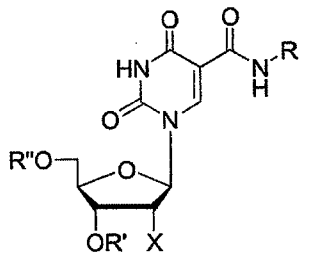
from the 3'-*O*-acetyl-nucleoside (**5e**) as described for (**6a**). The crude product (**6e**) was purified with the same equipment and buffers as used for (**6a**), but the gradient was modified to run buffer B from 15% to 60%during the 50 minute elution to improve resolution of products (Table 3: prep-HPLC Conditions 3). For (**6e**) [$\varepsilon_{est.}$ 13,700 cm^{-1} M^{-1}] the isolated purified product was 101 μmol (20% yield). ^{1}H-NMR (D_2O) δ 1.17 (18H, t, J = 7.3 Hz), 2.17-2.36 (2H, m), 3.09 (12H, q, J = 7.3 Hz), 3.60-3.73 (2H, m), 4.01 (2H, t, J = 5.4 Hz), 4.03-4.15 (3H, m), 4.45-4.50 (1H, m), 4.70 (>7H, bs, HOD), 6.04 (1H, t, J = 6.6 Hz), 6.95-7.12 (4H, m), 8.02 (1H, s). ^{31}P-NMR (D_2O) δ -10.35 (d, J = 20 Hz), -11.40 (d, J = 20 Hz), -23.23 (t, J = 20 Hz). MS (*m/z*) calcd for $C_{19}H_{24}N_5O_{16}P_3$, 671.04; found 670.1 [M-H]$^-$.

~~**[0096]** The foregoing embodiments and examples are intended only as examples. No particular embodiment, example, or element of a particular embodiment or example is to be construed as a critical, required, or essential element or feature of any of the claims. Further, no element described herein is required for the practice of the appended claims unless expressly described as "essential" or "critical." Various alterations, modifications, substitutions, and other variations can be made to the disclosed embodiments without departing from the scope of the present invention, which is defined by the appended claims. The specification, including the examples, is to be regarded in an illustrative manner, rather than a restrictive one, and all such modifications and substitutions are intended to be included within the scope of the invention. Accordingly, the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given above. For example, steps recited in any of the method or process claims may be executed in any feasible order and are not limited to an order presented in any of the embodiments, the examples, or the claims.~~

What is claimed is:

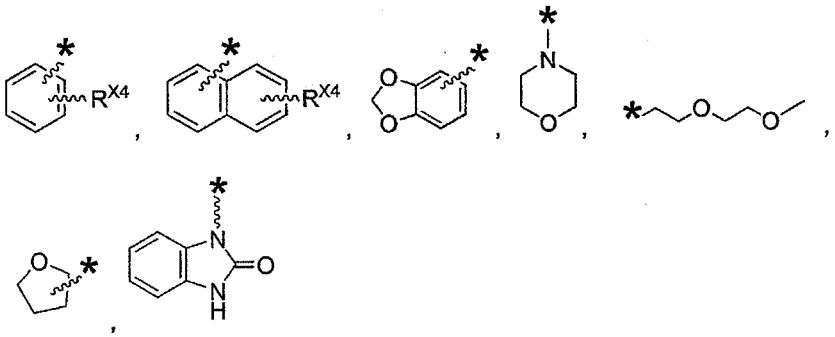
1. A compound selected from the compounds having the following structure or a salt thereof:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

R^{X2}, R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \sout{(CH_2)n}$;

wherein n = ~~0~~-10;

wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

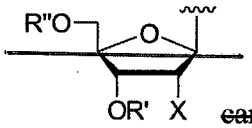
wherein

R' is selected from the group consisting of ~~-Oac, -P(N(iBu)2(O(CH2)2)CN, -OBz and -OSiMe2tBu~~;

wherein

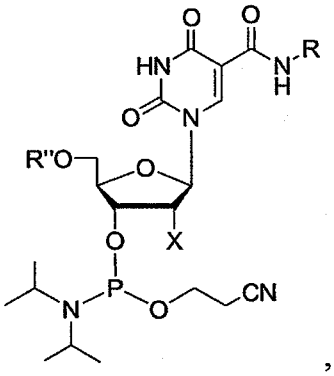
R" is selected from the group consisting of H, DMT and triphosphate (-P(O)(OH)-O-P(O)(OH)-O-$P(O)(OH)_2$) or a salt thereof; ~~and~~

~~wherein~~

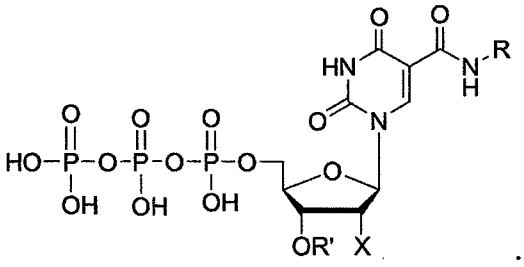


~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside.~~

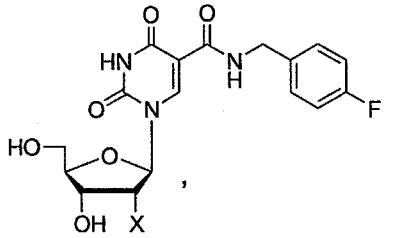
~~2.~~ A compound according to claim 1 having the following structure or a salt thereof:

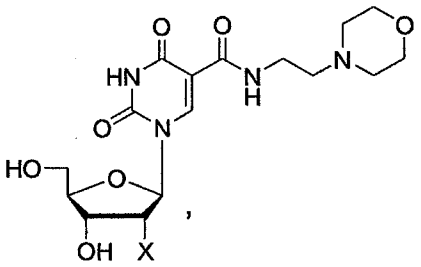


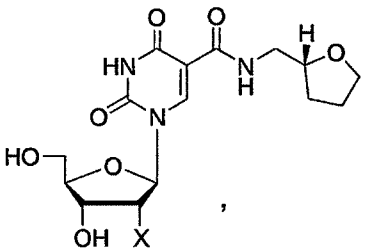
, or

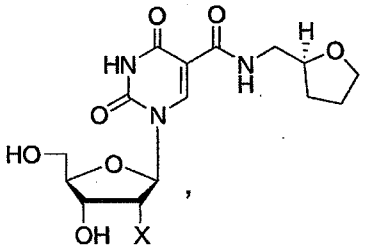


~~3.~~ A compound ~~according to claim 1~~ having the following structure or a salt thereof:

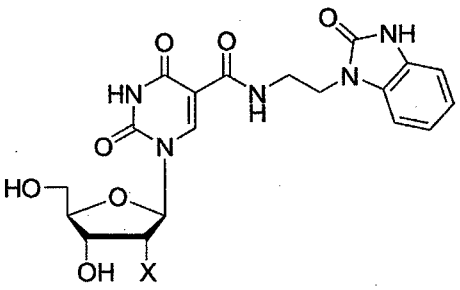

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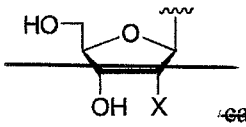
~~or~~



wherein

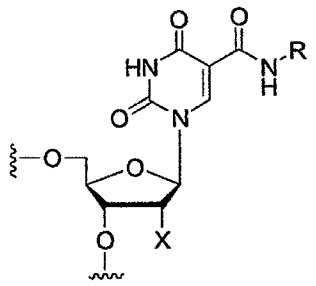
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido~~; and~~

~~wherein~~



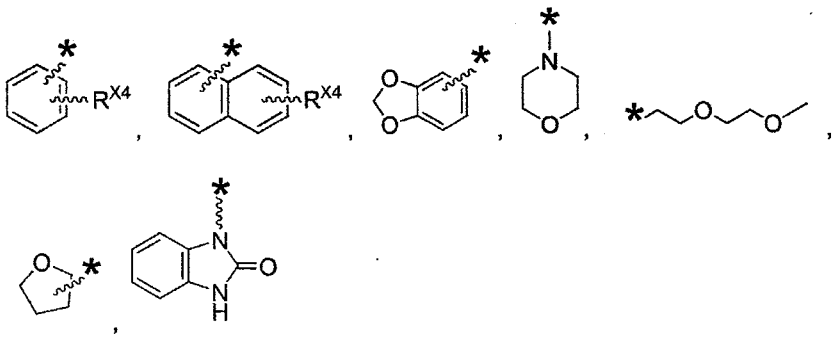
~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside.~~

~~4.~~ An oligonucleotide comprising at least one modified nucleotide having the following structure:



R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of:



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

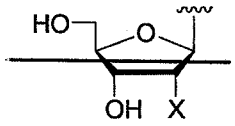
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \sout{(CH_2)n;}$

wherein n = ~~0-10~~;

wherein

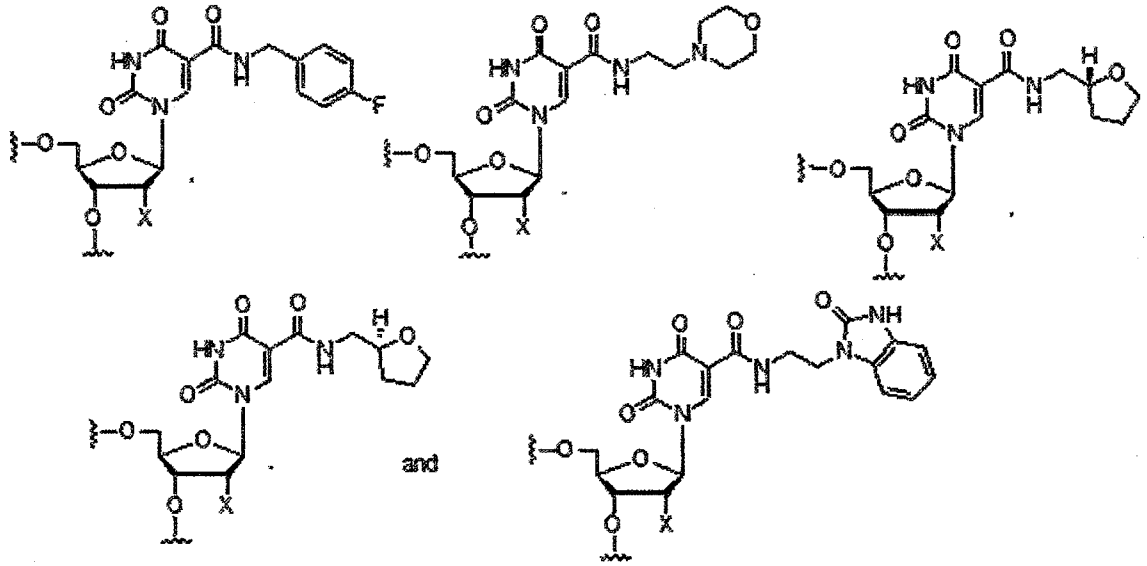
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside~~.

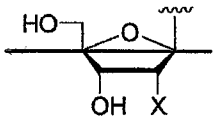
~~5.~~ An oligonucleotide according to claim ~~4~~ comprising at least one modified nucleotide independently selected from the following structures:



wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



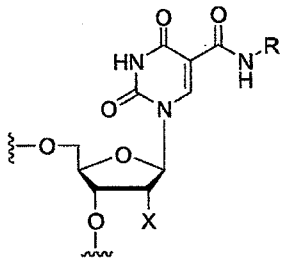
~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside~~.

~~6.~~ An oligonucleotide of ~~claim 4 or claim 5~~, wherein the oligonucleotide is selected from a ribonucleic acid or a deoxyribonucleic acid,

optionally wherein said oligonucleotide further comprises at least one chemical modification comprising a chemical substitution at one or more positions independently selected from a ribose position, a deoxyribose position, a phosphate position, and a base position,

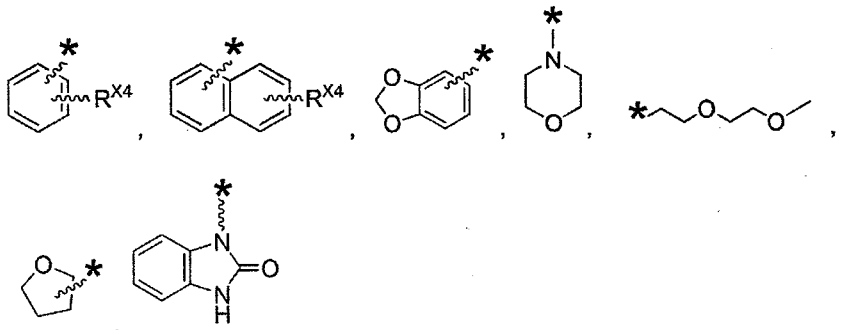
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification, a backbone modification, methylation, a 3' cap, and a 5' cap.

~~7.~~ An aptamer comprising at least one modified nucleotide having the following structure:



R is selected from the group consisting of -$(CH_2)_n$-R^{XI};

R^{XI} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

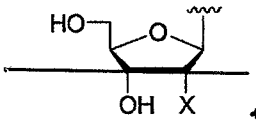
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = $ ~~$(CH_2)n$~~;

wherein n = ~~0~~-10;

wherein

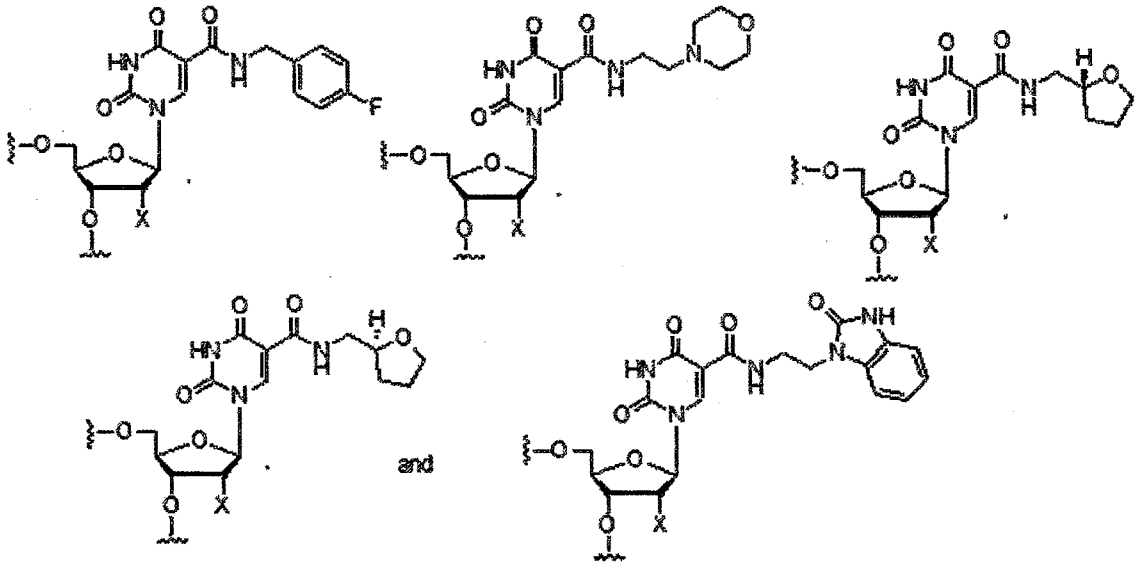
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside.~~

~~8.~~ An aptamer according to claim ~~7~~ comprising at least one modified nucleotide independently selected from the following structures:

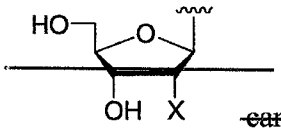


and

wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido~~; and~~

~~wherein~~



~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside.~~

~~9.~~ An aptamer of ~~claim 7 or claim 8~~, wherein the aptamer is selected from a ribonucleic acid or a deoxyribonucleic acid,

optionally wherein said aptamer further comprises at least one chemical modification comprising a chemical substitution at one or more positions independently selected from a ribose position, a deoxyribose position, a phosphate position, and a base position,

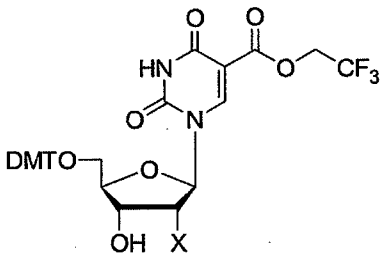
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification, a backbone modification, methylation, a 3' cap, and a 5' cap.

~~10.~~ A method for preparing a C-5 modified aminocarbonylpyrimidine comprising:

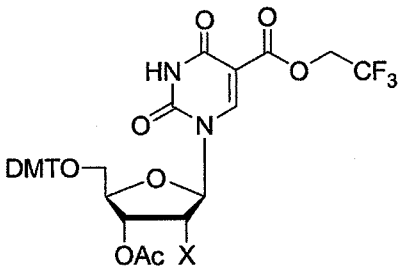
reacting a pyrimidine modified at the 5-position with a trifluoroethoxycarbonyl with an amine in the presence of a tertiary amine base; and

isolating said C-5 modified aminocarbonylpyrimidine;

wherein said pyrimidine modified at the 5-position with a trifluoroethoxycarbonyl optionally has the following structure:



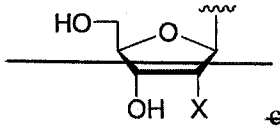
or



wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside;~~

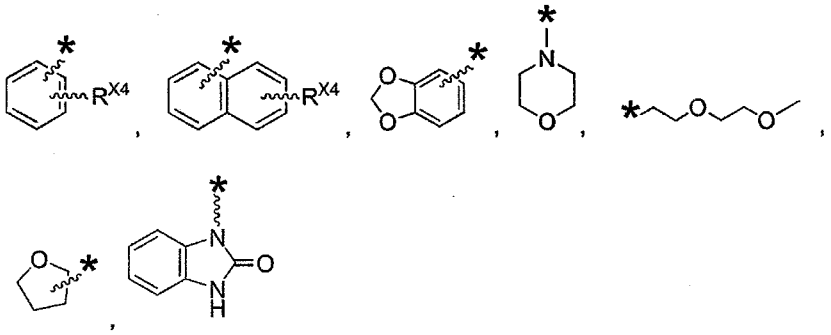
wherein said base is optionally selected from triethylamine, diisopropylamine or a related tertiary amine;

wherein said amine is selected from the group consisting of RNH_2,

wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

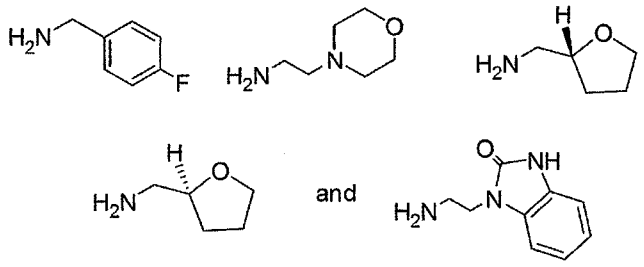
R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$); and

wherein

R^{X2}, R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \sout{(CH_2)n;}$ and

wherein $n = \sout{0}$-10.

~~11.~~ The method of claim ~~10~~ wherein said amine is selected from the group consisting of



and

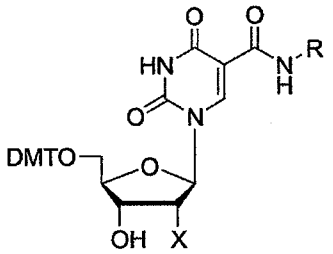
~~12.~~ A method for preparing a 3'-phosporamidite of a C-5 modified aminocarbonylpyrimidine comprising:

reacting said C-5 modified aminocarbonylpyrimidine with cyanoethyldiisopropylchlorophosphoramidite in the presence of a tertiary amine; and

isolating said 3'-phosporamidite;

wherein said base is optionally selected from triethylamine, diisopropylamine or a related tertiary amine; and

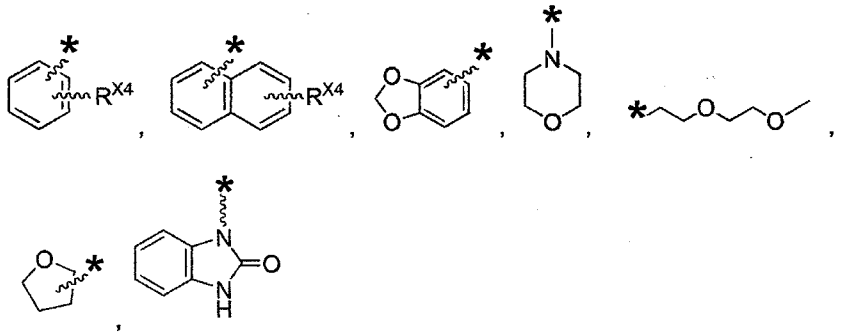
wherein said C-5 modified aminocarbonylpyrimidine has the following structure:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

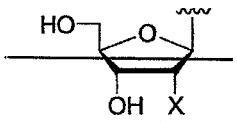
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = $ ~~$(CH_2)n$~~; and

wherein n = ~~0~~-10;

wherein

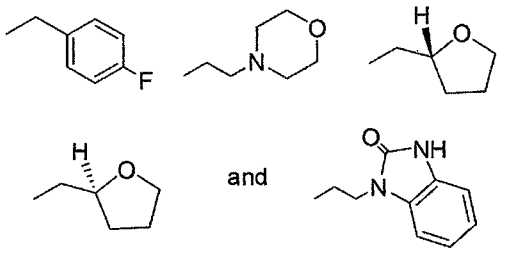
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



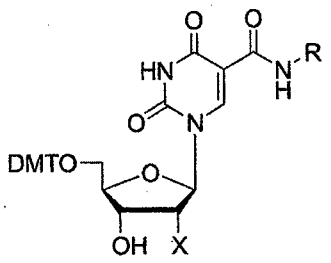
~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside.~~

~~13.~~ The method of claim ~~14~~ wherein R is selected from the group consisting of:



~~14.~~ A method for preparing a 5'-triphosphate of a C-5 modified aminocarbonylpyrimidine comprising:

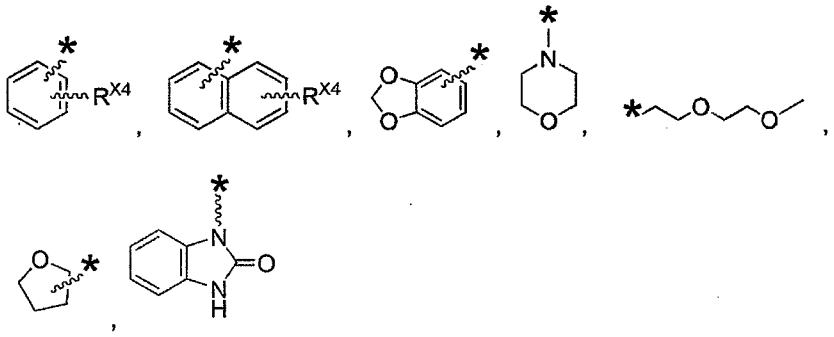
a) reacting a C-5 modified aminocarbonylpyrimidine having the formula:



wherein

R is selected from the group consisting of -$(CH_2)_n$-R^{X1};

$R^{X1}$is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

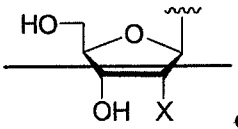
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = $ ~~$(CH_2)n$~~;

wherein n = ~~0~~-10;

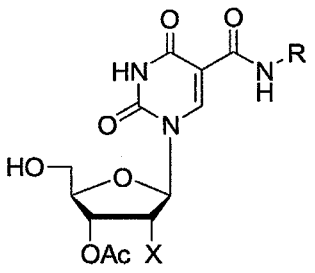
wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido; ~~and~~

~~wherein~~



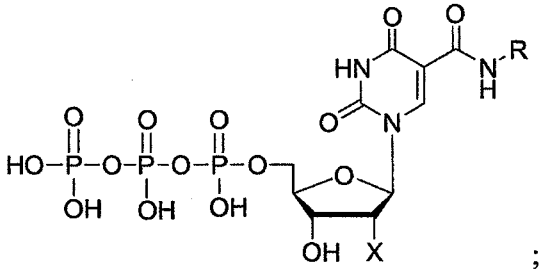
~~can be replaced with carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs and abasic nucleoside analogs such as methyl riboside;~~ with acetic anhydride in the presence of a base, followed by cleavage of the 5'-DMTgroup with an acid to form a 3'-acetate of the following structure:



;

b) performing a Ludwig-Eckstein reaction followed by anion exchange chromatography on the 3'-acetate of step a); and

c) isolating a 5'-triphosphate of a C-5 modified aminocarbonylpyrimidine having the following structure or a salt thereof:

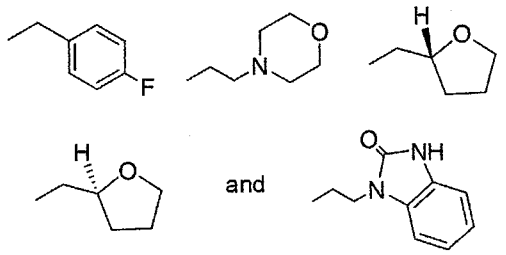


;

wherein said acid is optionally selected from group consisting of dichloroacetic acid, trichloroacetic acid and 1,1,1,3,3,3-hexafluoro-2-propanol; and

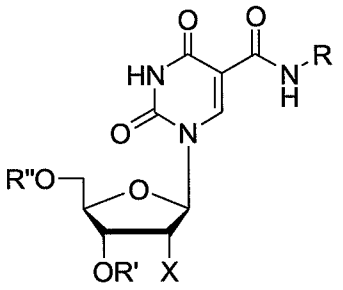
wherein said base is optionally a tertiary amine or pyridine.

~~15.~~ The method of claim ~~14~~ wherein R is selected from the group consisting of:


F
N
O
H
O
H
O
and
O
NH
N

What is claimed is:

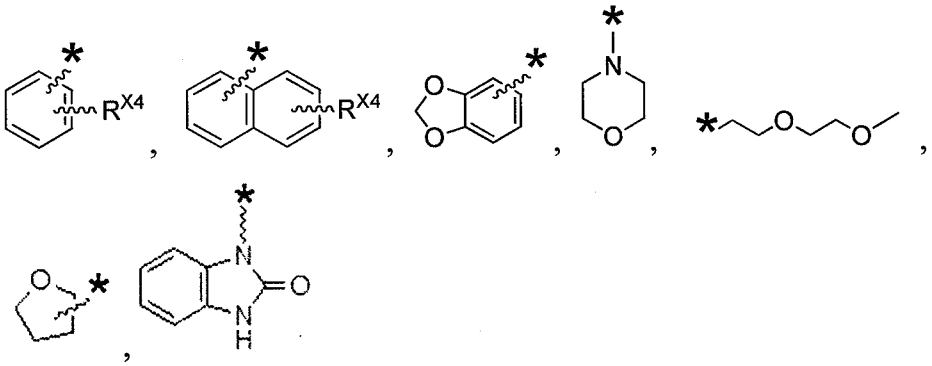
1. A compound selected from the compounds having the following structure or a salt thereof:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

R^{X2}, R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \underline{(CH_2)_n}$;

wherein n = 2-10;

wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

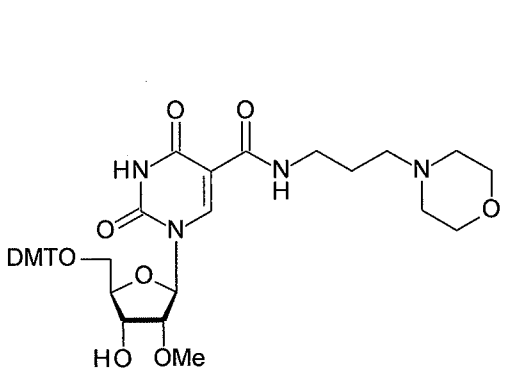
wherein

R' is selected from the group consisting of -Ac; -$P(N(iPr)_2(O(CH_2)_2)CN$; -Bz and -$SiMe_2tBu$;

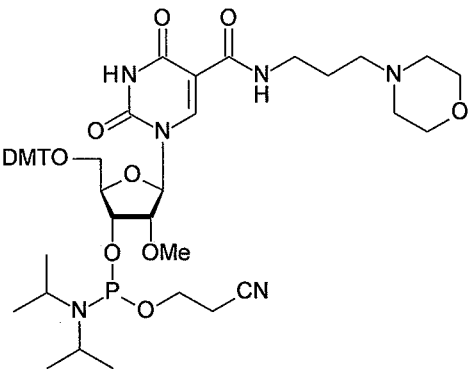
wherein

R" is selected from the group consisting of H, DMT and triphosphate (-P(O)(OH)-O-P(O)(OH)-O-$P(O)(OH)_2$) or a salt thereof;

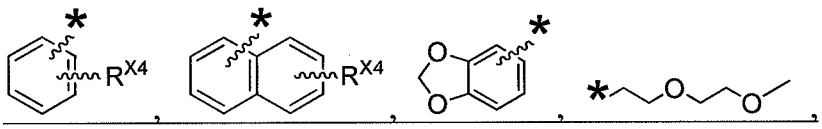
with the proviso that the compound *is not*

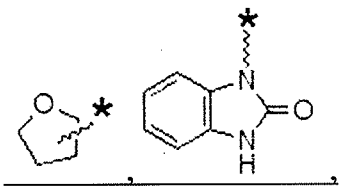


or



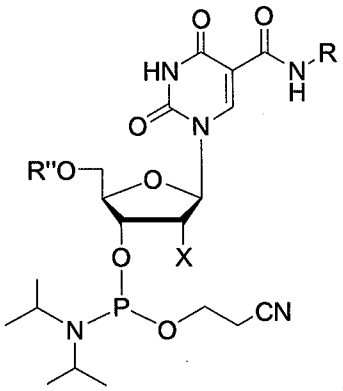
2. A compound according to claim 1 wherein R^{X1} is selected from the group consisting of



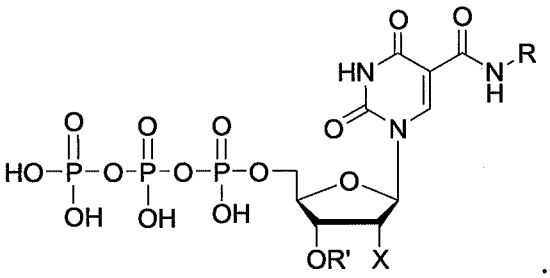


*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group.

3. A compound according to claim 1 or claim 2 having the following structure or a salt thereof:

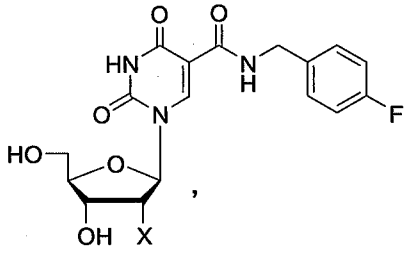


, or

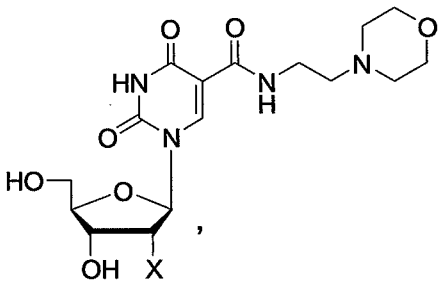


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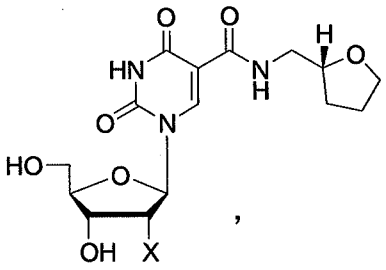
4. A compound having the following structure or a salt thereof:



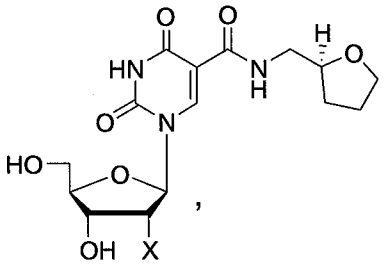
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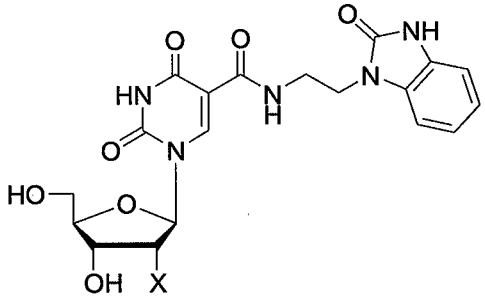
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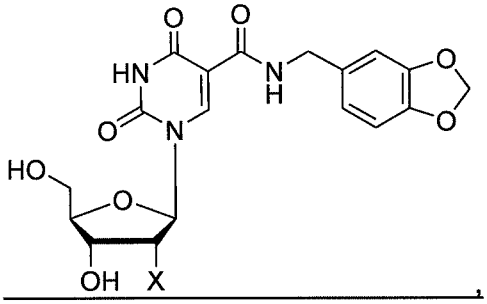
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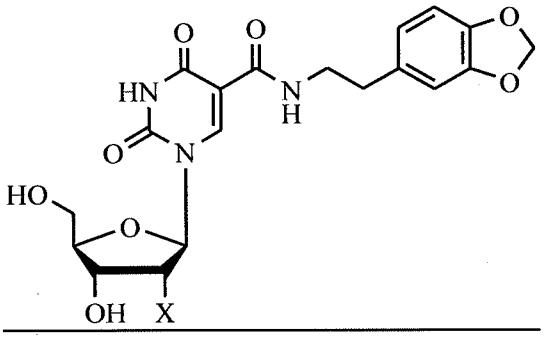


,



,

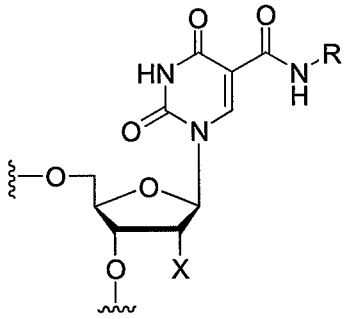
or



wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido.

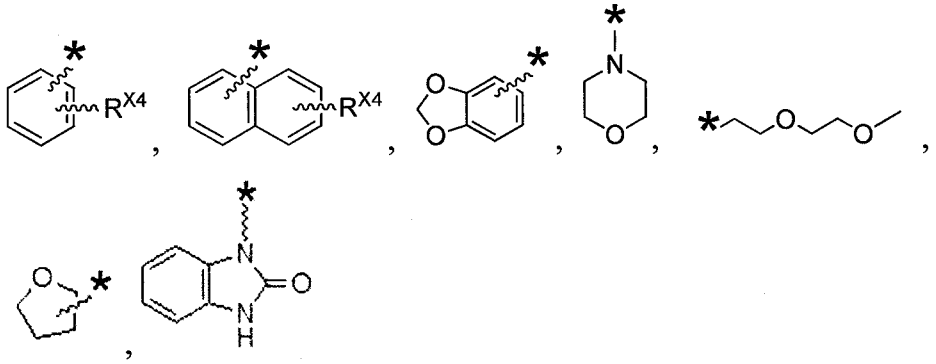
5. An oligonucleotide comprising at least one modified nucleotide having the following structure:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of:



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

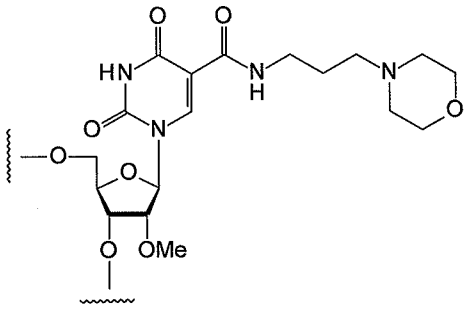
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = (CH_2)_n$;

wherein n = 2-10;

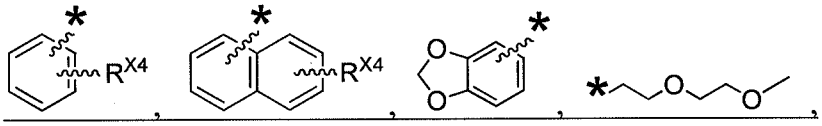
wherein

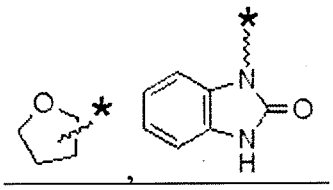
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, $-OCH_2CH_2OCH_3$ and -azido;

with the proviso that the structure of the at least one modified nucleotide *is not*



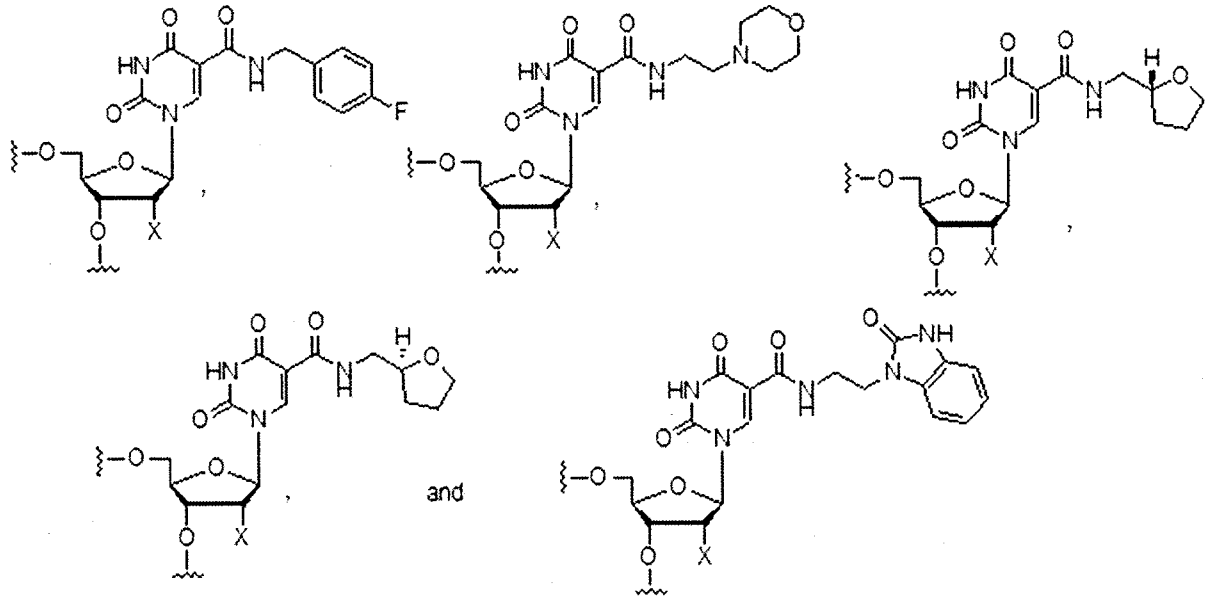
6. An oligonucleotide according to claim 5, wherein R^{X1} is selected from the group consisting of:

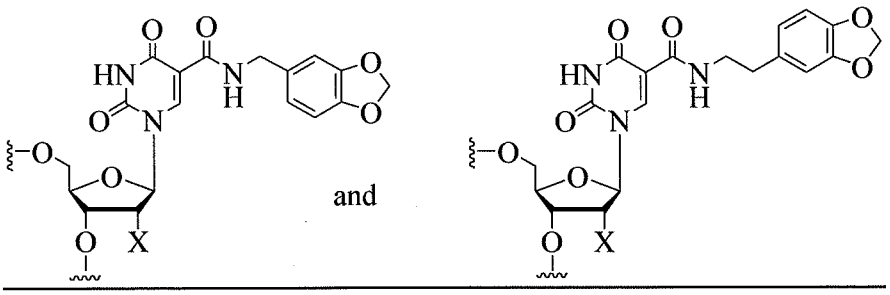




*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group.

7. An oligonucleotide according to claim 5 comprising at least one modified nucleotide independently selected from the following structures:



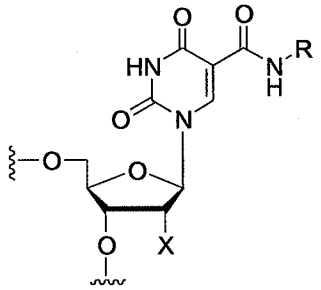


wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido.

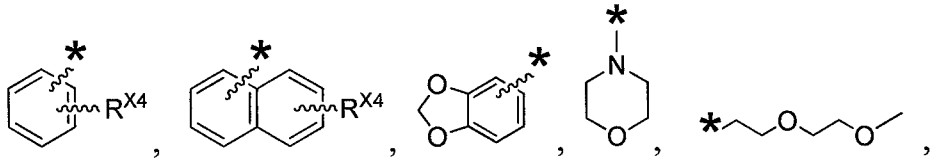
8. An oligonucleotide of any one of claims 5 to 7, wherein the oligonucleotide is selected from a ribonucleic acid or a deoxyribonucleic acid,
optionally wherein said oligonucleotide further comprises at least one chemical modification comprising a chemical substitution at one or more positions independently selected from a ribose position, a deoxyribose position, a phosphate position, and a base position,
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification, a backbone modification, methylation, a 3' cap, and a 5' cap.

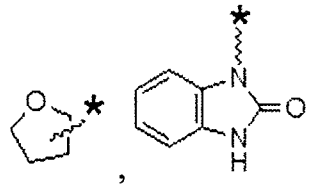
9. An aptamer comprising at least one modified nucleotide having the following structure:



R is selected from the group consisting of -$(CH_2)_n$-R^{X1};

R^{X1} is selected from the group consisting of





*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

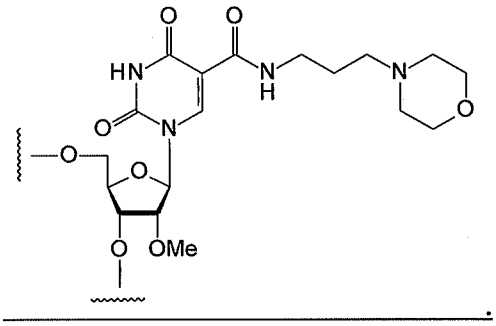
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \underline{(CH_2)_n}$;

wherein n = 2-10;

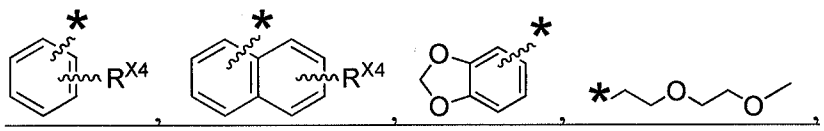
wherein

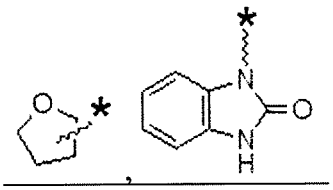
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

with the proviso that the structure of the at least one modified nucleotide *is not*



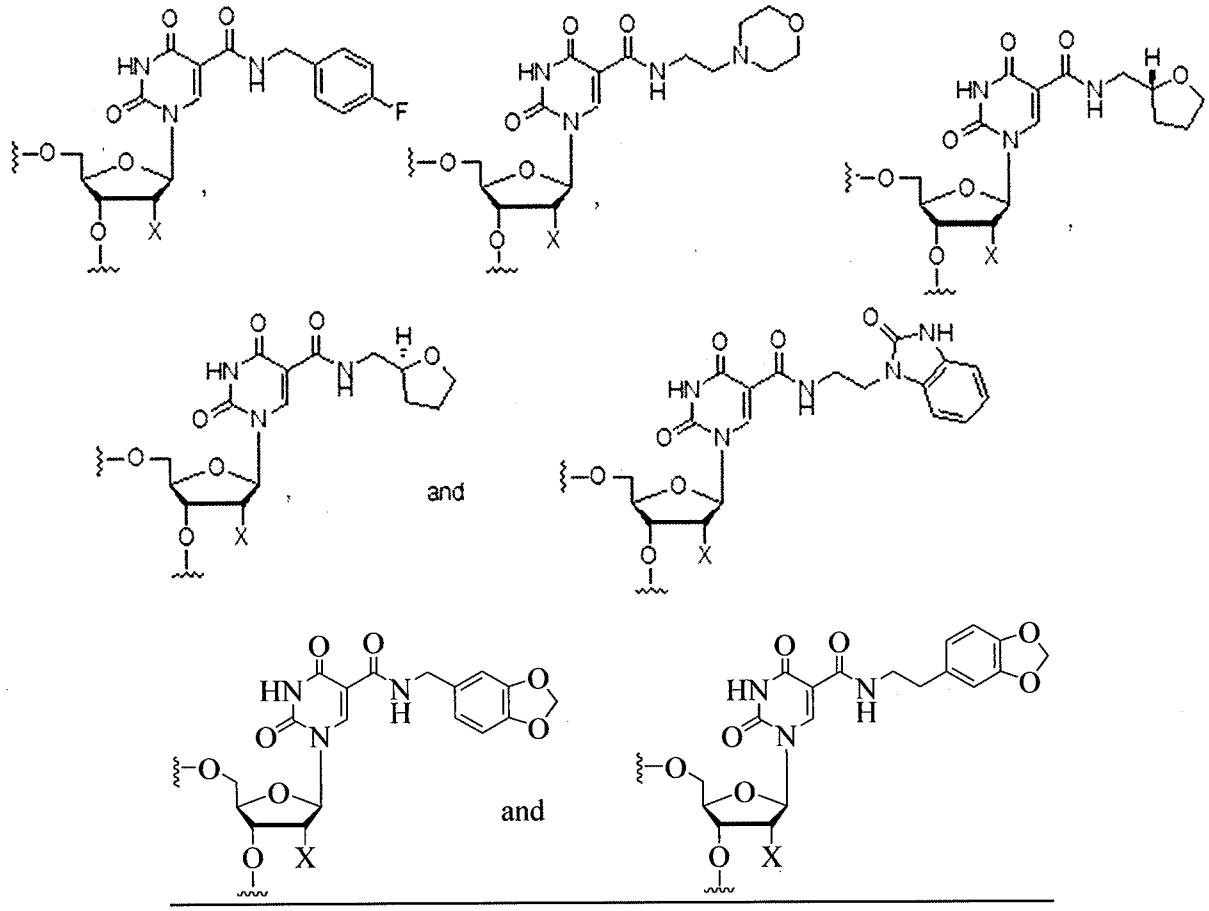
10. An aptamer according to claim 9, wherein R^{X1} is selected from the group consisting of:





*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group.

11. An aptamer according to claim 9 comprising at least one modified nucleotide independently selected from the following structures:



wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido.

12. An aptamer of any one claims 9 to 11, wherein the aptamer is selected from a ribonucleic acid or a deoxyribonucleic acid,

optionally wherein said aptamer further comprises at least one chemical modification comprising a chemical substitution at one or more positions independently selected from a ribose position, a deoxyribose position, a phosphate position, and a base position,

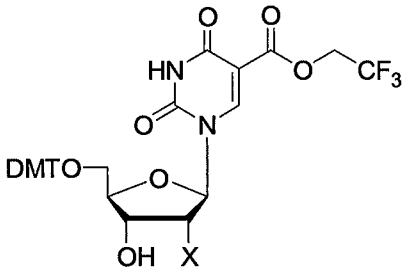
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification, a backbone modification, methylation, a 3' cap, and a 5' cap.

13. A method for preparing a C-5 modified aminocarbonylpyrimidine comprising:

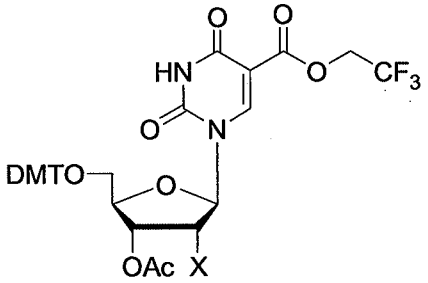
reacting a pyrimidine modified at the 5-position with a trifluoroethoxycarbonyl with an amine in the presence of a tertiary amine base; and

isolating said C-5 modified aminocarbonylpyrimidine;

wherein said pyrimidine modified at the 5-position with a trifluoroethoxycarbonyl optionally has the following structure:



or



wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

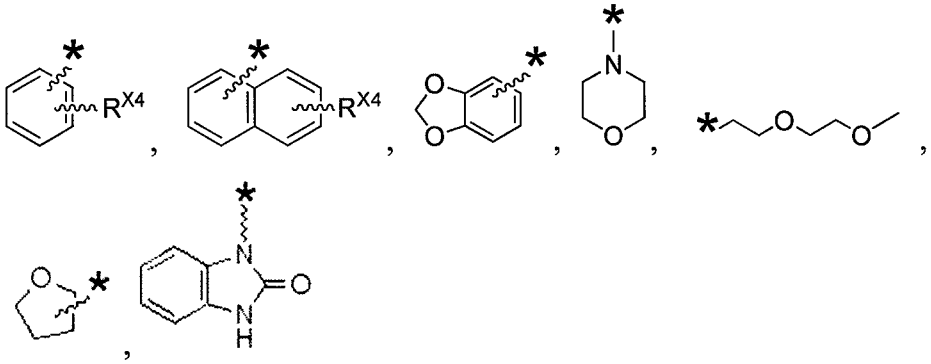
wherein said base is optionally selected from triethylamine, diisopropylamine or a related tertiary amine;

wherein said amine is selected from the group consisting of RNH_2,

wherein

R is selected from the group consisting of -$(CH_2)_n$-R^{X1};

$R^{X1}$is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

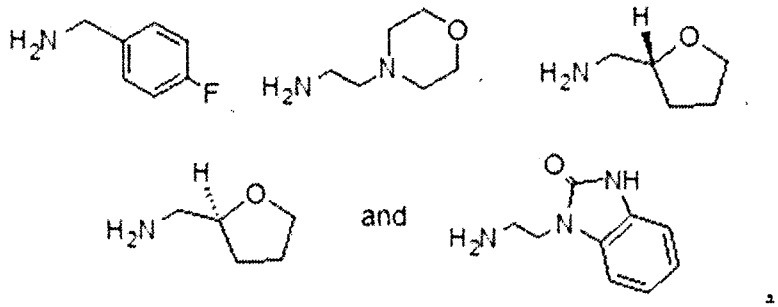
R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$); and

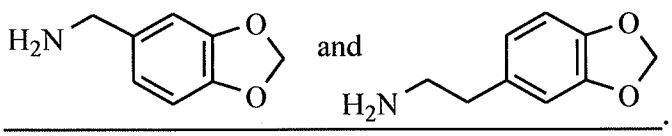
wherein

R^{X2}, R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = \underline{(CH_2)_n}$; and

wherein n = 2-10.

14. The method of claim 13 wherein said amine is selected from the group consisting of





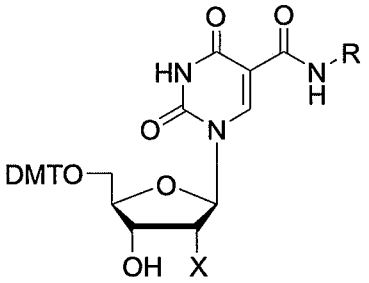
15. A method for preparing a 3'-phosporamidite of a C-5 modified aminocarbonylpyrimidine comprising:

reacting said C-5 modified aminocarbonylpyrimidine with cyanoethyldiisopropylchlorophosphoramidite in the presence of a tertiary amine; and

isolating said 3'-phosporamidite;

wherein said base is optionally selected from triethylamine, diisopropylamine or a related tertiary amine; and

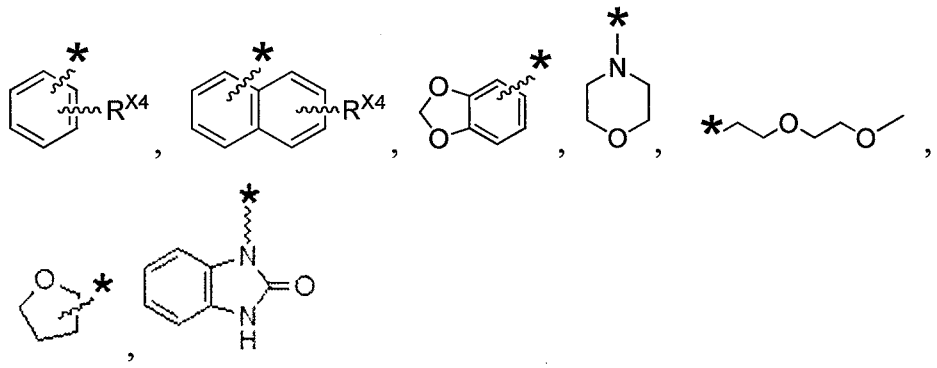
wherein said C-5 modified aminocarbonylpyrimidine has the following structure:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5}

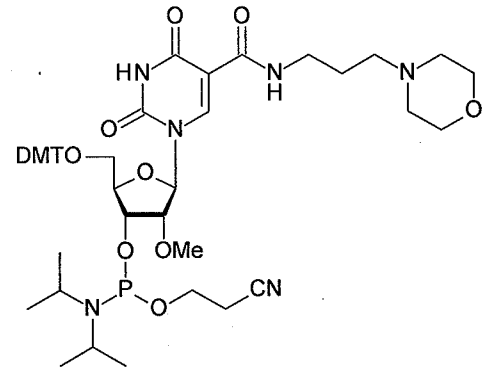
is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = (CH_2)_n$; and

wherein n = 2-10;

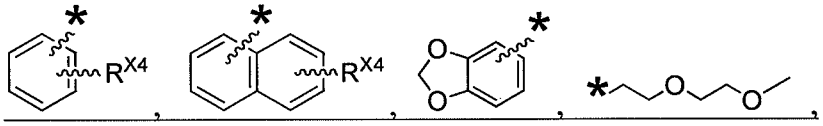
wherein

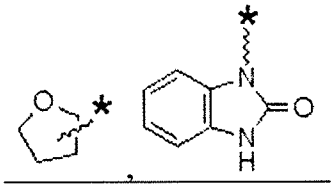
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

with the proviso that the 3'-phosporamidite *is not*



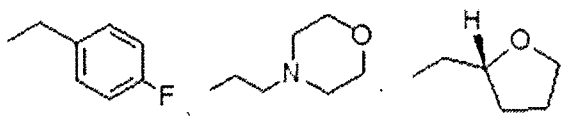
16. The method of claim 15, wherein R^{X1} is selected from the group consisting of:

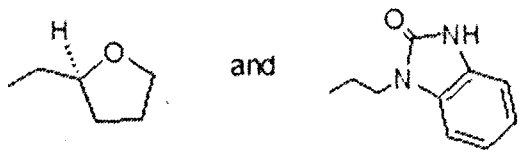


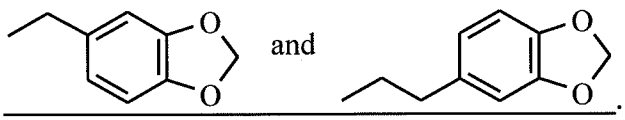


*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group.

17. The method of claim 15 or claim 16 wherein R is selected from the group consisting of:

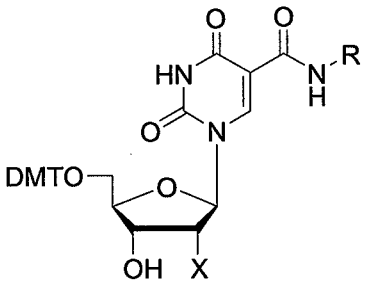






18. A method for preparing a 5'-triphosphate of a C-5 modified aminocarbonylpyrimidine comprising:

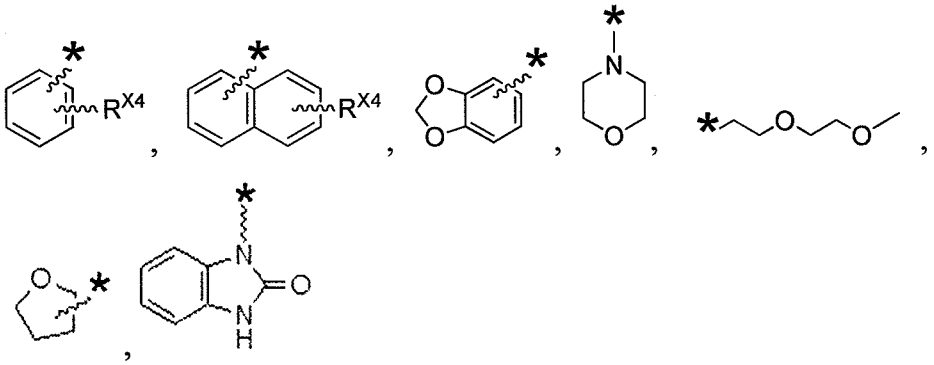
a) reacting a C-5 modified aminocarbonylpyrimidine having the formula:



wherein

R is selected from the group consisting of $-(CH_2)_n-R^{X1}$;

R^{X1} is selected from the group consisting of



*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group

wherein

R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); sulfonamide (SO_2NH_2); N-alkylsulfonamide ($SONHR^{X2}$);

wherein

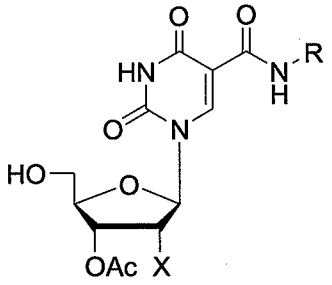
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = (CH_2)_n$;

wherein n = 2-10;

wherein

X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

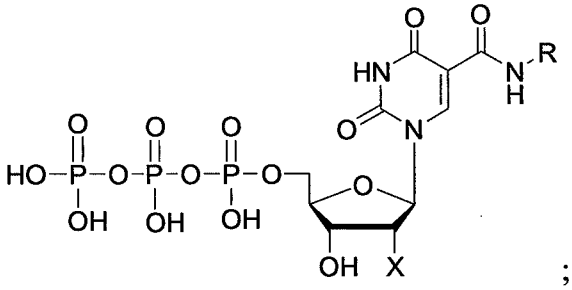
with acetic anhydride in the presence of a base, followed by cleavage of the 5'-DMTgroup with an acid to form a 3'-acetate of the following structure:



;

b) performing a Ludwig-Eckstein reaction followed by anion exchange chromatography on the 3'-acetate of step a); and

c) isolating a 5'-triphosphate of a C-5 modified aminocarbonylpyrimidine having the following structure or a salt thereof:

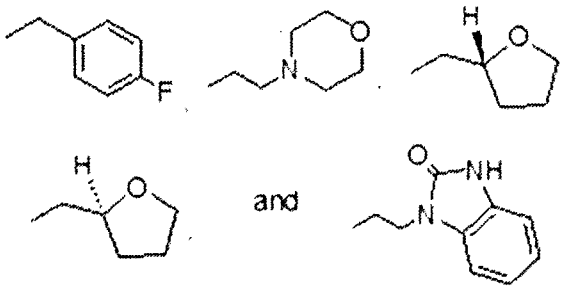


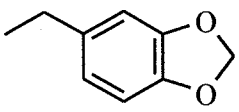
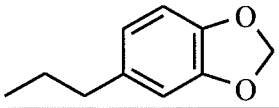
;

wherein said acid is optionally selected from group consisting of dichloroacetic acid, trichloroacetic acid and 1,1,1,3,3,3-hexafluoro-2-propanol; and

wherein said base is optionally a tertiary amine or pyridine.

19. The method of claim 18 wherein R is selected from the group consisting of:



 and .