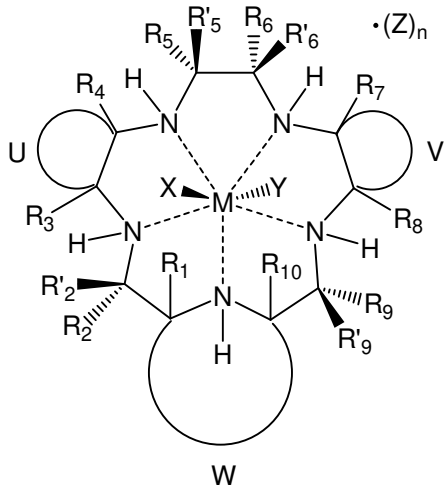
WHAT IS CLAIMED IS:

1. Use of a pentaaza macrocyclic ring complex corresponding to Formula (I) below in the manufacture of a medicament for reducing the risk of carcinogenesis associated with excessive radiation exposure in a mammalian subject:



(I)

wherein

M is Mn^{2+} or Mn^{3+};

R_1, R_2, R'_2, R_3, R_4, R_5, R'_5, R_6, R'_6, R_7, R_8, R_9, R'_9, and R_{10} are independently hydrogen, hydrocarbyl, substituted hydrocarbyl, heterocyclyl, an amino acid side chain moiety, or a moiety selected from the group consisting of $-OR_{11}$, $-NR_{11}R_{12}$, $-COR_{11}$, $-CO_2R_{11}$, $-CONR_{11}R_{12}$, $-SR_{11}$, $-SOR_{11}$, $-SO_2R_{11}$, $-SO_2NR_{11}R_{12}$, $-N(OR_{11})(R_{12})$, $-P(O)(OR_{11})(OR_{12})$, $-P(O)(OR_{11})(R_{12})$, and $-OP(O)(OR_{11})(OR_{12})$, wherein R_{11} and R_{12} are independently hydrogen or alkyl;

U, together with the adjacent carbon atoms of the macrocycle, forms a fused substituted or unsubstituted, saturated, partially saturated or unsaturated, cycle or heterocycle having 3 to 20 ring carbon atoms;

V, together with the adjacent carbon atoms of the macrocycle, forms a fused substituted or unsubstituted, saturated, partially saturated or unsaturated, cycle or heterocycle having 3 to 20 ring carbon atoms;

W, together with the nitrogen of the macrocycle and the carbon atoms of the macrocycle to which it is attached, forms an aromatic or alicyclic, substituted or unsubstituted, saturated, partially saturated or unsaturated nitrogen-containing fused heterocycle having 2 to 20 ring carbon atoms, provided that when W is a fused aromatic heterocycle the hydrogen attached to the nitrogen which is both part of the heterocycle and the macrocycle and R_1 and R_{10} attached to the carbon atoms which are both part of the heterocycle and the macrocycle are absent;

X and Y represent suitable ligands which are derived from any monodentate or polydentate coordinating ligand or ligand system or the corresponding anion thereof;

Z is a counterion;

n is an integer from 0 to 3; and

the dashed lines represent coordinating bonds between the nitrogen atoms of the macrocycle and the transition metal, manganese.

2. The use according to claim 1, wherein the mammalian subject is at increased risk of carcinogenesis, or will be at increased risk of carcinogenesis due to a therapeutic radiation exposure.

3. The use according to claim 1, wherein the mammalian subject has been exposed to radiation as a part of a course of radiation therapy provided to treat cancer;

wherein the mammalian subject will be exposed to radiation as a part of a course of radiation therapy provided to treat cancer; and

wherein the mammalian subject is at increased risk of carcinogenesis, or will be at increased risk of carcinogenesis due to a non-therapeutic radiation exposure.

4. The use according to claim 1, wherein the mammalian subject has been exposed to radiation during travel beyond the upper atmosphere of the Earth; and wherein the mammalian subject will be exposed to radiation during travel beyond the upper atmosphere of the Earth.

5. The use according to claim 1, wherein the mammalian subject is at increased risk of carcinogenesis, or will be at increased risk of carcinogenesis, due to exposure to gamma radiation; wherein the mammalian subject is at increased risk of carcinogenesis, or will be at increased risk of carcinogenesis, due to exposure to cosmic ray radiation.

6. The use of claim 1, wherein the administration of the pentaaza macrocyclic ring complex reduces the risk of ovarian tumors.

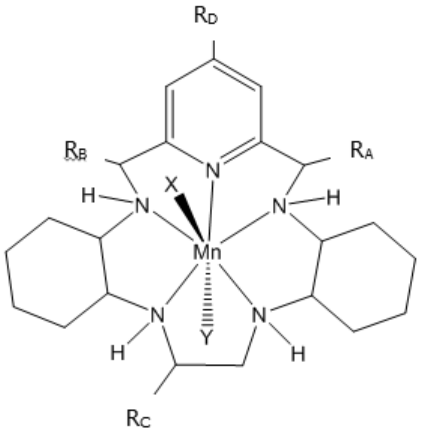
7. The use of claim 1, wherein the mammalian subject is a human subject.

8. The use according to claim 1, wherein R_1, R_2, R'_2, R_3, R_4, R_5, R'_5, R_6, R'_6, R_7, R_8, R_9, R'_9, and R_{10} are each hydrogen.

9. The use according to claim 1, wherein W is an unsubstituted pyridine moiety.

10. The use according to claim 1, wherein U and V are transcyclohexanyl fused rings.

11. The use according to claim 1, wherein the pentaaza macrocyclic ring complex is represented by Formula (II)



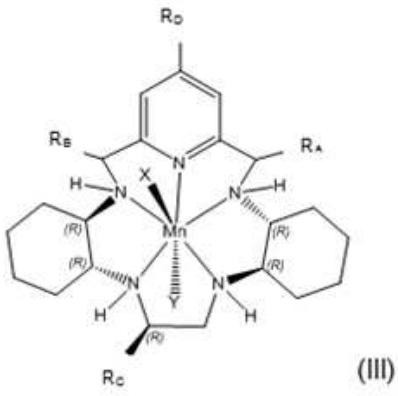
(II)

wherein

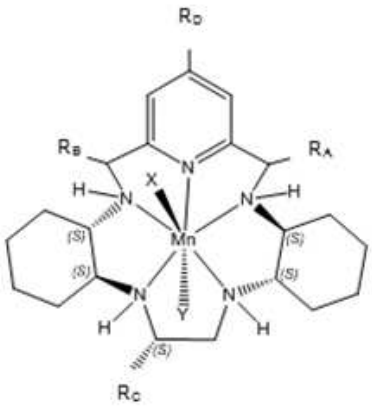
X and Y represent suitable ligands which are derived from any monodentate or polydentate coordinating ligand or ligand system or the corresponding anion thereof; and

R_A, R_B, R_C, and R_D are independently hydrogen, hydrocarbyl, substituted hydrocarbyl, heterocyclyl, an amino acid side chain moiety, or a moiety selected from the group consisting of $-OR_{11}$, $-NR_{11}R_{12}$, $-COR_{11}$, $-CO_2R_{11}$, $-CONR_{11}R_{12}$, $-SR_{11}$, $-SOR_{11}$, $-SO_2R_{11}$, $-SO_2NR_{11}R_{12}$, $-N(OR_{11})(R_{12})$, $-P(O)(OR_{11})(OR_{12})$, $-P(O)(OR_{11})(R_{12})$, and $-OP(O)(OR_{11})(OR_{12})$, wherein R_{11} and R_{12} are independently hydrogen or alkyl.

12. The use according to claim 1, wherein the pentaaza macrocyclic ring complex is represented by Formula (III) or Formula (IV):



(III)



(IV)

wherein

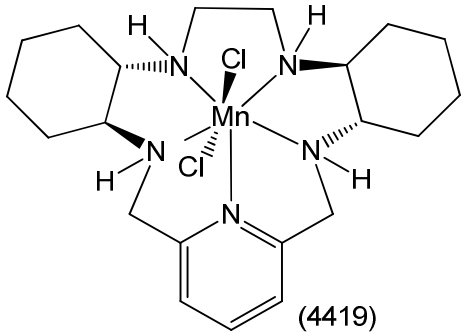
X and Y represent suitable ligands which are derived from any monodentate or polydentate coordinating ligand or ligand system or the corresponding anion thereof; and

R_A, R_B, R_C, and R_D are independently hydrogen, hydrocarbyl, substituted hydrocarbyl, heterocyclyl, an amino acid side chain moiety, or a moiety selected from the group consisting of $-OR_{11}$, $-NR_{11}R_{12}$, $-COR_{11}$, $-CO_2R_{11}$, $-CONR_{11}R_{12}$, $-SR_{11}$, $-SOR_{11}$, $-SO_2R_{11}$, $-SO_2NR_{11}R_{12}$, $-N(OR_{11})(R_{12})$, $-P(O)(OR_{11})(OR_{12})$, $-P(O)(OR_{11})(R_{12})$, and $-OP(O)(OR_{11})(OR_{12})$, wherein R_{11} and R_{12} are independently hydrogen or alkyl.

13. The use according to claim 1, wherein X and Y are independently selected from the group consisting of fluoro, chloro, bromo, and iodo anions.

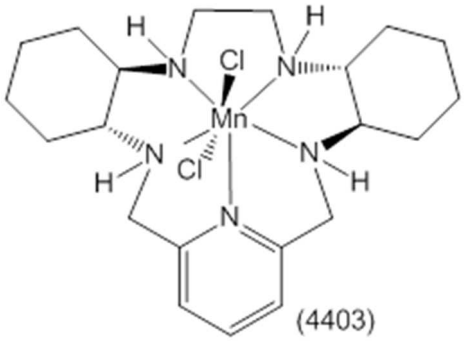
14. The use according to claim 1, wherein X and Y are independently selected from the group consisting of alkyl carboxylates, aryl carboxylates and arylalkyl carboxylates.

15. The use according to claim 1, wherein the pentaaza macrocyclic ring complex is a compound represented by the formula:



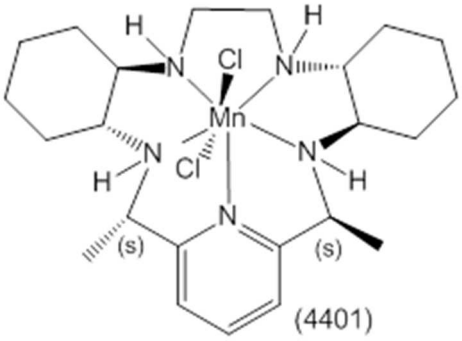
(4419) .

16. The use according to claim 1, wherein the pentaaza macrocyclic ring complex is a compound represented by the formula:



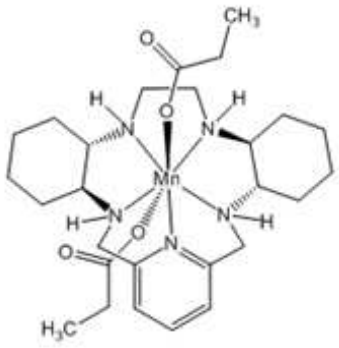
(4403) ;

wherein the pentaaza macrocyclic ring complex is a compound represented by the formula:



(4401) ; and

wherein the pentaaza macrocyclic ring complex is represented by the formula:



GC4711

17. The use according to claim 1, wherein the pentaaza macrocyclic ring complex is to be administered to the subject in a dose in a range of from 0.2 mg/kg to 40 mg/kg; wherein the pentaaza macrocyclic ring complex is to be administered via at least one of parenteral route and oral route.

18. The use according to claim 1, wherein the mammalian subject is at increased risk of carcinogenesis, or will be at increased risk of carcinogenesis due occupational exposure to radiation; wherein the mammalian subject is at increased risk of

carcinogenesis, or will be at increased risk of carcinogenesis due to accidental exposure to radiation.

19. The use according to claim 18, wherein the accidental exposure is due to a nuclear accident or terrorist incident; and wherein the occupational exposure is in a lab or hospital.

20. The use according to claim 18, wherein the mammalian subject is a first responder.

21. The use according to claim 1, wherein mammalian subject has or will be receiving radionuclide therapy.

22. The use according to claim 1, wherein the mammalian subject is a pediatric patient that has or will be receiving therapeutic radiation therapy for the treatment of cancer.

23. The use according to claim 1, wherein the mammalian subject has an increased likelihood of secondary tumor development due to therapeutic radiation therapy provided to treat cancer.