may be optionally substituted with one or more substituents, and the substituents is selected independently of each other a group consisting of a C_{1-3} alkyl group which may be optionally substituted with one or more halogen atoms, a halogen atom, and an amino group which may be optionally substituted with one or more C_{1-3} alkyl group.

[10] The compound according to [9] or salts thereof wherein the five or six membered heteroaryl group is selected from~~represents~~ a group consisting of a triazolyl group, an oxadiazolyl group, a thiadiazolyl group, a pyrimidinyl group, and a pyrazinyl group, each may be optionally substituted with one or more substituents.

[11] The compound according to [10] or salts thereof wherein the triazolyl group which may be optionally substituted with one or more substituents represents 1,5-dimethyl-1,2,4-triazol-3-yl group.

[12] The compound according to [10] or salts thereof wherein the oxadiazolyl group which may be optionally substituted with one or more substituents represents 5-methyl-1,2,4-oxadiazol-3-yl group.

[13] The compound according to [10] or salts thereof wherein the thiadiazol group which may be optionally substituted with one or more substituents represents 3-methyl-1,2,4-thiadiazol-5-yl group.

[14] The compound according to any one of [1] to [3] or salts

yl]benzamide (Present compound 2);

[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-2-(2-methylpropanoylamino)purin-6-yl]N,N-diphenylcarbamate (Present compound 3);

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-purin-6-yl]benzamide (Present compound 4);

3-[[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile (Present compound 5);

N-[1-[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl)oxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide (Present compound 6);

(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-methyl-3-(5-methyl-2,4-

(such as muscle), which accordingly can be expected to use as novel nucleic acid medicine.

MODE FOR CARRYING OUT THE INVENTION

[0012]

Hereinafter, the present invention is further explained in details. All of the publications cited herein are incorporated herein by reference.

(Definition)

First, the definitions of the terms as used herein are described.

[0013]

The term of "C_{1-6} alkyl which may be optionally substituted with one or more substituents" as used herein encompasses any straight chain alkyl group having 1 to 6 carbon atoms (C_{1-6}), preferably 1 to 4 carbon atoms (C_{1-4}), more preferably 1 to 3 carbon atoms (C_{1-3}), any branched chain alkyl group having 3 to 6 carbon atoms in which the identical or different branched chains are contained, any cyclic alkyl group having 3 to 6 carbon atoms, and any combinations thereof which have 4 to 6 carbon atoms. Specific examples of the straight chain alkyl group having 1 to 6 carbon atoms include methyl, ethyl, normal (which is abbreviated as "n")-propyl, iso (which is abbreviated as "i")- propyl, n-butyl, n-pentyl, and n-hexyl. Specific examples of the branched

The term of "an aromatic group which may be optionally substituted with one or more substituents" as used herein means to encompass both of an aryl group and a heteroaryl group. The aryl group and the heteroaryl group may be independently of each other substituted with one or more substituents. Examples of the substituents include one or more (or preferably one to three) identical or different groups selected from the group consisting of a hydroxy group, a halogen atom, a nitro group, a cyano group, a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, a C_{2-6} alkenyl group which may be optionally substituted with one or more substituents, a C_{2-6} alkynyl group which may be optionally substituted with one or more substituents, a hydroxy group, a C_{1-6} alkoxy group, an aryloxy group, an amino group which may be optionally substituted with one or more C_{1-3} alkyl groups, an C_{1-6} alkyl groups which may be optionally substituted with one or more halogen atoms, and an aryl group, preferably a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, an amino group which may be optionally substituted with one or more C_{1-3} alkyl groups, and a halogen atom, and more preferably a trifluoromethyl group, a dimethylamino group, a chloro atom and the others, and any groups not being affected under a reaction condition for oligomerization is preferably included.

trifluoromethyl group, a dimethylamino group, a chloro atom and the others, and any groups not being affected under a reaction condition for oligomerization is preferably included.

Specific examples of the aryl group which may be optionally substituted with one or more substituents include 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, 2,6-dimethylphenyl, 2,4-dimethylphenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 2,5-dichlorophenyl, 2,6-dichlorophenyl, 2-bromophenyl, 4-methoxyphenyl, 4-chlorophenyl, 2-nitrophenyl, 4-nitrophenyl, 2-nitrophenyl, 2,6-dinitrophenyl, 2-trifluoromethylphenyl, 3-trifluoromethylphenyl, 4-trifluoromethylphenyl, 2-dimethylaminophenyl, 3-dimethylaminophenyl, 4-dimethylaminophenyl, and biphenyl and the others. Preferred examples of the aryl group include a phenyl group which is substituted with halogen atom, C_{1-6} alkoxy group or nitro group, or an unsubstituted phenyl group.

[0019]

The term of "heteroaryl (group)" as used herein represents a monovalent group in which one hydrogen atom is excluded from optional heteroaromatic compound containing one or more heteroatoms (such as nitrogen atom, oxygen atom, and/or sulfur atom) in a ring structure and having 5 to 12 carbon atoms, consisting of one or more five membered and/or

trifluoromethyl group, a dimethylamino group, a chloro atom and the others, and any groups not being affected under a reaction condition for oligomerization is preferably included.

Specific examples of the heteroaryl group which may be optionally substituted with one or more substituents include 1,2,4-triazolyl, 1,5-dimethyl-1,2,4-triazolyl, 1,2,4-oxadiazolyl, 5-methyl-1,2,4-oxadiazol-3-yl, 1,2,4-thiadiazolyl, 3-methyl-1,2,4-thiadiazol-5-yl, 1,3-pyrimidinyl, 1,5-pyrimidinyl, 4-trifluoromethyl, 1,5-pyrimidinyl, 4-dimethylamino-2,4-pyrimidinyl, 3-dimethylamino-2,4-pyrimidinyl, 3-chloro-1,5-pyrimidinyl, and 1,4-pyridazinyl, and preferably 1,5-dimethyl-1,2,4-triazol-3-yl, 1,2,4-oxadiazolyl, 3-methyl-1,2,4-thiadiazol-5-yl, 1,5-pyrimidinyl, 4-trifluoromethyl-1,5-pyrimidinyl, 4-dimethylamino-2,4-pyrimidinyl, 3-dimethylamino-2,4-pyrimidinyl, 3-chloro-1,5-pyrimidinyl, and 1,4-pyridazinyl, and more preferably 1,5-dimethyl-1,2,4-triazol-3-yl, 1,2,4-oxadiazol-3-yl, and 3-methyl-1,2,4-thiadiazol-5-yl.

[0020]

Examples of the term of "five or six membered heteroaryl group containing one or more heteroatoms selected from the group consisting of nitrogen atom, oxygen atom and sulfur atom, which may be optionally substituted with one or more substituents" as used herein include a five membered cyclic

phenyl, 4-methylphenyl, and the others, preferably methyl and phenyl.

[0023]

The term of "C_{1-6} alkoxy group" as used herein represents a monovalent group in which the C_{1-6} alkyl binds to an oxygen atom, and represents a C_{1-6} alkyl-O group. Specific examples thereof include methoxy, ethoxy, n-propoxy, i-propoxy, n-butoxy, t-butoxy, s-butoxy, 3-methylbutoxy, and the others, which are not limited thereto.

[0024]

The term of "aryloxy (group)" as used herein represents a monovalent group in which the aryl group is bonded to an oxygen atom. Specific examples thereof include phenoxy, p-tolyl and the others, which are not limited thereto.

[0025]

The term of "amino group which may be optionally substituted with one or more C_{1-3} alkyl groups" as used herein represents an amino group which may be optionally substituted with one or more hydrogen atoms may be optionally substituted with a C_{1-3} alkyl group. Specific examples thereof include methylamino, ethylamino, isopropylamino, dimethylamino, diethylamino, methylethylamino, and the others, which are not limited thereto.

[0026]

Examples of the term of "halogen (atom)" as used herein

alkoxy group having 1 to 6 carbon atoms, halogen atom, and/or cyano group; a carbonyl group substituted with alkoxy group having 1 to 6 carbon atoms; an aryl group substituted with halogen atom, alkoxy group having 1 to 6 carbon atoms and/or nitro group; a carbonyl group substituted with alkoxy group having 1 to 6 carbon atoms, said alkoxy group being substituted with halogen atom and/or silyl group substituted with alkyl group having 1 to 6 carbon atoms; an alkenyloxycarbonyl group; an aralkyloxycarbonyl group which may be optionally substituted with alkoxy group having 1 to 6 carbon atoms and/or aryl group substituted with nitro group; and the others.

[0029]

The term of "protecting group for hydroxy group" represents a protecting group that is usually used in an organic synthetic chemistry (in particular, nucleic acid synthesis), and includes, for example, an aliphatic acyl group; an aromatic acyl group; an aminocarbonyl group which may be substituted; an alkoxycarbonyl group which may be substituted; an aliphatic sulfonyl group; an aromatic sulfonyl group; a methyl group substituted with one to three aryl groups; a methyl group substituted with one to three aryl groups, said aryl group being substituted with alkyl group having 1 to 6 carbon atoms, alkoxy group having 1 to 6 carbon atoms, halogen atom and/or cyano group; or a silyl

thio-1,3,2-oxa-thiaphospharane containing five valent phosphorus atom, which is described in non-patent document, K. W. Knouse et al., Science 10. 1126/science. aau3369 (2018), which is not limited thereto.

[0032]

The term of "protecting group for amino group" represents a protecting group that is usually used in an organic synthetic chemistry (in particular, nucleic acid synthesis), and include, for example, an aliphatic acyl group; an aromatic acyl group; an alkoxycarbonyl group which may be optionally substituted; a methyl group substituted with one to three aryl groups; and a methyl group substituted with aryl groups, said aryl group being substituted with halogen atom and/or cyano group. Specific examples thereof include acetyl (Ac), phenoxyacetyl (Pac), t-butylphenoxyacetyl group (Tac), p-isopropyl phenoxyacetyl group (iPc-Pac), trifluoroacetyl, propionyl group, isobutyryl, benzoyl (Bz), methoxycarbonyl, ethoxycarbonyl, t-butoxycarbonyl (Boc), trimethylsilylethoxycarbonyl (Teoc), cyanoethoxycarbonyl (Ceoc), benzyloxycarbonyl (Cbz), allyloxycarbonyl, 9-fluorenylmethoxycarbonyl (Fmoc), dimethylaminomethylenyl, 2,2,2-trichloroethoxycarbonyl, t-amyloxycarbonyl, 4-methoxybenzyl, triphenylmethyl, 2-nitrobenzenesulfonyl, 2,4-dinitrobenzenesulfonyl or 2-(trimethylsilyl)ethoxymethyl and the others, which are not

and includes diphenylaminocarbonyl group, silyl group (such as trimethylsilyl group, dimethylhexylsilyl group, t-butyldimethylsilyl group, and t-butyldiphenylsilyl group), trityl group, alkyl group, acyl group (such as acetyl group, propionyl group, isobutyryl group, benzoyl group (Bz), phenoxyacetyl group (Pac)), alkoxycarbonyl group (such as t-butoxycarbonyl group (Boc), benzyloxycarbonyl group (Cbz), diphenylaminocarbonyl group (DPC), cyanoethoxycarbonyl group (Ceoc)), sulfonyl group (such as methanesulfonyl group, and p-toluenesulfonyl group), dimethylaminomethylenyl group, and the others, which are not limited thereto.

[0042]

The term of "artificial nucleic acid" as used herein encompasses artificial nucleoside, artificial nucleotide (herein, one nucleoside or nucleotide is sometimes referred to as a monomer) or artificial oligonucleotide. These artificial nucleic acids are not natural nucleic acids, but nucleic acids that can be produced only artificially. Examples of these artificial nucleic acids include those in which the nucleic acid base moiety contains an unnatural base, those having a sugar in which the sugar moiety is modified, and/or those containing an unnatural phosphate group as a phosphate moiety, and the artificial nucleic acids as used herein represents those in which the sugar moiety contains an unnatural sugar, in particular, those containing

X represents a group represented by formula (II-2); and

the five or six membered heteroaryl group as A group is selected from the group consisting of a triazolyl group, an oxadiazolyl group, a thiadiazolyl group, a pyrimidinyl group, and a pyrazinyl group, each may be optionally substituted with one or more substituents,

is provided.

[0066]

According to one embodiment of the present application, a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-2); and

the triazolyl group which may be optionally substituted with one or more substituents represents 1,5-dimethyl-1,2,4-triazol-3-yl group,

is provided.

[0067]

According to one embodiment of the present application, a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-2); and

the oxadiazolyl group which may be optionally substituted with one or more substituents represents 5-methyl-1,2,4-oxadiazol-3-yl group,

is provided.

[0068]

According to one embodiment of the present application,

a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-2); and

the thiadiazolyl group which may be optionally substituted with one or more substituents represents 3-methyl-1,2,4-thiadiazol-5-yl group,

is provided.

[0069]

According to one embodiment of the present application, a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-3); and

M represents a sulfonyl group which is substituted with one substituent selected from a C1-6 alkyl group which may be optionally substituted with one or more substituents, and an aryl group which may be optionally substituted with one or more substituents,

is provided.

[0070]

According to one embodiment of the present application, a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-3); and

M represents a sulfonyl group which is substituted with one substituent selected from the group consisting of a methyl group which may be optionally substituted with one or more substituents, and a phenyl group which may be optionally

substituted with one or more substituents,

is provided.

[0071]

According to one embodiment of the present application, a compound ~~group~~ represented by formula (I) or salts thereof wherein

X represents a group represented by formula (II-3); and

M represents a sulfonyl group which is substituted with one or more substituents selected from the group consisting of a methyl group and a phenyl group,

is provided.

[0072]

According to one embodiment of the present application, as specific examples of the compound represented by formula (I) or salts thereof, one or more compounds selected from the following compounds or salts thereof are provided.

The compounds selected from the group consisting of the following compounds:

3-[[(1R,4R,6R,7S)-4-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-6-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-2-methylsulfonyl-5-oxa-2-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile (Present compound 1);

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-

yl]benzamide (Present compound 2);

[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-2-(2-methylpropanoylamino)purin-6-yl]N,N-diphenylcarbamate (Present compound 3);

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-purin-6-yl]benzamide (Present compound 4);

3-[[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisoprop~~n~~ylamino)phosphanyl]oxypropanenitrile (Present compound 5);

N-[1-[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl)oxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide (Present compound 6);

(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-methyl-3-(5-methyl-2,4-

chromatography (chloroform/methanol, 100/0 to 95/5) to a compound 2Ac (10.6 g, yields over three steps 75%).

MS(ESI): m/z = 763 $(M+H)^+$

[0163]

Example 12 Synthesis of Compound 2Ad

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-purin-6-yl]benzamide (Present compound 4)

To a solution of the compound 2Ac (5.60 ~~m~~g, 7.01 mmol) in dichloromethane (40 mL) were added DIPEA (4.8 mL, 28.0 mmol) and 2-cyanoethyl N,N-diisopropylchloro phosphoramidite (4.7 mL, 21.0 mmol) in ice-cooling, and the mixture was stirred at room temperature for 4 hours. Thereto was added ethanol (1.2 mL, 21.0 mmol) under ice-cooling, and the mixture was stirred at room temperature for 5 minutes. The mixture was placed again under ice-cooling, and thereto were added saturated sodium bicarbonate water (20 mL), and saturated brine (20 mL), and the mixture was stirred, and the organic layer was passed through a phase separator. After the filtrates were evaporated under reduced pressure, the resulting residue was purified by silica gel chromatography (hexane/ethyl acetate, 67/33 to 10/90) to obtain a compound 2Ad as the present compound 4 (5.44 g,

under ice-cooling, and thereto was added benzenesulfonyl chloride (0.21 mL, 1.6 mmol), and the mixture was stirred under ice-cooling for 4 hours. To the reaction solution was added 5% potassium carbonate solution (20 mL), and the mixture was stirred, and extracted with dichloromethane (5 mL). The aqueous layer was mixed with dichloromethane (5 mL), extracted, and the extracts were combined and mixed with the dichloromethane organic layer. After the solvent was evaporated from the organic layer, the resulting residue was purified by silica gel chromatography (hexane/ethyl acetate, 40/60 to 20/80) to obtain a compound 3Tb (0.78 g, yield 64%).

MS(ESI): m/z = 782 $(M-H)^-$

[0166]

Example 14 Synthesis of Compound 3Tc

1-[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-hydroxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methylpyrimidin-2,4-dione

A compound 3Tc (0.59 g, yield 84%) was synthesized from the compound 3Tb (0.78 g, 0.99 mmol) similarly to the Example 3.

MS(ESI): m/z = 710 $(M-H)^-$

[0167]

Example 15 Synthesis of Compound 3Td

3-[[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-3-(5-methyl-2,4-dioxo-

pyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile (Present compound 5)

To a solution of the compound 3Tc (599 mg, 0.765 mmol) in acetonitrile (3 mL) were added diisopropylammonium tetrazolide (171 mg, 0.996 mmol), 2-Cyanoethyl N,N,N',N'-Tetraisopropylphosphordiamidite (0.36 mL, 1.1 mmol), and the mixture was stirred at room temperature for 19 hours. To the reaction solution were added ethyl acetate (10 mL) and water (5 mL), and after the mixture was stirred, the aqueous layer was separated. To the aqueous layer was added ethyl acetate (10 mL), and after the mixture was mixed, the organic layer was separated. The organic layer was combined and mixed with above organic layer, and the mixture was concentrated at 40 °C under reduced pressure. The resulting residue was purified by silica gel chromatography (hexane/ethyl acetate, 67/33 to 10/90) to obtain a compound 3Td as the present compound 5 (0.65 g, yield 86%).

MS(ESI): m/z = 912 $(M+H)^+$

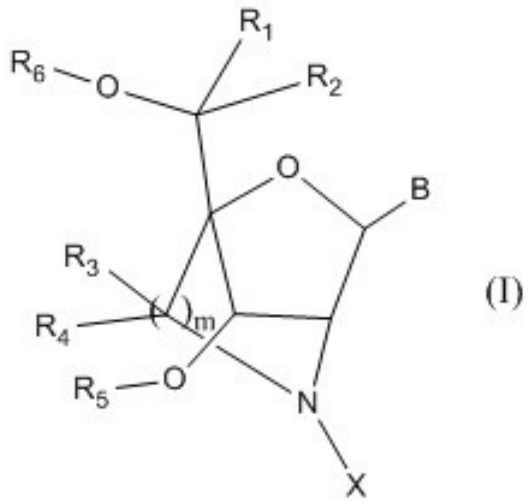
^{31}P-NMR ($CDCl_3$) δ: 149.68, 149.22

[0168]

Synthesis of ALNA[Bs]-mC

CLAIMS

1. A compound represented by general formula I:



(I)

[wherein

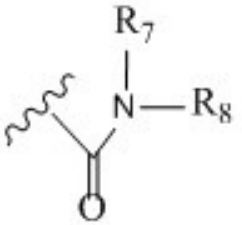
B represents a base moiety of nucleic acid wherein the base moiety may be optionally substituted with one or more substituents;

R_1, R_2, R_3 and R_4 represent independently of each other a hydrogen atom, or a C_{1-6} alkyl group which may be optionally substituted with one or more substituents;

R_5 and R_6 represent independently of each other a hydrogen atom, a protecting group for hydroxy group, or a phosphate group which may be optionally substituted with substituents;

m is an integer of 1 or 2;

X represents a group represented by the following formula (II-1), (II-2) or (II-3):



(II-1)

,



(II-2)

,



(II-3)

;

the symbols:



which is described in the formula (II-1), (II-2) or (II-3) represents a binding point to 2'-amino group;

R_7 and R_8 represent independently of each other a hydrogen atom, a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, a C_{2-6} alkenyl group which may be optionally substituted with one or more substituents, a C_{2-6} alkynyl group which may be optionally substituted with one or more substituents, or an aromatic group which may be optionally substituted with one or more substituents;

A represents an aromatic group;

M represents a sulfonyl group which is substituted with one substituent selected from the group consisting of a C_{1-6} alkyl group which may be optionally substituted with one or more substituents and an aromatic group which may be optionally substituted with one or more substituents.]

or salts thereof.

2. The compound according to claim 1 or salt thereof

wherein B represents an adeninyl group which may be optionally substituted with one or more substituents, a guaninyl group which may be optionally substituted with one or more substituents, a cytosinyl group which may be optionally substituted with one or more substituents, a 5-methylcytosinyl group which may be optionally substituted with one or more substituents, or an uracilyl group which may be optionally substituted with one or more substituents.

3. The compound according to claim 1 or 2 or salts thereof wherein R_1, R_2, R_3 and R_4 represent independently of each other a hydrogen atom; and

m is an integer of 1.

4. The compound according to any one of claims 1 to 3 or salts thereof wherein

X represents a group represented by formula (II-1); and

R_7 and R_8 represent independently of each other a hydrogen atom, a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, or an aromatic group which may be optionally substituted with one or more substituents.

5. The compound according to claim 4 or salts thereof wherein R_7 and R_8 represent independently of each other a hydrogen atom, or a C_{1-3} alkyl group which may be optionally substituted with one or more substituents.

6. The compound according to claim 5 or salts thereof wherein one of R_7 and R_8 represents a hydrogen atom, and the other thereof represents a methyl group.

7. The compound according to claim 5 or salts thereof wherein one of R_7 and R_8 represents a hydrogen atom, and the other thereof represents an isopropyl group.

8. The compound according to any one of claims 1 to 3 or salts thereof wherein

X represents a group represented by formula (II-2);

A represents a five or six membered heteroaryl group containing one or more heteroatoms selected from the group consisting of nitrogen atom, oxygen atom and sulfur atom, which may be optionally substituted with one or more substituents.

9. The compound according to claim 8 or salts thereof wherein A represents a five or six membered heteroaryl group containing two or three heteroatoms selected from the group consisting of nitrogen atom, oxygen atom and sulfur atom, provided that at least two nitrogen atoms are included, which may be optionally substituted with one or more substituents, and the substituent is selected independently of each other from a group consisting of a C_{1-3} alkyl group which may be optionally substituted with one or more halogen atoms, a halogen atom, and an amino group which may be optionally substituted with one or more

C_{1-3} alkyl group.

10. The compound according to claim 9 or salts thereof wherein the five or six membered heteroaryl group is selected from~~represents~~ a group consisting of a triazolyl group, an oxadiazolyl group, a thiadiazolyl group, a pyrimidinyl group, and a pyrazinyl group, each may be optionally substituted with one or more substituents.

11. The compound according to claim 10 or salts thereof wherein the triazolyl group which may be optionally substituted with one or more substituents represents 1,5-dimethyl-1,2,4-triazol-3-yl group.

12. The compound according to claim 10 or salts thereof wherein the oxadiazolyl group which may be optionally substituted with one or more substituents represents 5-methyl-1,2,4-oxadiazol-3-yl group.

13. The compound according to claim 10 or salts thereof wherein the thiadiazol group which may be optionally substituted with one or more substituents represents 3-methyl-1,2,4-thiadiazol-5-yl group.

14. The compound according to any one of claims 1 to 3 or salts thereof wherein

X represents a group represented by formula (II-3); and

M represents a sulfonyl group which is substituted with one or more substituents selected from the group

consisting of a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, and an aryl group which may be optionally substituted with one or more substituents.

15. The compound according to claim 14 or salts thereof wherein M represents a sulfonyl group which is substituted with one or more substituents selected from the group consisting of a methyl group and a phenyl group.

16. The compound according to according to any one of claims 1 to 15 or salts thereof wherein R_6 represents a hydrogen atom or DMTr group, and R_5 represents a hydrogen atom or $-P(O(CH_2)_2CN)(N(ipr)_2)$.

17. A compound selected from the group consisting of

3-[[(1R,4R,6R,7S)-4-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-6-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-2-methylsulfonyl-5-oxa-2-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-

azabicyclo[2.2.1]heptan-3-yl]-2-(2-methylpropanoylamino)purin-6-yl]N,N-diphenylcarbamate;

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-purin-6-yl]benzamide;

3-[[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisoprop~~n~~ylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-5-(benzenesulfonyl)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl)oxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-methyl-3-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

(1R,3R,4R,7S)-3-(4-benzamide-5-methyl-2-oxo-pyrimidin-1-yl)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-methyl-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-

phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-(methylcarbamoyl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-2-(2-methylpropanoylamino)purin-6-yl]N,N-diphenylcarbamate;

(1R,3R,4R,7S)-3-(6-benzamidepurin-9-yl)-1-[[bis(4-methoxyphenyl)phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-methyl-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-isopropyl-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

(1R,3R,4R,7S)-3-(4-benzamide-5-methyl-2-oxopyrimidin-1-yl)-1-[[bis(4-methoxyphenyl)phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-isopropyl-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-(isopropylcarbamoyl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-2-(2-methylpropanoylamino)purin-6-yl]N,N-diphenylcarbamate;

(1R,3R,4R,7S)-3-(6-benzamidepurin-9-yl)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N-isopropyl-2-oxa-5-

azabicyclo[2.2.1]heptane-5-carboxamide;

(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N,N-dimethyl-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

(1R,3R,4R,7S)-3-(4-benzamide-5-methyl-2-oxo-pyrimidin-1-yl)-1-[[bis(4-methoxyphenyl)-phenylmethoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-N,N-dimethyl-2-oxa-5-azabicyclo[2.2.1]heptane-5-carboxamide;

3-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-5-pyrimidin-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-pyrimidin-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

N'-[9-(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-pyrimidin-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-6-oxo-1H-purin-2-yl]-N,N-dimethyl-6-formamidine;

N'-[9-(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-

methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-pyrimidin-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]purin-6-yl]benzamide;

3-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-5-pyrimidin-4-yl-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-pyrimidin-4-yl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-5-[4-(trifluoromethyl)pyrimidin-2-yl]-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-[4-(trifluoromethyl)pyrimidin-2-yl]-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-5-(5-chloropyrimidin-2-yl)-3-(5-methyl-2,4-

dioxo-pyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-5-(5-chloropyrimidin-2-yl)-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methylpyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-5-[6-(dimethylamino)pyrimidin-4-yl]-3-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamine)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy(diisopropylamino)phosphanyl]oxy-5-[(6-dimethylamino)pyrimidin-4-yl]-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-5-[2-(dimethylamino)pyrimidin-4-yl]-3-(5-methyl-2,4-dioxo-pyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-

(diisopropylamino)phosphanyl]oxy-5-[2-(dimethylamino)pyrimidin-4-yl]-7-hydroxy-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-5-pyrazin-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-pyrazine-2-yl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-5-(1,5-dimethyl-1,2,4-triazol-3-yl)-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-(1,5-dimethyl-1,2,4-triazol-3-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

N'-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-

(diisopropylamino)phosphanyl]oxy-5-(1,5-dimethyl-1,2,4-triazol-3-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-6-oxo-1H-purin-2-yl]-N,N-dimethylformamidine

N-[9-(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-(1,5-dimethyl-1,2,4-triazol-3-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]purin-6-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-5-(5-methyl-1,2,4-oxadiazol-3-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-(5-methyl-1,2,4-oxadiazol-3-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

3-[[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-3-(5-methyl-2,4-dioxopyrimidin-1-yl)-5-(3-methyl-1,2,4-thiadiazol-5-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-7-yl]oxy-(diisopropylamino)phosphanyl]oxypropanenitrile;

N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-

(diisopropylamino)phosphanyl]oxy-5-(3-methyl-1,2,4-thiadiazol-5-yl)-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]benzamide;

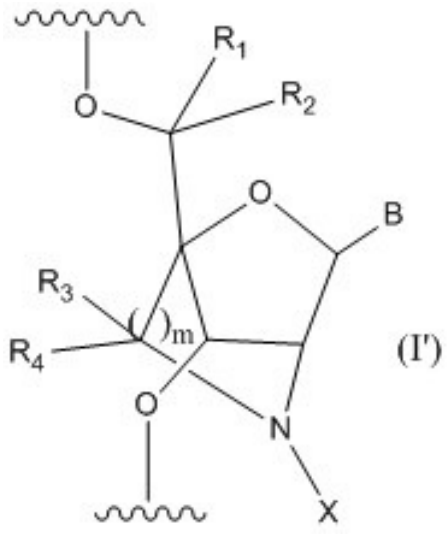
N-[1-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-hydroxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-5-methyl-2-oxo-pyrimidin-4-yl]dihydropyrimidin-2-one;

N'-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-6-oxo-1H-purin-2-yl]-N,N-dimethylformamidine;

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-[2-cyanoethoxy-(diisopropylamino)phosphanyl]oxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-6-oxo-1H-purin-2-yl]-2-methylpropane amide; and

N-[9-[(1R,3R,4R,7S)-1-[[bis(4-methoxyphenyl)-phenyl-methoxy]methyl]-7-hydroxy-5-methylsulfonyl-2-oxa-5-azabicyclo[2.2.1]heptan-3-yl]-6-oxo-1H-purin-2-yl]-2-methylpropane amide.

18. An oligonucleotide compound comprising one or more nucleosides represented by general formula (I'):



(I')

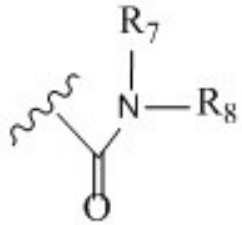
[wherein,

B represents a base moiety of nucleic acid wherein the base moiety may be optionally substituted with one or more substituents;

R_1, R_2, R_3 and R_4 represent independently of each other a hydrogen atom, or a C1–6 alkyl group which may be optionally substituted with one or more substituents;

m is an integer of 1 or 2;

X represents a group represented by the following formula (II'–1), (II'–2), or (II'–3):



(II'-1)



(II'-2)



(II'-3)

;

the symbols:



which is described in the formula (II'-1), (II'-2) or (II'-3) represents a binding point to 2'-amino group;

A represents an aromatic group containing one or more heteroatoms selected from the group consisting of nitrogen atom, oxygen atom and sulfur atom, which may be optionally substituted with one or more substituents;

M represents a sulfonyl group which is substituted with one or more substituents selected from the group consisting of a C_{1-6} alkyl group which may be optionally substituted with one or more substituents, and an aromatic group which may be optionally substituted with one or more substituents.]

or salts thereof.

19. The compound according to claim 18 or salts thereof wherein B represents an adeninyl group which may be optionally substituted with one or more substituents, a guaninyl group which may be optionally substituted with one or more substituents, a cytosinyl group which may be optionally substituted with one or more substituents, a 5-methylcytosinyl group which may be optionally substituted with one or more substituents or an uracilyl group which may be optionally substituted with one or more substituents.

20. The oligonucleotide compound according to claim 18 or 19 or salts thereof wherein

R_1, R_2, R_3 and R_4 represent independently of each other a hydrogen atom; and

m is an integer of 1.

21. The oligonucleotide compound according to any one of claims 18 to 20 or salts thereof, wherein

X represents a group represented by formula (II'-1); and

R_7 and R_8 represent independently of each other a hydrogen atom, a C1-6 alkyl group which may be optionally substituted with one or more substituents, or an aromatic group which may be optionally substituted with one or more substituents.

22. The oligonucleotide compound according to claim 21 or salts thereof wherein R_7 and R_8 represent independently of each other a hydrogen atom, a C1-3 alkyl group which may be optionally substituted with one or more substituents.

23. The oligonucleotide compound according to claim 22 or salts thereof wherein one of R_7 and R_8 represents a hydrogen atom, and the other thereof represents a methyl group.

24. The oligonucleotide compound according to claim 23 or salts thereof wherein one of R_7 and R_8 represents a hydrogen atom, and the other thereof represents an isopropyl group.

25. The oligonucleotide compound according to any one of

claims 18 to 20 or salts thereof wherein

X represents a group represented by formula (II'-2); and

A represents a five or six membered heteroaryl group containing one or more heteroatoms selected from the group consisting of nitrogen atom, oxygen atom and sulfur atom, which may be optionally substituted with one or more substituents.

26. The oligonucleotide compound according to claim 25 or salts thereof wherein

A represents a five or six membered heteroaryl group containing two or three heteroatoms selected from nitrogen atom, oxygen atom, and sulfur atom, provided that at least two nitrogen atoms are included, which may be optionally substituted with one or more substituents, and the substituent is selected independently of each other from a group consisting of a C1-3 alkyl group which may be optionally substituted with one or more halogen atoms, a halogen atom, and an amino group which may be optionally substituted with one or more C1-3 alkyl groups.

27. The oligonucleotide compound according to claim 26 or salts thereof wherein the five or six membered heteroaryl group is selected from the group consisting of a triazolyl group, an oxadiazolyl group, a thiadiazolyl group, a pyrimidinyl group, and a pyrazinyl group, each may be

optionally substituted with one or more substituents.

28. The oligonucleotide compound according to claim 27 or salts thereof wherein the triazolyl group which may be optionally substituted with one or more substituents represents 1,5-dimethyl-1,2,4-triazol-3-yl group.

29. The oligonucleotide compound according to claim 27 or salts thereof wherein the oxadiazolyl group which may be optionally substituted with one or more substituents represents 5-methyl-1,2,4-oxadiazol-3-yl group.

30. The oligonucleotide compound according to claim 27 or salts thereof wherein the thiadiazolyl group which may be optionally substituted with one or more substituents represents 3-methyl-1,2,4-thiadiazol-5-yl group.

31. The oligonucleotide compound according to any one of claims 18 to 20 or salts thereof, wherein

X represents a group represented by formula (II'-3); and

M represents a sulfonyl group which is substituted with one or more substituents selected from the group consisting of a C1-6 alkyl group which may be optionally substituted with one or more substituents, and an aryl group which may be optionally substituted with one or more substituents.

32. The compound according to any one of claims 18 to 31 or salts thereof wherein M represents a sulfonyl group

which is substituted with one or more substituents selected from the group consisting of a methyl group and a phenyl group.

33. The oligonucleotide compound according to any one of claims 1 to 32 or salts thereof wherein one or more phosphate bonds between nucleotides represent a phosphorothioate bond.