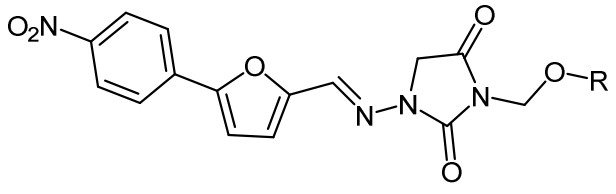
What is claimed is:

1. Use of a pharmaceutical composition comprising a therapeutically effective amount of a compound of formula I, a compound of formula II, or a pharmaceutically acceptable salt thereof, or a combination thereof



I

wherein R is $-P(O)(OH)_2$ or $-P(O)(OR_1)(OR_2)$;

R_1 is H, $-C_{1-26}$alkyl, aryl, C_{1-6}alkC(O)O-C_{1-26}alkyl, $-C_1$alkOC(O)C_{1-26}alkyl, or C_1alkOC(O)OC_{1-26}alkyl; and

R_2 is $-C_{1-26}$alkyl, aryl, C_{1-6}alkC(O)O-C_{1-26}alkyl, $-C_1$alkOC(O)C_{1-26}alkyl, or C_1alkOC(O)OC_{1-26}alkyl;

in the manufacture of a medicament for the therapeutic and/or prophylactic treatment of a human subject that has been or will be exposed to radiation, wherein the radiation is X-ray radiation, gamma ray radiation, neutron radiation, or a combination thereof, wherein the medicament is suitable for subcutaneous or intramuscular administration.

2. The use of the pharmaceutical composition of claim 1, wherein R is $-P(O)(OH)_2$.

3. The use of the pharmaceutical composition of claim 1, wherein R is $P(O)(OR_1)(OR_2)$.

4. The use of the pharmaceutical composition of claim 3, wherein R_1 is H.

5. The use of the pharmaceutical composition of claim 3, wherein R_1 is $-C_{1-26}$alkyl.

6. The use of the pharmaceutical composition of claim 3, wherein R_1 is aryl.

7. The use of the pharmaceutical composition of claim 3, wherein R_1 is C_{1-6}alkC(O)O-C_{1-26}alkyl.

8. The use of the pharmaceutical composition of claim 3, wherein R_1 is -C_1alkOC(O)C_{1-26}alkyl.

9. The use of the pharmaceutical composition of claim 3, wherein R_1 is C_1alkOC(O)OC_{1-26}alkyl.

10. The use of the pharmaceutical composition of any one of claims 4 to 9, wherein R_2 is -C_{1-26}alkyl, aryl.

11. The use of the pharmaceutical composition of any one of claims 4 to 9, wherein R_2 is C_{1-6}alkC(O)O-C_{1-26}alkyl.

12. The use of the pharmaceutical composition of any one of claims 4 to 9, wherein R_2 is -C_1alkOC(O)C_{1-26}alkyl.

13. The use of the pharmaceutical composition of any one of claims 4 to 9, wherein R_2 is C_1alkOC(O)OC_{1-26}alkyl.

14. The use of the pharmaceutical composition of any one of the preceding claims, wherein the compound of formula I is in the form of a pharmaceutically acceptable salt.

15. The use of the pharmaceutical composition of any one of the preceding claims, wherein the human subject has been or will be exposed to a radiation dose of between 0.3 Gy and 50 Gy.

16. The use of the pharmaceutical composition of any one of the preceding claims, wherein the human subject has been or will be exposed to a radiation dose of at least 0.7 Gy.

17. The use of the pharmaceutical composition of any one of the preceding claims, wherein the human subject has been or will be exposed to a radiation dose of at least 6 Gy, at least 10 Gy, or at least 50 Gy.

18. The use of the pharmaceutical composition of any one of the preceding claims, wherein the radiation exposure is chemoradiation exposure.

19. The use of the pharmaceutical composition of any one of claims 1 to 17, wherein the radiation exposure is nuclear power plant leakage exposure.

20. The use of the pharmaceutical composition of any one of claims 1 to 17, wherein the radiation exposure is nuclear weapon exposure.

21. The use of the pharmaceutical composition of any one of the preceding claims, wherein the pharmaceutical composition is to be administered to the human subject 24 hours or less after the human subject has been exposed to the radiation.

22. The use of the pharmaceutical composition of any one of the preceding claims, wherein the therapeutically effective amount is 1 mg/kg to about 30 mg/kg of a compound of formula I.

23. The use of the pharmaceutical composition of any one of the preceding claims, wherein the pharmaceutical composition is to be administered to the human subject prior to the subject being exposed to the radiation.

24. The use of the pharmaceutical composition of any one of the preceding claims, wherein the pharmaceutical composition comprises a compound of formula I or a pharmaceutically acceptable salt thereof, mannitol, a polysorbate, a povidone, an optional pH adjustor, and water.

25. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment lowers the mortality of the human subject as a result of the radiation exposure, as compared to a control subject that did not receive the treatment.

26. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment improves at least one hematological parameter of the human subject, as compared to a control subject that did not receive the treatment.

27. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating hematopoietic syndrome occurring in the human subject as a result of the radiation exposure.

28. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating gastrointestinal syndrome occurring in the human subject as a result of the radiation exposure.

29. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating cardiovascular syndrome occurring in the human subject as a result of the radiation exposure.

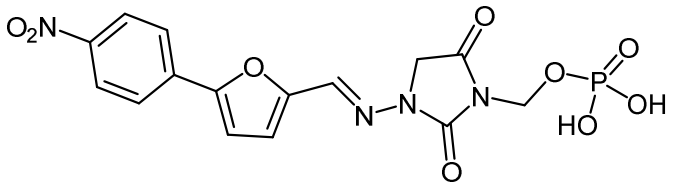
30. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating central nervous system syndrome occurring in the human subject as a result of the radiation exposure.

31. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating anorexia, nausea, vomiting, cramps, or diarrhea occurring in the human subject as a result of the radiation exposure.

32. The use of the pharmaceutical composition of any one of the preceding claims, wherein the treatment is effective for treating cognitive changes or behavior changes occurring in the human subject as a result of the radiation exposure.

33. The use of the pharmaceutical composition for use of any one of the preceding claims, comprising a pharmaceutically acceptable salt of formula I, wherein R is $-P(O)(OH)_2$.

34. The use of the pharmaceutical composition for use of any one of the preceding claims, comprising a tromethamine salt of Formula I-A:



I-A.