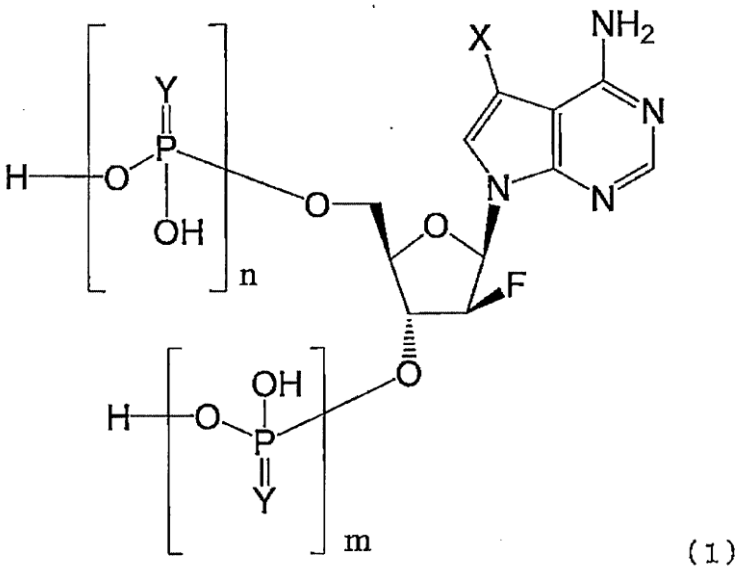
Claims

1. A compound represented by the following general formula (1):

[Formula 1]



(1)

wherein

X represents a chlorine atom, a bromine atom or an iodine atom,

Ys, which may be the same or different, each represent an oxygen atom or a sulfur atom,

m represents an integer of 0 or 1,

n represents an integer of 0 or 1, and

m + n = 1,

or a pharmaceutically acceptable salt thereof.

2. The compound or a pharmaceutically acceptable salt thereof according to claim 1, wherein X represents a bromine atom or an iodine atom.

3. The compound or a pharmaceutically acceptable salt thereof according to claim 2, wherein X represents an iodine atom.

4. The compound or a pharmaceutically acceptable salt thereof according to claim 3, wherein Y represents an oxygen atom.

5. The compound or a pharmaceutically acceptable salt thereof according to claim 4, wherein m = 0 and n = 1.

6. The compound or a pharmaceutically acceptable salt thereof according to claim 1, wherein X represents a bromine atom or an iodine atom; Y represents an oxygen atom; m = 0; and n = 1.

7. A compound selected from the group consisting of:

(1) ((2R,3R,4S,5R)-5-(4-amino-5-bromo-7H-pyrrolo [2,3-d]pyrimidin-7-yl)-4-fluoro-3-hydroxytetrahydrofuran-2-yl)methyl dihydrogen phosphate;

(2) ((2R,3R,4S,5R)-5-(4-amino-5-iodo-7H-pyrrolo[2,3-d]pyrimidin-7-yl)-4-fluoro-3-hydroxytetrahydrofuran-2-yl) methyl dihydrogen phosphate;

(3) O-(((2R,3R,4S,5R)-5-(4-amino-5-iodo-7H-pyrrolo [2,3-d]pyrimidin-7-yl)-4-fluoro-3-hydroxytetrahydrofuran-2-yl)methyl) O,O-dihydrogen phosphorothioate;

(4) (2R,3R,4S,5R)-5-(4-amino-5-iodo-7H-pyrrolo[2,3-d]pyrimidin-7-yl)-4-fluoro-2-(hydroxymethyl)tetrahydro-furan-3-yl dihydrogen phosphate; and

(5) (2R,3R,4S,5R)-5-(4-amino-5-chloro-7H-pyrrolo [2,3-d]pyrimidin-7-yl)-4-fluoro-3-hydroxytetrahydrofuran-2-yl)methyl dihydrogen phosphate

or a pharmaceutically acceptable salt thereof.

8. An antitumor agent comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7, as an active ingredient.

9. A pharmaceutical composition comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 and a pharmaceutical acceptable carrier.

10. The antitumor agent according to claim 8 or the pharmaceutical composition according to claim 9, formulated as an oral preparation or an injectiable preparation.

11. The compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 for use as a pharmaceutical composition.

12. The compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7, formulated as an oral preparation or an injectable preparation.

13. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7, in the manufacture of a medicament in the form of an antitumor agent or a pharmaceutical composition wherein the tumor is selected from the group consisting of head and neck cancer (e.g. oral cancer, pharyngeal cancer, laryngeal cancer, nasal cancer, sinus cancer, salivary gland cancer, thyroid cancer), gastrointestinal cancer (e.g., esophageal cancer, stomach cancer, duodenal cancer, liver cancer, biliary tract cancer (e.g., gall bladder/bile duct cancer), pancreatic cancer, colorectal cancer (e.g., colon cancer, rectal cancer)), lung cancer (e.g., non-small cell lung cancer, small cell lung cancer, mesothelioma), breast cancer, genital cancer (e.g., ovarian cancer, uterine cancer (e.g., cervical cancer, endometrial cancer)), urinary cancer (e.g., kidney cancer, bladder cancer, prostate cancer, a testicular tumor), a hematopoietic organ tumor (e.g., leukemia, malignant lymphoma, multiple myeloma), a bone/soft tissue tumor, skin cancer and a brain tumor.

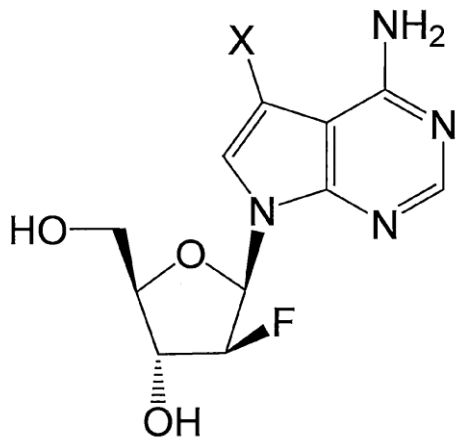
14. The use of claim 13 wherein the antitumor agent, is formulated as an oral preparation or an injectable preparation.

15.The antitumor agent according to claim 8, , , wherein the tumor is selected from the group consisting of head and neck cancer (e.g. oral cancer, pharyngeal cancer, laryngeal cancer, nasal cancer, sinus cancer, salivary gland cancer, thyroid cancer), gastrointestinal cancer (e.g., esophageal cancer, stomach cancer, duodenal cancer, liver cancer, biliary tract cancer (e.g., gall bladder/bile duct cancer), pancreatic cancer, colorectal cancer (e.g., colon cancer, rectal cancer)), lung cancer (e.g., non-small cell lung cancer, small cell lung cancer, mesothelioma), breast cancer, genital cancer (e.g., ovarian cancer, uterine cancer (e.g., cervical cancer, endometrial cancer)), urinary cancer (e.g., kidney cancer, bladder cancer, prostate cancer, a testicular tumor), a hematopoietic organ tumor (e.g., leukemia, malignant lymphoma, multiple myeloma), a bone/soft tissue tumor, skin cancer and a brain tumor.

16. The antitumor agent according to claim 15, or the use according to claim 13, wherein the tumor is a brain tumor.

17. A compound represented by the following general formula (2):

[Formula 2]



(2)

wherein

X represents a chlorine atom, a bromine atom or an iodine atom,

or a pharmaceutically acceptable salt thereof.

18. An antitumor agent comprising the compound or a pharmaceutically acceptable salt thereof according to claim 17, as an active ingredient.

19. A pharmaceutical composition comprising the compound or a pharmaceutically acceptable salt thereof according to claim 17 and a pharmaceutically acceptable carrier.

20.The antitumor agent according to claim 18 or the pharmaceutical composition according to claim 19,

formulated as an oral preparation or an injectable preparation.

21. The compound or a pharmaceutically acceptable salt thereof according to claim 17, for use in preventing and/or treating a tumor.

22. Use of the compound or a pharmaceutically acceptable salt thereof according to claim 17, in the manufacture of a medicament in the form of a pharmaceutical composition or antitumor agent to treat a tumor, wherein the tumor is selected from the group consisting of head and neck cancer (e.g., oral cancer, pharyngeal cancer, laryngeal cancer, nasal cancer, sinus cancer, salivary gland cancer, thyroid cancer), gastrointestinal cancer (e.g., esophageal cancer, stomach cancer, duodenal cancer, liver cancer, biliary tract cancer (e.g., gall bladder/bile duct cancer), pancreatic cancer, colorectal cancer (e.g., colon cancer, rectal cancer)), lung cancer (e.g., non-small cell lung cancer, small cell lung cancer, mesothelioma), breast cancer, genital cancer (e.g., ovarian cancer, uterine cancer (e.g., cervical cancer, endometrial cancer)), urinary cancer (e.g., kidney cancer, bladder cancer, prostate cancer, a testicular tumor), a hematopoietic organ tumor (e.g., leukemia, malignant lymphoma, multiple myeloma), a bone/soft tissue tumor, skin cancer and a brain tumor.

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23. The antitumor agent according to claim 18, wherein the tumor is selected from the group consisting of head and neck cancer (e.g., oral cancer, pharyngeal cancer, laryngeal cancer, nasal cancer, sinus cancer, salivary gland cancer, thyroid cancer), gastrointestinal cancer (e.g., esophageal cancer, stomach cancer, duodenal cancer, liver cancer, biliary tract cancer (e.g., gall bladder/bile duct cancer), pancreatic cancer, colorectal cancer (e.g., colon cancer, rectal cancer)), lung cancer (e.g., non-small cell lung cancer, small cell lung cancer, mesothelioma), breast cancer, genital cancer (e.g., ovarian cancer, uterine cancer (e.g., cervical cancer, endometrial cancer)), urinary cancer (e.g., kidney cancer, bladder cancer, prostate cancer, a testicular tumor), a hematopoietic organ tumor (e.g., leukemia, malignant lymphoma, multiple myeloma), a bone/soft tissue tumor, skin cancer and a brain tumor.

24. The antitumor agent or pharmaceutical composition, according to claim 18 or the use according to claim 22, wherein the tumor is a brain tumor.

25. The antitumor agent or pharmaceutical composition consisting of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1

to 7 or claim 17, which is to be used in combination with an alkylating agent.

26. An enhancer of an antitumor effect comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, for enhancing an antitumor effect of an alkylating agent.

27. An antitumor agent comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, for treating a cancer patient having received an administration of an alkylating agent.

28. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for treating a tumor, which is to be administered in combination with an alkylating agent.

29. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for enhancing an antitumor effect of an alkylating agent, which is to be administered in combination with an alkylating agent.

30. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for treating a tumor of a cancer patient who has already received an administration of an alkylating agent.

31. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for enhancing an antitumor effect of an alkylating agent, of a cancer patient who has already received an administration of an alkylating agent.

32. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of a anti tumor agent for the treatment of a tumor wherein the antitumor agent is to be administered in combination with an alkylating agent.

33.Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for enhancing an antitumor effect of an alkylating agent, wherein the medicament is to be administered in combination with an alkylating agent.

34.Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of an antitumor agent, wherein the antitumor agent is to be administered to a cancer patient who has received an administration of an alkylating agent or a cancer patient who has yet to receive an administration of an alkylating agent.

35. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for enhancing of an antitumor effect of an alkylating agent, wherein the medicament is to be administered to a cancer patient who has received an administration of an alkylating agent or a cancer patient who has yet to receive an administration of an alkylating agent.

36. The antitumor agent according to claim 27 or claim 29, the enhancer of an antitumor effect according to claim 26, t or the use according to any one of claims 36 to 43, wherein the alkylating agent is temozolomide.

37. The antitumor agent according to claim 30 or 32, the enhancer of an antitumor effect according to claim 31, or the use according to any one of claims 28 to 35, which is

to be used in combination with a radiation therapy in addition to the alkylating agent.

38.An antitumor agent consisting of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, which is to be used in combination with a radiation therapy.

39. An enhancer of an antitumor effect comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, for enhancing an antitumor effect of a radiation therapy.

40. An antitumor agent or a pharmaceutical composition comprising the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, for treating a cancer patient who has received a radiation therapy.

41. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for treating a tumor, which is to be used in combination with a radiation therapy.

42. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or

claim 17, for enhancing an antitumor effect, which is to be used in combination with a radiation therapy.

43. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament for treating a tumor, after a cancer patient has received a radiation therapy.

44. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament to enhance an antitumor effect, after a cancer patient has received a radiation therapy.

45. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of an antitumor agent for the treatment of a tumor, wherein the antitumor agent is to be used in combination with a radiation therapy.

46. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of an enhancer of an antitumor effect, for the treatment

of a tumor, wherein the enhancer of an antitumor effect is to be used in combination with a radiation therapy.

47. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of an antitumor agent for the treatment of a tumor, wherein the medciament is to be administered to a cancer patient who has received a radiation therapy.

48. Use of the compound or a pharmaceutically acceptable salt thereof according to any one of claims 1 to 7 or claim 17, in the manufacture of a medicament in the form of an enhancer of an antitumor effect, for the treatment of a tumor, wherein the medicament is to be administered to a cancer patient who has received a radiation therapy.

49. The antitumor agent according to claim 38 or claim 40, the enhancer of an antitumor effect according to claim 39, or the use according to any one of claims 41 to 48, which is to be used in combination with an alkylating agent in addition to the radiation therapy.

50. The antitumor agent, enhancer of an antitumor effect, or use according to claim 49, wherein the alkylating agent is temozolomide.