to 6-membered)heterocycloalkyl, wherein R^7 is substituted with 0-3 R'';

wherein R^8 and R^9 are independently selected from the group consisting of hydrogen, -(C1-C3)alkyl, -(C3-C6)cycloalkyl, and -(4- to 6-membered)heterocycloalkyl, wherein R^8 and R^9 are independently substituted with 0-3 R'';

wherein R' is halogen, (C1-C4)alkyl, or -O-(C1-C4)alkyl; and

wherein R'' is halogen, -(C1-C3)alkyl or -O-(C1-C3)alkyl.

14. The compound according to claim 13, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

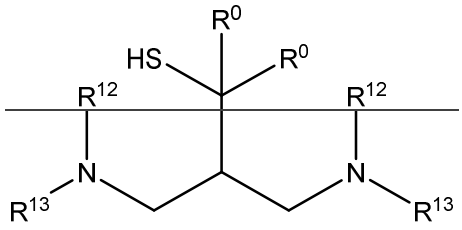
each R^9 is hydrogen;

each R^{12} is H;

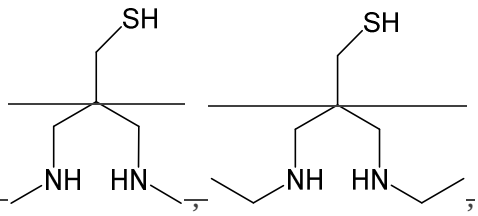
each R^{13} is independently -(C1-C3)alkyl; and

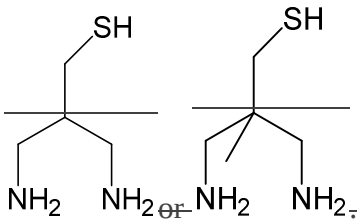
R^7, R^8 and R^9 are -(C1-C3)alkyl.

15. The compound according to claim 1, wherein the compound has a structure according to formula VI:



formula VI

or a pharmaceutically acceptable salt, solvate, hydrate, polymorph, prodrug or double prodrug thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, provided that the compound is not 

, 

or .

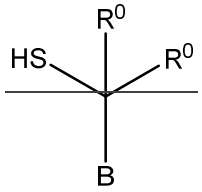
16. The compound according to claim 15, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:

each R^0 is independently hydrogen, (C1-C3)alkyl, or -SH;

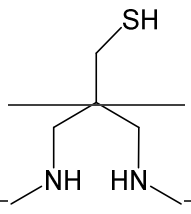
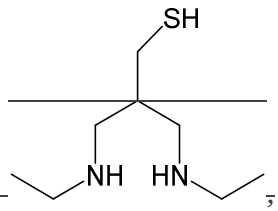
each R^{12} is independently hydrogen, (C1-C3)alkyl or -(4- to 10-membered)heteroaryl;

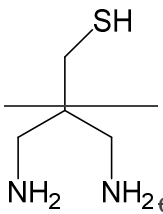
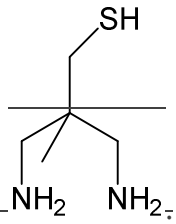
each R^{13} is taken together with the nitrogen atoms to which they are attached to form a (7- to 8-membered)heterocycloalkyl.

~~17. The compound according to claim 1, wherein the compound has a structure according to formula VII:~~



~~formula VII,~~

~~or a pharmaceutically acceptable salt, solvate, hydrate, polymorph, prodrug or double prodrug thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, provided that the compound is not~~  ~~,~~  ~~,~~

 ~~or~~  ~~.~~

~~18. The compound according to claim 17, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein:~~

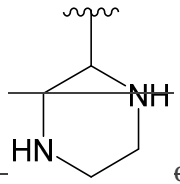
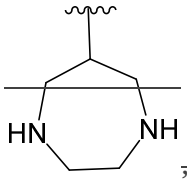
~~each R^0 is independently hydrogen, (C1-C3)alkyl, or -SH;~~

~~wherein B is a (6- to 8-membered)heterocycloalkyl containing two N atoms, wherein B is substituted with a (C1-C4)alkyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, so as to form a bicyclic ring, and/or substituted with 0-3 (C1-C4)alkyl,~~

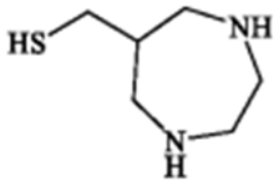
~~cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, (C1-C6)aryl, (C5 to C6)heteroaryl, (C1-C4)acyl, (C1-C4)alkenyl and (C1-C4)alkynyl, wherein the (C1-C4)alkyl, (C1-C4)alkenyl and (C1-C4)alkynyl are optionally substituted with 1-3 halogen or (C1-C4)alkoxy~~

~~or B is Moiety B[1];~~

~~wherein when present, each occurrence of R^{12} and R^{13} is independently hydrogen, -(C1-C6)alkyl, or -(4- to 10-membered)heteroaryl.~~

~~19. The compound according to claim 18, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, wherein B is the heterocycle~~  ~~or~~  ~~, wherein the heterocycle is substituted with a (C1-C4)alkyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, so as to form a bicyclic ring, and/or substituted with 0-3 (C1-C4)alkyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, (C1-C6)aryl, (C5 to C6)heteroaryl, (C1-C4)acyl, (C1-C4)alkenyl and (C1-C4)alkynyl, wherein the (C1-C4)alkyl, (C1-C4)alkenyl and (C1-C4)alkynyl are optionally substituted with 1-3 halogen or (C1-C4)alkoxy.~~

~~20.~~14. ~~The~~ A compound ~~according to claim 1, wherein the compound is~~ selected from the group consisting of:



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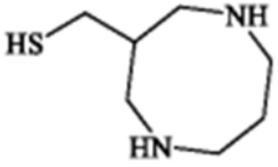

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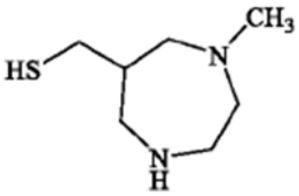

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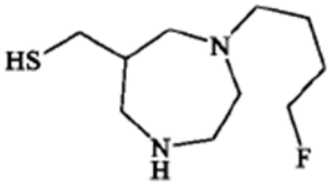

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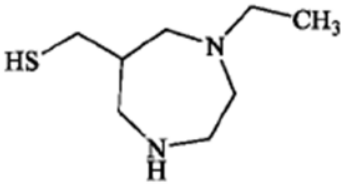

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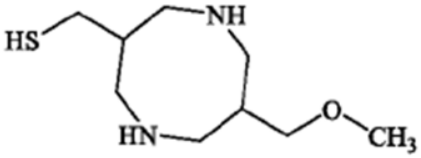

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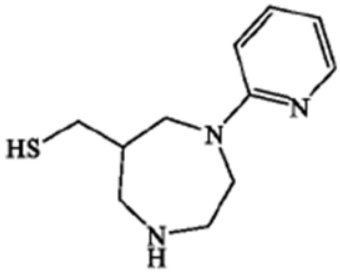

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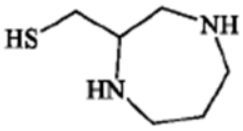
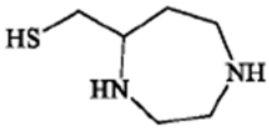
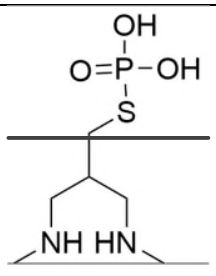
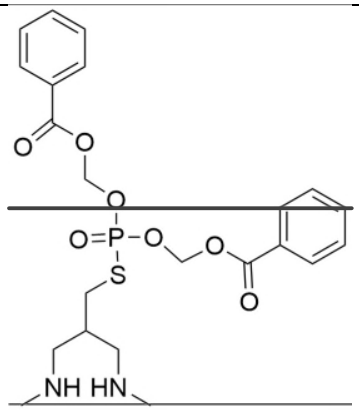
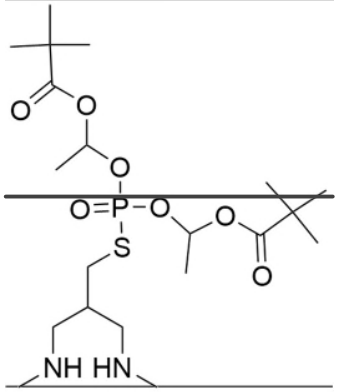
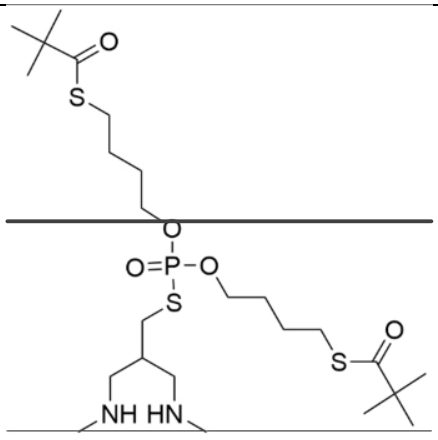
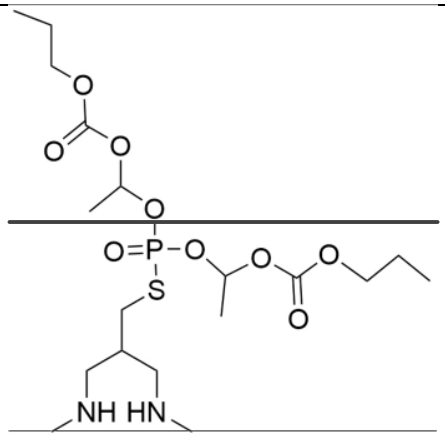
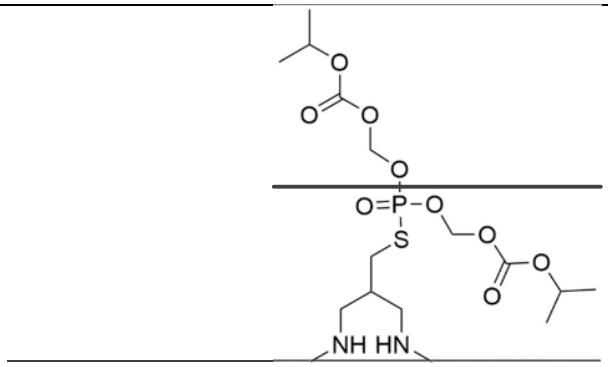
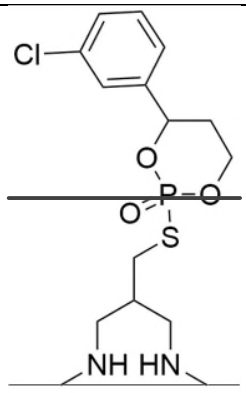


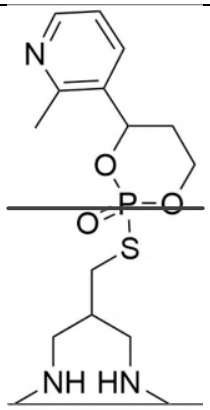
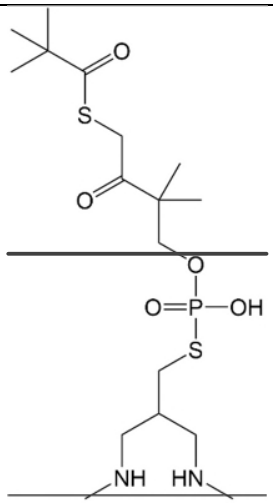
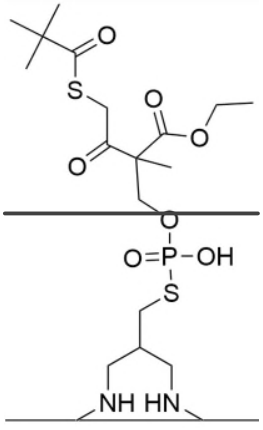
39, and


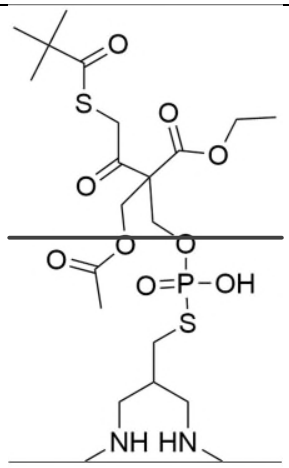
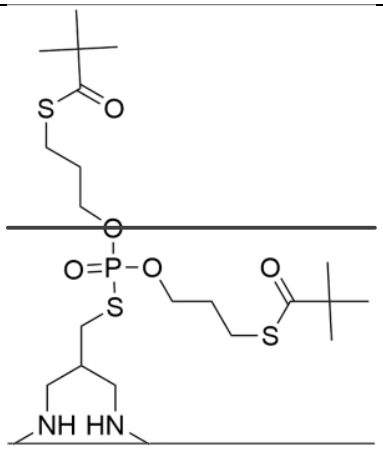
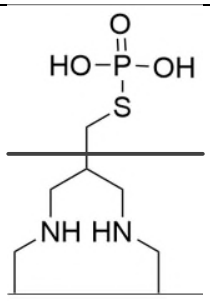
40, or a pharmaceutically acceptable salt or stereoisomer thereof.

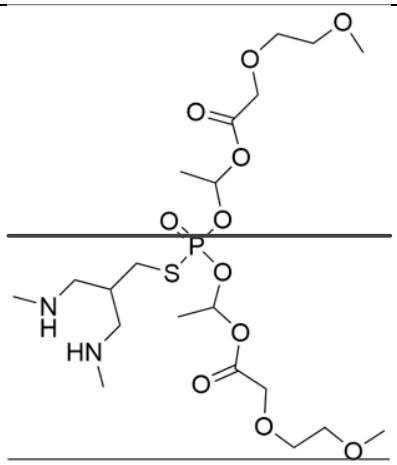
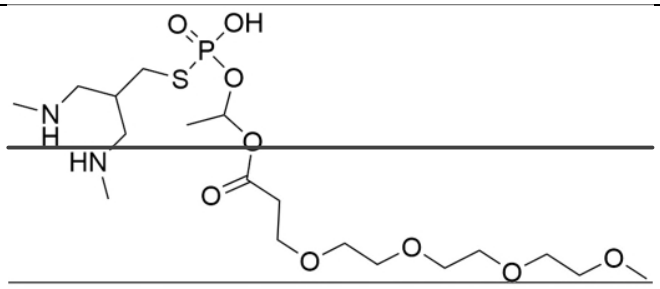
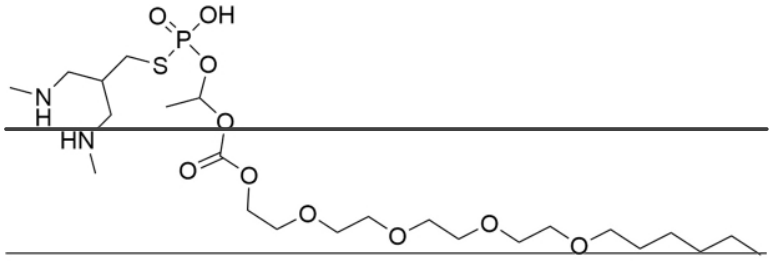
~~Compound~~	~~Structure~~
~~1~~	 ~~PrC-210-PT~~

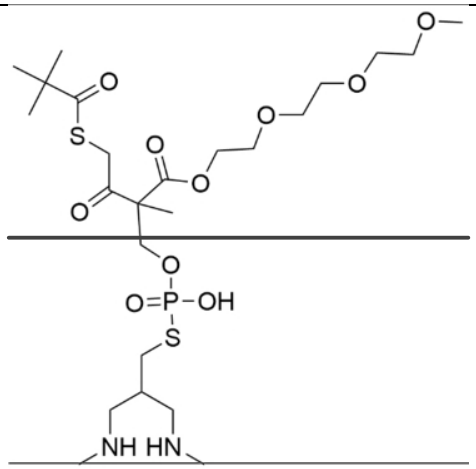
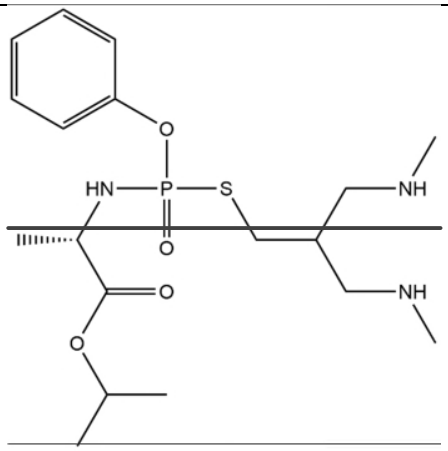
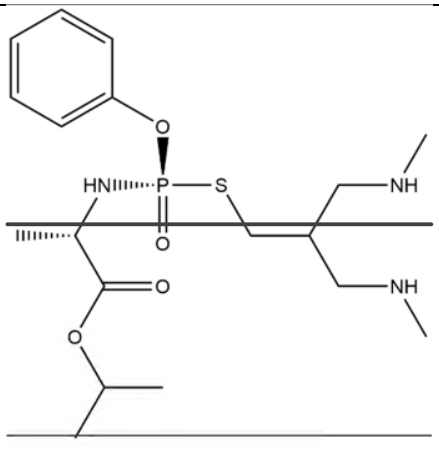
~~2~~	 **~~PrC-210-PT-BzOM~~**
~~3~~	 **~~PrC-210-PT-POE~~**
~~4~~	 **~~PrC-210-PT-PivTB~~**

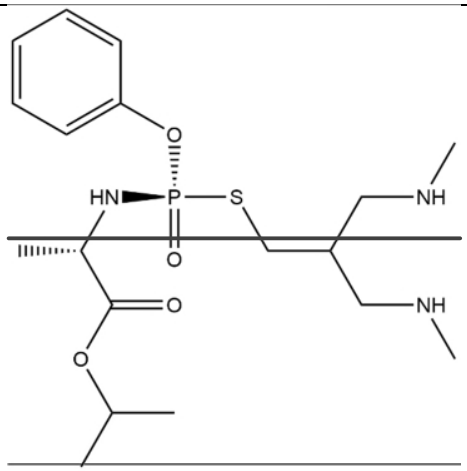
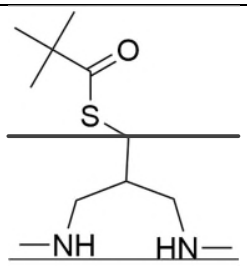
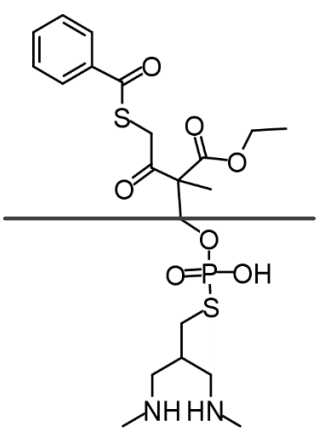
~~5~~	 **~~PrC-210-PT-POCE~~**
~~6~~	 **~~PrC-210-PT-POC~~**
~~7~~	 **~~PrC-210-PT-ClDOxP~~**

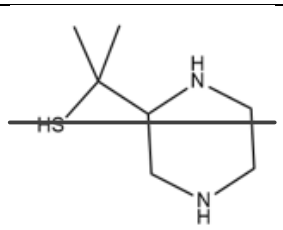
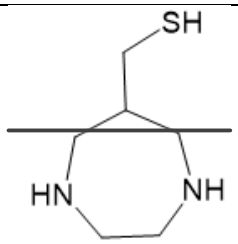
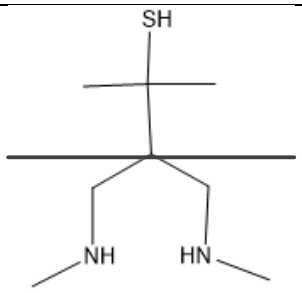
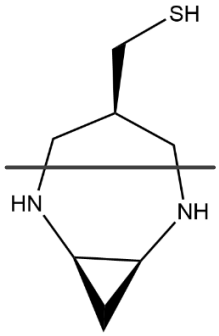
~~8~~	 **~~PrC-210-PT-PyDOxP~~**
~~9~~	 **~~PrC-210-PT-PivTB2~~**
~~10~~	 **~~PrC-210-PT-PivTB3~~**

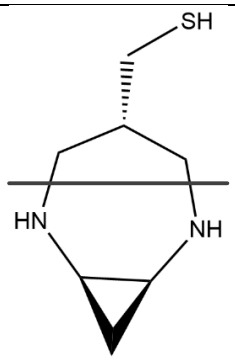
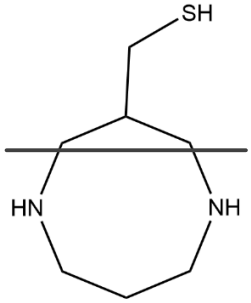
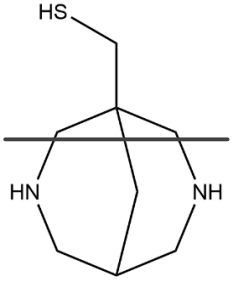
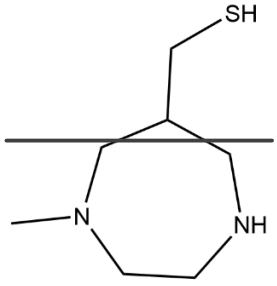
~~11~~	 **~~PrC-210-PT-PivTB4~~**
~~12~~	 **~~PrC-210-PivTP~~**
~~13~~	 **~~DE-PrC-210-PT~~**

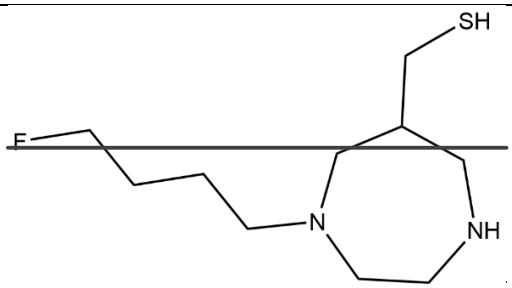
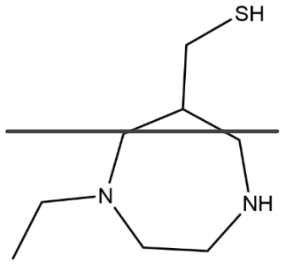
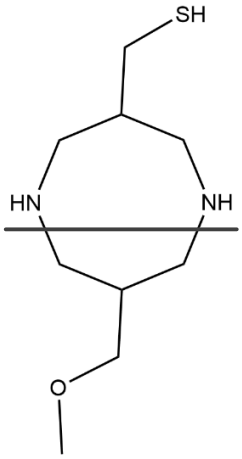
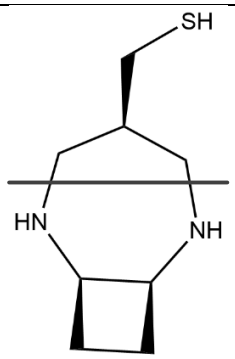
~~14~~	 ~~PrC-210-PT-PEGOE1~~
~~15~~	 ~~PrC-210-PT-PEGOE2~~
~~16~~	 ~~PrC-210-PT-PEGOE3~~

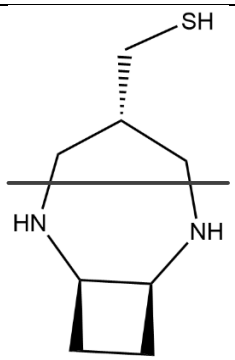
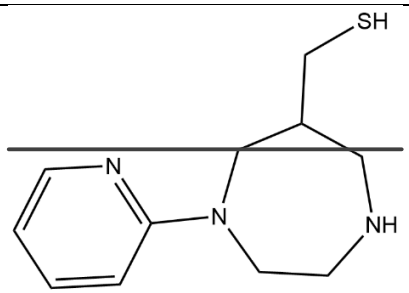
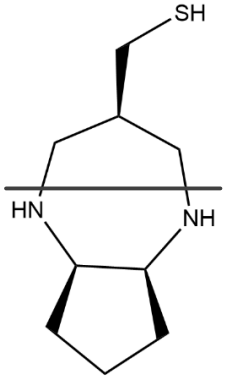
~~17~~	 **~~PrC-210-PT-PEGOE4~~**
~~18~~	 **~~PrC-210-PT-alaf~~**
~~18 (S,S)~~	 **~~(S,S)-PrC-210-PT-alaf~~**

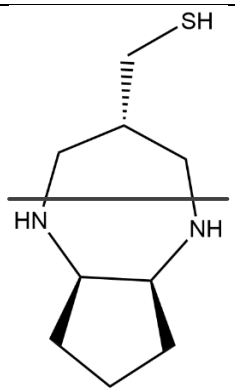
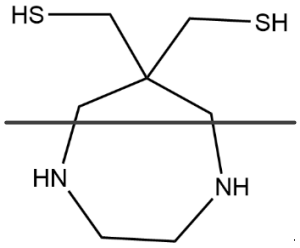
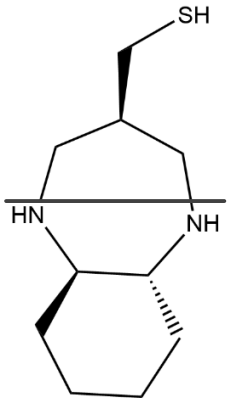
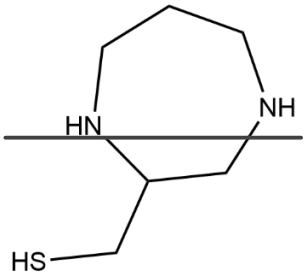
~~18 (R,S)~~	 **~~(R,S)-PrC-210-PT-alaf~~**
~~19~~	 **~~PrC-210-S-Piv~~**
~~20~~	 **~~PrC-210-PT-BzTB1~~**

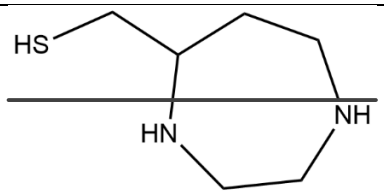
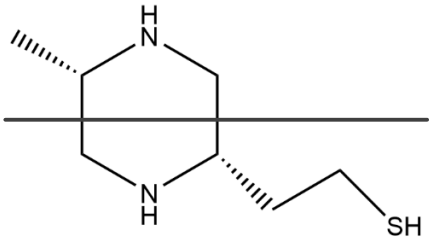
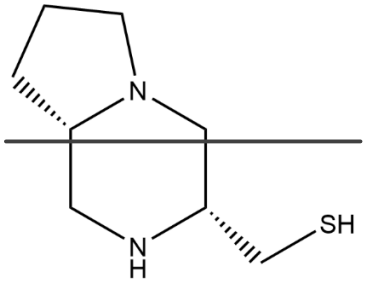
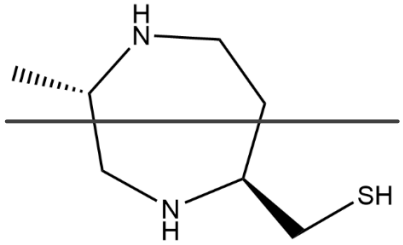
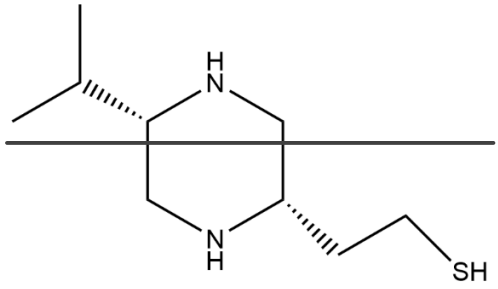
~~21~~	 **~~2Pip-2PrSH~~**
~~22~~	 **~~DzCH2SH~~**
~~23~~	 **~~DMPrC-210~~**
~~24~~	 ~~[(1R,4s,7S)-2,6-diazabicyclo[5.1.0]octan-4-yl]methanethiol~~

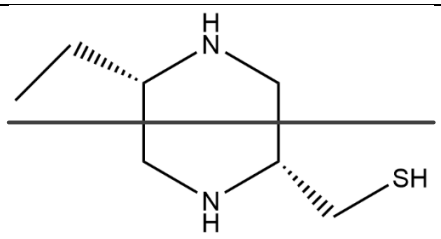
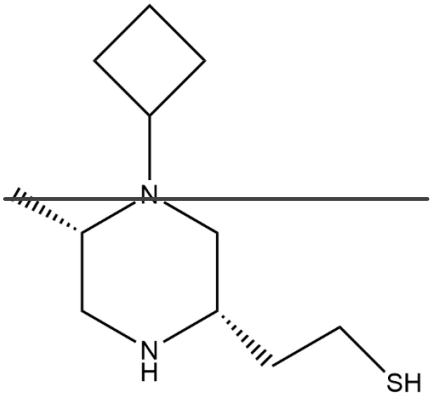
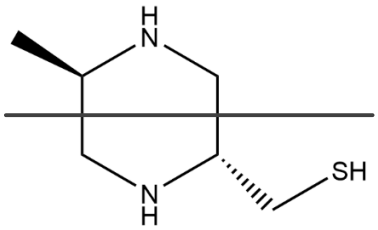
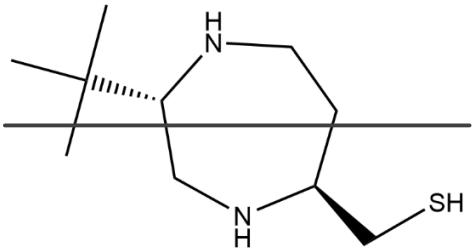
~~25~~	 ~~[(1R,4r,7S)-2,6-diazabicyclo[5.1.0]octan-4-yl]methanethiol~~
~~26~~	 ~~(1,5-diazocan-3-yl)methanethiol~~
~~27~~	 ~~{3,7-diazabicyclo[3.3.1]nonan-1-yl}methanethiol~~
~~28~~	 ~~(1-methyl-1,4-diazepan-6-yl)methanethiol~~

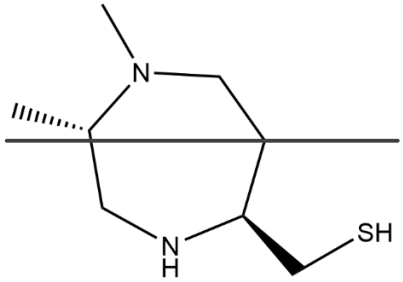
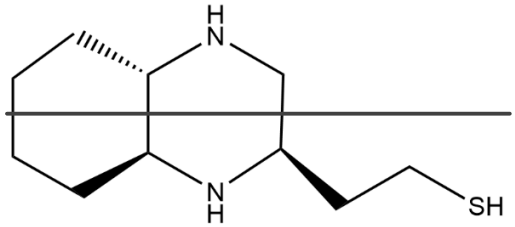
~~29~~	 ~~[1-(4-fluorobutyl)-1,4-diazepan-6-yl]methanethiol~~
~~30~~	 ~~(1-ethyl-1,4-diazepan-6-yl)methanethiol~~
~~31~~	 ~~[7-(methoxymethyl)-1,5-diazocan-3-yl]methanethiol~~
~~32~~	 ~~[(1R,4S,7S)-2,6-diazabicyclo[5.2.0]nonan-4-yl]methanethiol~~

~~33~~	 ~~[(1R,4R,7S)-2,6-diazabicyclo[5.2.0]nonan-4-yl]methanethiol~~
~~34~~	 ~~[1-(pyridin-2-yl)-1,4-diazepan-6-yl]methanethiol~~
~~35~~	 ~~[(3S,5aR,8aS)-decahydrocyclopenta[b][1,4]diazepin-3-yl]methanethiol~~

~~36~~	 ~~[(3R,5aR,8aS)-decahydrocyclopenta[b][1,4]diazepin-3-yl]methanethiol~~
~~37~~	 ~~[6-(sulfanylmethyl)-1,4-diazepan-6-yl]methanethiol~~
~~38~~	 ~~[(5aR,9aR)-decahydro-1H-1,5-benzodiazepin-3-yl]methanethiol~~
~~39~~	 ~~(1,4-diazepan-2-yl)methanethiol~~

~~40~~	 ~~(1,4-diazepan-5-yl)methanethiol~~
~~41~~	 ~~2-[(2S,5S)-5-methylpiperazin-2-yl]ethane-1-thiol~~
~~42~~	 ~~[(3R,8aS)-octahydropyrrolo[1,2-a]pyrazin-3-yl]methanethiol~~
~~43~~	 ~~[(2S,5S)-2-methyl-1,4-diazepan-5-yl]methanethiol~~
~~44~~	 ~~2-[(2S,5S)-5-(propan-2-yl)piperazin-2-yl]ethane-1-thiol~~

~~45~~	 ~~[(2R,5S)-5-ethylpiperazin-2-yl]methanethiol~~
~~46~~	 ~~2-[(2S,5S)-4-cyclobutyl-5-methylpiperazin-2-yl]ethane-1-thiol~~
~~47~~	 ~~[(2R,5R)-5-methylpiperazin-2-yl]methanethiol~~
~~48~~	 ~~[(2S,5S)-2-tert-butyl-1,4-diazepan-5-yl]methanethiol~~

~~49~~	 ~~[(2S,5S)-1,2-dimethyl-1,4-diazepan-5-yl]methanethiol~~
~~50~~	 ~~[2-((2R,4aS,8aS)-decahydroquinoxalin-2yl)ethane-1-thiol]~~

~~or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof, or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt.~~

~~21. A crystalline salt form of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt.~~

~~22. The crystalline salt form according to claim 21, wherein the salt is selected from the group consisting of chloride, benzenesulfonate, 4-toluenesulfonate, cyclohexylsulfamate, fumarate, bromide, maleate, malonate, oxalate, succinate, trifluoroacetate, sulfamate, acetate, ascorbate, mucate, sulfate and 1,5-naphthalenedisulfonate.~~

~~23. The crystalline salt form according to any one of claims 21-22, wherein the salt form is stable when stored at ambient temperature for at least 1 year.~~

~~24.~~15. A pharmaceutical composition comprising ~~a~~the compound according to ~~any one of~~ claim~~s~~ 1~~4~~ ~~20~~, or a pharmaceutically acceptable salt or stereoisomer thereof, ~~the crystalline salt form according to any one of claims 21-23~~ and a pharmaceutically acceptable carrier.

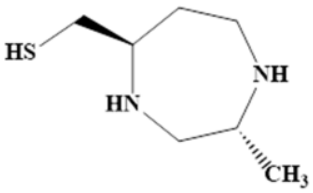
16. The pharmaceutical composition according to claim 15, wherein the pharmaceutical composition is formulated for oral administration.

17. The pharmaceutical composition according to claim 15, wherein the pharmaceutical composition is formulated for parenteral administration.

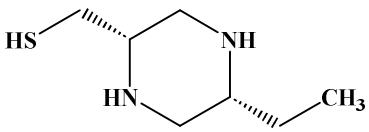
18. The pharmaceutical composition according to claim 17, wherein the parenteral administration is subcutaneous, intravenous, intramuscular, or intrathecal.

~~25.~~19. The pharmaceutical composition according to claim 15~~24~~, wherein the pharmaceutical composition further comprises an antioxidant.

20. A compound selected from the group consisting of:



43,



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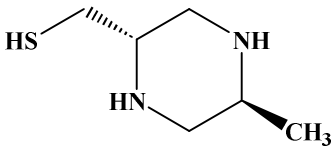
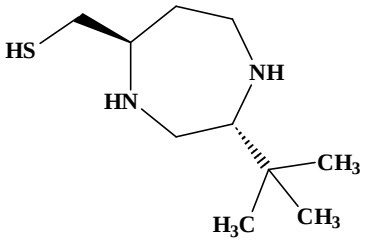
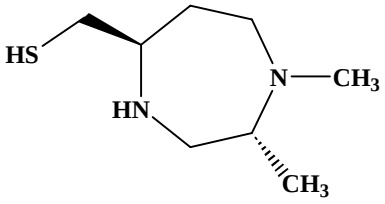


47,



48, and



49, or a pharmaceutically acceptable salt thereof.

21. A pharmaceutical composition comprising the compound according to claim 20, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier.

22. The pharmaceutical composition according to claim 21, wherein the pharmaceutical composition is formulated for oral administration.

23. The pharmaceutical composition according to claim 21, wherein the pharmaceutical composition is formulated for parenteral administration.

24. The pharmaceutical composition according to claim 23, wherein the parenteral administration is subcutaneous, intravenous, intramuscular, or intrathecal.

25. The pharmaceutical composition according to claim 21, wherein the pharmaceutical composition further comprises an antioxidant.

~~26. The pharmaceutical composition according to claim 24, wherein the composition is co-administered sequentially, concurrently or separately, with an antioxidant.~~

~~27. The pharmaceutical composition according to claim 24, wherein the Compound is Compound 42 or Compound 50, and the composition further comprises an antioxidant.~~

~~28. The pharmaceutical composition according to any one of claims 25-27, wherein the antioxidant is selected from the group consisting of ascorbic acid, ascorbate, vitamin C, N-acetylcysteine, glutathione, lipoic acid, uric acid, α-tocopherol, β-tocopherol, γ-tocopherol, δ-tocopherol, α-tocotrienol, β-tocotrienol, γ-tocotrienol, δ-tocotrienol, vitamin E, carotene, beta-carotene, vitamin A, retinol, selenocysteine, cyanidine-3-glucoside, and ubiquinol.~~

29. The pharmaceutical composition according to any one of claims 25-27, wherein the antioxidant is a non-thiol antioxidant.

30. The pharmaceutical composition according to claim 29, wherein the non-thiol antioxidant is selected from the group comprising α-tocopherol, β-tocopherol, γ-tocopherol, δ-tocopherol, α-tocotrienol, β-tocotrienol, γ-tocotrienol, δ-tocotrienol, vitamin E, carotene, beta-carotene, ascorbate, vitamin C, cyanidine-3-glucoside, selenocysteine, or combinations thereof.

31. The pharmaceutical composition according to claim 29, wherein the non-thiol antioxidant is selected from the group consisting of α-tocopherol, β-tocopherol, γ-tocopherol, δ-tocopherol, α-tocotrienol, β-tocotrienol, γ-tocotrienol, δ-tocotrienol, vitamin E, carotene, beta-carotene, ascorbate, vitamin C, cyanidine-3-glucoside, selenocysteine, and combinations thereof.

32. The pharmaceutical composition according to claim 31, wherein the non-thiol antioxidant is selected from the group consisting of α-tocopherol, γ-tocotrienol, and selenocysteine.

33. The pharmaceutical composition according to any one of claims 25-32, wherein the pharmaceutical composition exhibits a synergistic radioprotective effect in mammals, mammalian tissues and/or cultured mammalian cells.

34. The pharmaceutical composition according to any one of claims 24-33, wherein the composition is suitable for oral, transmucosal, transdermal, parenteral, topical or cutaneous administration.

35. The pharmaceutical composition according to claim 34, wherein the composition is suitable for parenteral administration, and the administration is subcutaneous, intravenous, intramuscular, or intrathecal administration.

36. The pharmaceutical composition according to claim 34, wherein the composition is suitable for oral administration.

37. The pharmaceutical composition according to any one of claims 24-36, wherein the composition is stable at ambient temperature for at least 1 year.

38. A method of treating or preventing a toxicity or condition associated with ionizing radiation exposure in a subject in need thereof, comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, or of a pharmaceutical composition according to any one of claims 24-37.

39. The method according to claim 38, wherein the source of the ionizing radiation is nuclear warfare, a nuclear reactor, air travel, or space travel.

40. The method according to claim 39, wherein the source of the ionizing radiation is space travel, and the radiation is from one or more of galactic cosmic rays, chronic solar radiation, solar flares or coronal mass ejections.

41. The method according to claim 38, wherein the source of ionizing radiation is radiation therapy.

42. The method of any one of claims 38-41, wherein the ionizing radiation exposure is acute radiation exposure.

43. The method of any one of claims 38-41, wherein the ionizing radiation exposure is chronic radiation exposure.

44. The method according to any one of claims 38-43, wherein the subject's risk of developing future carcinogenesis after exposure to ionizing radiation is reduced.

45. The method according to any one of claims 38-44, wherein the toxicity is one or more of bone marrow toxicity, central nervous system toxicity, immunological toxicity, gastrointestinal toxicity, neurotoxicity, nephrotoxicity, ototoxicity, cardiotoxicity, hepatoxicity, cutaneous toxicity, alopecia mucositis, xerostomia, infertility, peripheral neuropathy, pulmonary toxicity or renal toxicity.

46. The method of claim 45, wherein the toxicity is a late onset toxicity.

47. The method according to any one of claims 38-42, wherein the condition is acute radiation syndrome.

48. The method according to claim 47, wherein one or more symptoms of acute radiation syndrome is prevented, eliminated or alleviated.

49. The method according to claim 48, wherein the acute radiation syndrome symptom is one or more symptom selected from the group consisting of nausea, vomiting, headache, diarrhea, loss of appetite, fatigue, fever, skin damage and hair loss.

50. The method according to any one of claims 38-49, wherein the pharmaceutical composition stimulates bone marrow production.

51. The method according to any one of claims 38-43, wherein the condition is a cognitive disorder selected from Alzheimer's disease or dementia.

52. The method according to any one of claims 38-43, wherein the condition is premature aging.

53. The method according to any one of claims 38-43, wherein the condition is selected from the group consisting of COVID-19-associated cytokine storm, COVID-19-associated multisystem inflammatory syndrome in children (MIS-C), and post-COVID-19 SARS-CoV-2-induced autoimmunity.

54. The method according to any one of claims 38-43, wherein the disease or condition is associated with oxidative stress.

55. The method according to claim 54, wherein the disease or condition is renal ischemia, myocardial ischemia, spinal cord ischemia and reperfusion injury, Alzheimer's disease, Parkinson's disease, rheumatoid arthritis myocardial infarction, cardiovascular disease, septic shock, chronic inflammation, Friedreich ataxia, Leber's hereditary optic neuropathy, myoclonus epilepsy, ragged red fiber disease, Mitochondrial Encephalopathy, Lactic Acidosis and Stroke (MELAS), radiation-induced cognitive decline, COVID-19-associated cytokine storm, COVID-19-associated multisystem inflammatory syndrome in children (MIS-C), or post-COVID-19 SARS-CoV-2-induced autoimmunity.

56. The method according to any one of claims 38-55, wherein the compound or the pharmaceutical composition is administered prior to, during, or after the subject has been or will be exposed to ionizing radiation.

57. A method of protecting normal tissues in a subject against toxicities associated with radiation therapy with minimal effect on the tumor response to those treatments, the method comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, or of a pharmaceutical composition according to any one of claims 24-37.

58. The method according to claim 57, wherein the radiation therapy is gamma radiation, X-radiation, proton beam radiation, electron beam radiation, gamma radiation from cobalt-60 decay, or in the form of a radiopharmaceutical.

59. The method according to claim 57 or 58, wherein the compound or the pharmaceutical composition is administered before, concurrently, separately, sequentially with, or after a radiation therapy.

60. The method according to any one of claims 57-59, wherein the radiation therapy is combined with a chemotherapeutic agent or immunotherapy.

61. The method according to claim 60, wherein the immunotherapy is selected from the group consisting of immune checkpoint inhibitors, T-cell transfer therapy, monoclonal antibodies, treatment vaccines and immune system modulators.

62. The method according to claim or 60, wherein the chemotherapeutic agent is selected from cyclophosphamide, ifosfamide, etoposide, oxaliplatin, cisplatin, carboplatin, mechlorethamine, melphalan, chlorambucil, cyclophosphamide, streptozocin, carmustine, lomustine, bleomycin, busulfan, bendamustine, dacarbazine, doxorubicin, daunoubicin, temozolomide, thiotepa, altretamine, procarbaine, hexamethylmelamine, teniposide or mitoxantrone.

63. A method of protecting normal tissues in a subject against toxicities associated with chemotherapy without adversely affecting the tumor response to those treatments, the method comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, or of a pharmaceutical composition according to any one of claims 24-37.

64. The method according to claim 63, wherein the chemotherapeutic agent is selected from cyclophosphamide, ifosfamide, etoposide, oxaliplatin, cisplatin, carboplatin, mechlorethamine, melphalan, chlorambucil, cyclophosphamide, streptozocin, carmustine, lomustine, bleomycin, busulfan, bendamustine, dacarbazine, doxorubicin, daunoubicin, temozolomide, thiotepa, altretamine, procarbaine, hexamethylmelamine, teniposide or mitoxantrone.

65. The method according to claim 63 or 64, wherein the compound or the pharmaceutical composition is administered before, concurrently, separately, sequentially with, or after a chemotherapeutic agent.

66. The method according to any of claims 63-65, wherein the chemotherapy is combined with immunotherapy.

67. The method according to claim 66, wherein the immunotherapy is selected from the group consisting of immune checkpoint inhibitors, T-cell transfer therapy, monoclonal antibodies, treatment vaccines and immune system modulators.

68. A method of reducing the risk of secondary tumor induction in a subject being treated with radiation therapy, the method comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, or of a pharmaceutical composition according to any one of claims 24-37.

69. The method according to claim 68, wherein the radiation therapy is gamma radiation, X-radiation, proton beam radiation or gamma radiation from cobalt-60 decay, or from a radiopharmaceutical.

70. The method according to claim 68 or 69, wherein the compound or the pharmaceutical composition is administered before, concurrently, separately, sequentially with, or after a radiation therapy.

71. The method according to any one of claims 68-70, wherein the radiation therapy is combined with a chemotherapeutic agent or immunotherapy.

72. The method according to claim 71, wherein the immunotherapy is selected from the group consisting of immune checkpoint inhibitors, T-cell transfer therapy, monoclonal antibodies, treatment vaccines and immune system modulators.

73. The method according to claim or 71, wherein the chemotherapeutic agent is selected from cyclophosphamide, ifosfamide, etoposide, oxaliplatin, cisplatin, carboplatin, mechlorethamine, melphalan, chlorambucil, cyclophosphamide, streptozocin, carmustine, lomustine, bleomycin, busulfan, bendamustine, dacarbazine, doxorubicin, daunoubicin, temozolomide, thiotepa, altretamine, procarbaine, hexamethylmelamine, teniposide or mitoxantrone.

74. A method of reducing the risk of secondary tumor induction in a subject being treated with chemotherapy, the method comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, or polymorph thereof or a solvate, hydrate, or polymorph of the pharmaceutically acceptable salt, or of a pharmaceutical composition according to any one of claims 24-37.

75. The method according to claim 74, wherein the chemotherapeutic agent is selected from cyclophosphamide, ifosfamide, etoposide, oxaliplatin, cisplatin, carboplatin, mechlorethamine, melphalan, chlorambucil, cyclophosphamide, streptozocin, carmustine, lomustine, bleomycin, busulfan, bendamustine, dacarbazine, doxorubicin, daunoubicin, temozolomide, thiotepa, altretamine, procarbaine, hexamethylmelamine, teniposide or mitoxantrone.

76. The method according to claim 74 or 75, wherein the compound or the pharmaceutical composition is administered before, concurrently, separately, sequentially, or after with a chemotherapeutic agent.

77. The method according to any of claims 74-76, wherein the chemotherapy is combined with immunotherapy.

78. The method according to claim 77, wherein the immunotherapy is selected from the group consisting of immune checkpoint inhibitors, T-cell transfer therapy, monoclonal antibodies, treatment vaccines and immune system modulators.

79. The method of any one of claims 38 or 57-78, wherein the subject has cancer and the cancer is hematological cancer, bone cancer, leukemia, lymphoma, myeloma, rectal cancer, colorectal cancer, breast cancer, ovarian cancer, prostate cancer, androgen-dependent prostate cancer, lung cancer, mesothelioma, head and neck cancer, esophageal cancer, gastric cancer, pancreatic cancer, gastrointestinal cancer, renal cell cancer, testicular cancer, germ cell cancer, glioma, cancers of the central nervous system or any other primary or solid tumor.

80. A method of reducing the risk of tumor induction in a subject who has been exposed to, is being exposed to, or will be exposed to ionizing radiation, the method comprising administering to said subject a therapeutically effective amount of a compound according to any one of claims 1-20, or a pharmaceutically acceptable salt, solvate, hydrate, polymorph or combination thereof, or of a pharmaceutical composition according to any one of claims 24-37.

81. The method according to claim 80, wherein the source of the ionizing radiation is nuclear warfare, a nuclear reactor, air travel, or space travel.

82. The method according to claim 81, wherein the source of the ionizing radiation is space travel, and the radiation is from one or more of galactic cosmic rays, chronic solar radiation, solar flares or coronal mass ejections.

83. The method according to claim 80, wherein the source of ionizing radiation is radiation therapy.

84. The method of any one of claims 80-83, wherein the ionizing radiation exposure is acute radiation exposure.

85. The method of any one of claim 80-83, wherein the ionizing radiation exposure is chronic radiation exposure.

86. A method of slowing the aging process in a subject, wherein the method comprises administering a compound according to any one of claims 1-20, or the pharmaceutical composition according to any one of claims 24-37.

87. The method according to claim 86, wherein the health span of the subject is increased.

88. A method of treating a disease or condition in a subject in need thereof comprising administering a compound according to any one of claims 1-20, or the pharmaceutical composition according to any one of claims 24-37.

89. The method according to claim 88, wherein the disease or condition is associated with oxidative stress.

~~90. The method according to claim 88 or 89, wherein the disease or condition is renal ischemia, myocardial ischemia, spinal cord ischemia and reperfusion injury, Alzheimer's disease, Parkinson's disease, rheumatoid arthritis myocardial infarction, cardiovascular disease, septic shock, chronic inflammation, Friedreich ataxia, Leber's hereditary optic neuropathy, myoclonus epilepsy, ragged red fiber disease, Mitochondrial Encephalopathy, Lactic Acidosis and Stroke (MELAS), radiation-induced cognitive decline, COVID-19-associated cytokine storm, COVID-19-associated multisystem inflammatory syndrome in children (MIS-C), or post-COVID-19 SARS-CoV-2-induced autoimmunity.~~