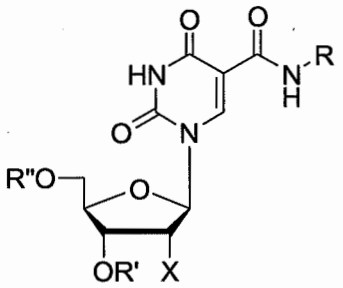
What is claimed is:

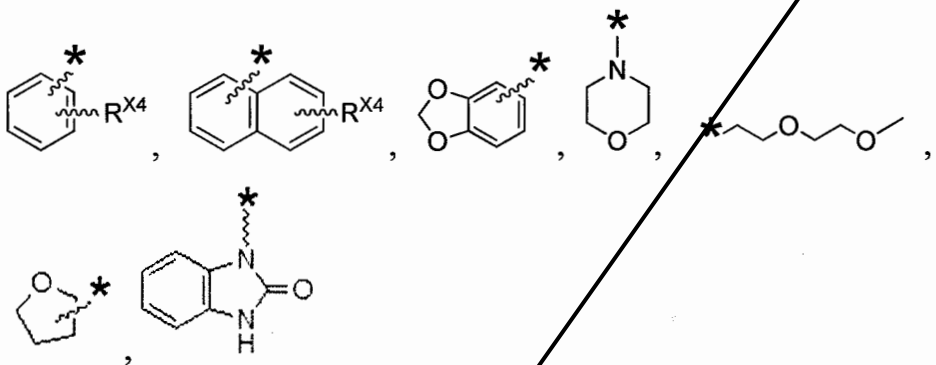
1. A compound selected from the compounds having the following structure or a salt thereof:



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 $R^{X2} = R^{X3} = (CH_2)_n$;

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;

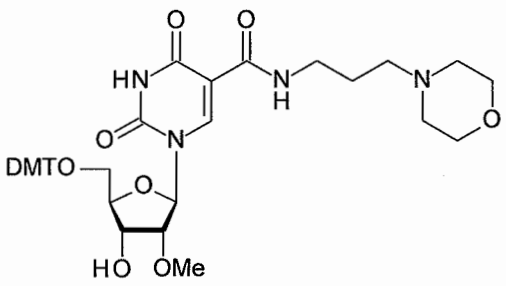
wherein

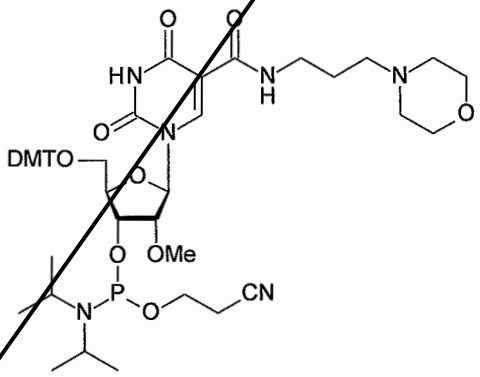
R' is selected from the group consisting of -Ac; -$P(N(iPr)_2(O(CH_2)_2)CN$; -Bz and -$SiMe_2tBu$;

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;

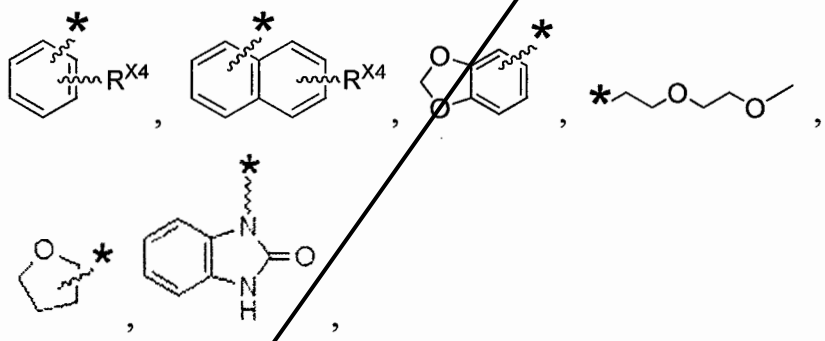
with the proviso that the compound *is not*





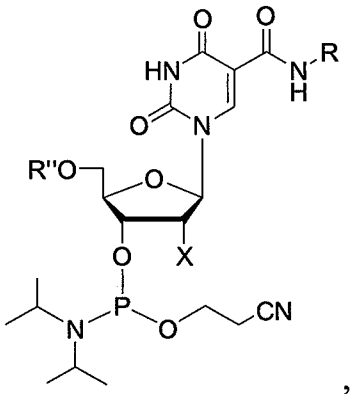
or .

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

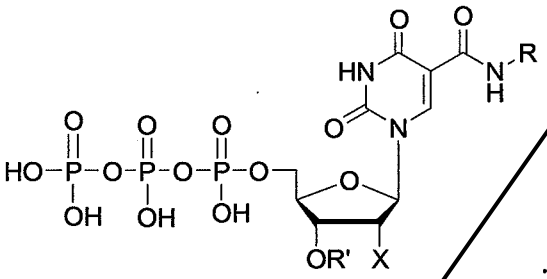


*Denotes point of attachment of the R^{X1} group to $(CH_2)_n$ connecting group.

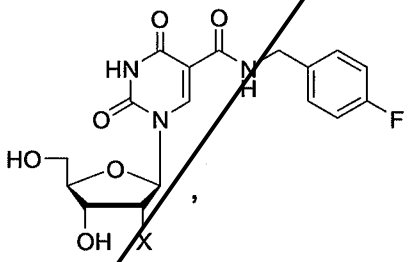
3. A compound according to claim 1 or claim 2 having the following structure or a salt thereof:



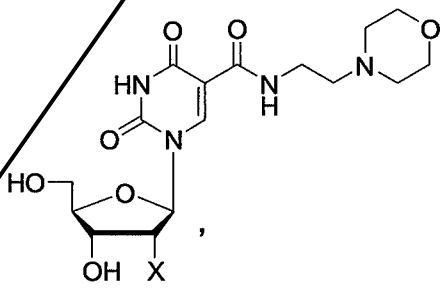
, or



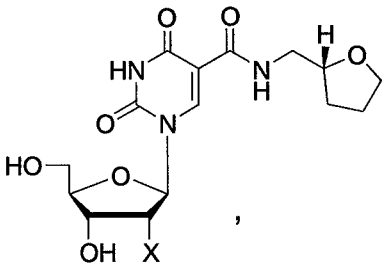
4. A compound having the following structure or a salt thereof:



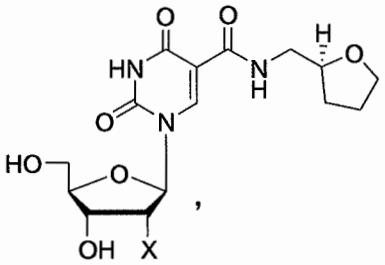
,

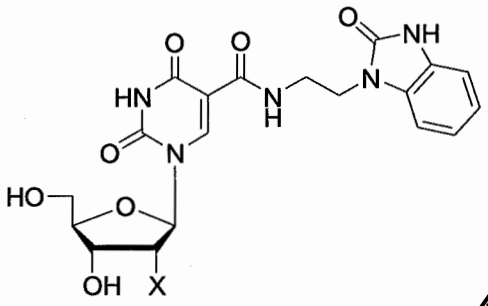


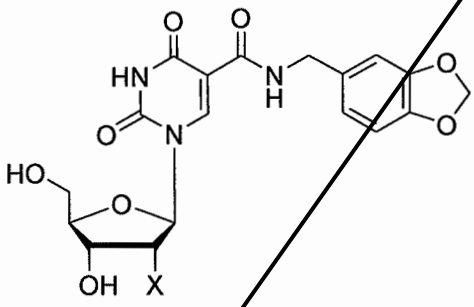
,



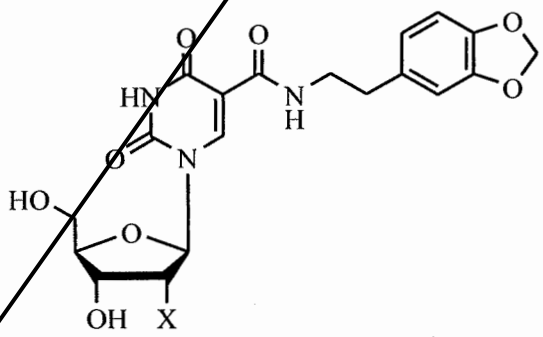
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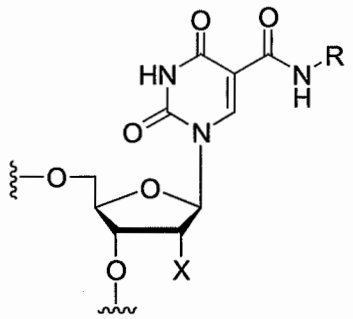
or



wherein

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

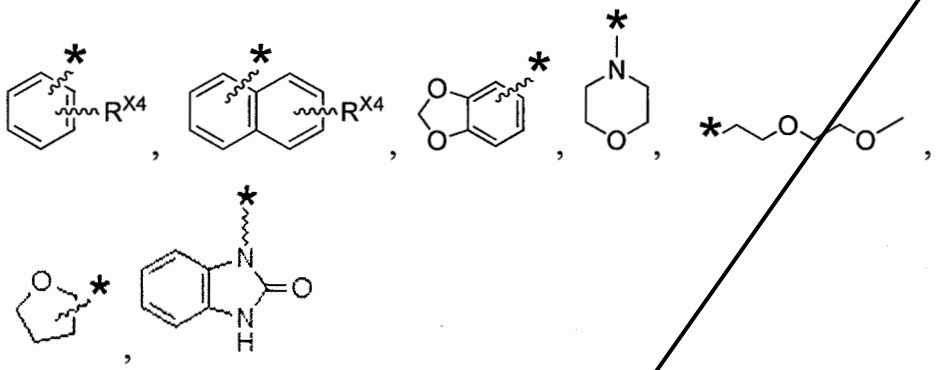
5. An oligonucleotide comprising at least one modified nucleotide having the following structure:



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

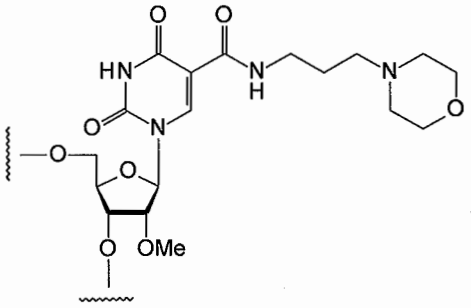
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is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

wherein n = 2-10;

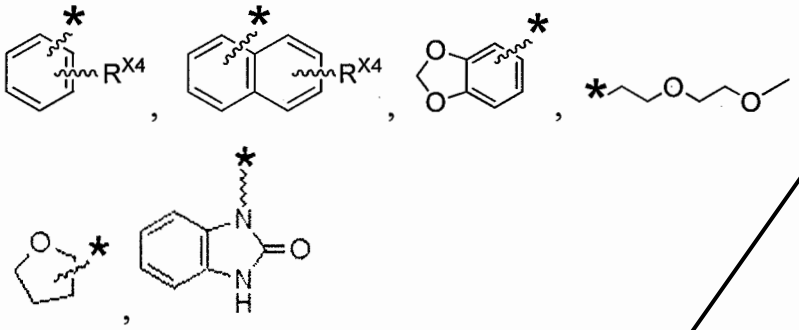
wherein

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*

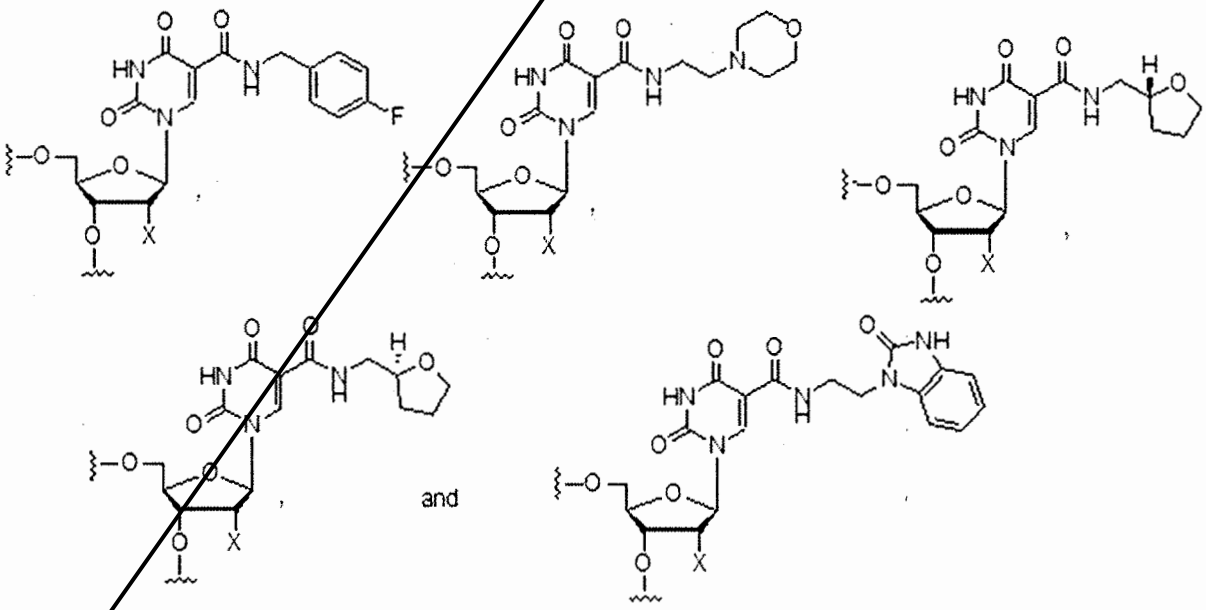


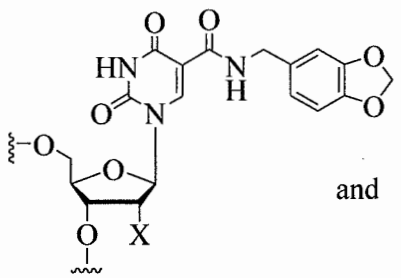
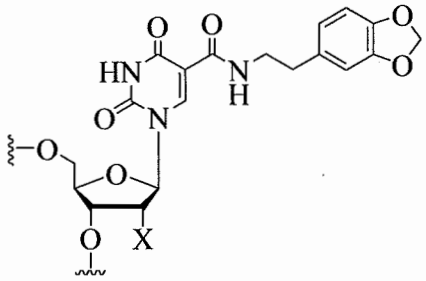
6. An oligonucleotide according to claim 5, wherein R^{X1} is selected from the group consisting of:



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

7. An oligonucleotide according to claim 6 comprising at least one modified nucleotide independently selected from the following structures:




and


wherein

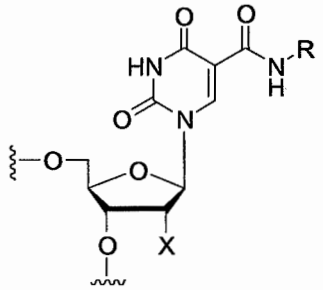
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido.

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,

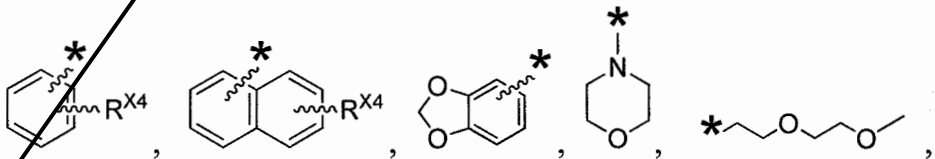
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification,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

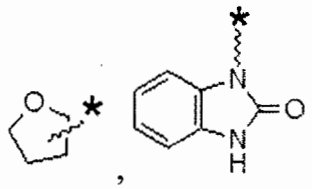
9. An aptamer comprising at least one modified nucleotide having the following structure:



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

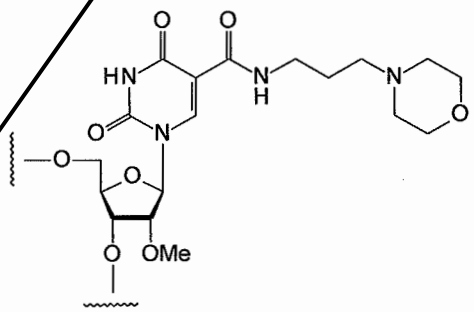
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is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

wherein n = 2-10;

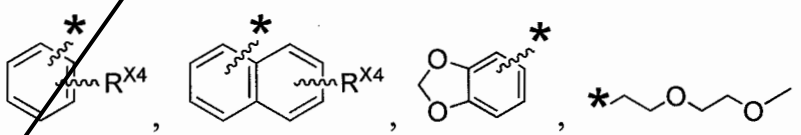
wherein

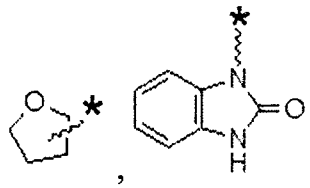
X is selected from the group consisting of -H, -OH, -OMe, -O-allyl, -F, -OEt, -OPr, -$OCH_2CH_2OCH_3$ and -azido;

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



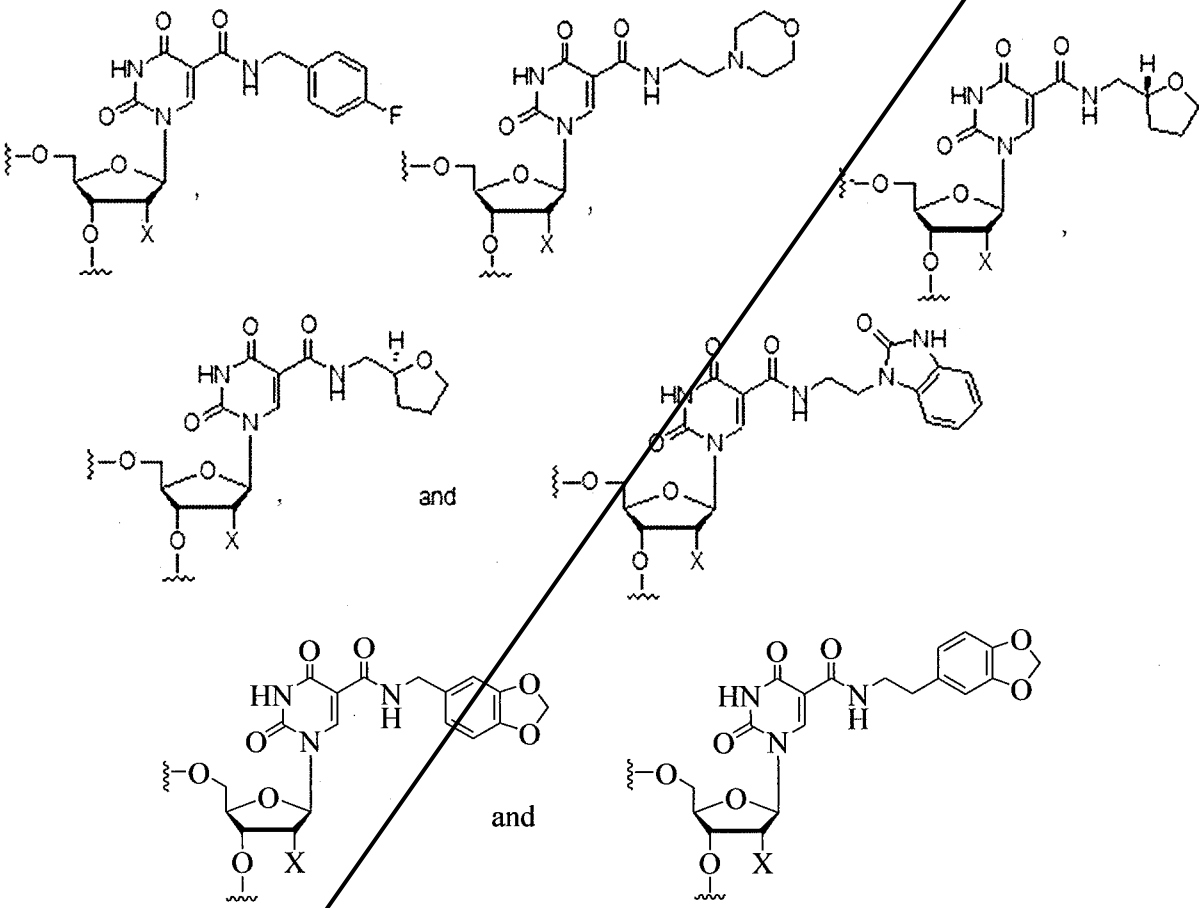
10. An aptamer according to claim 9, wherein R^{X1} is selected from the group consisting of:





*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,

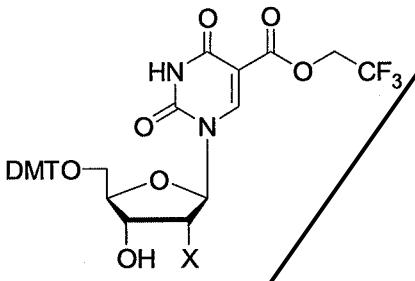
optionally wherein said chemical modification is independently selected from the group consisting of a 2'-position sugar modification, a 2'-amino (2'-NH_2), a 2'-fluoro (2'-F), a 2'-O-methyl (2'-OMe), 2'-O-ethyl (2'-OEt), 2'-O-propyl (2'-OPr), 2'-O-$CH_2CH_2OCH_3$, a 5-position pyrimidine modification,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

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

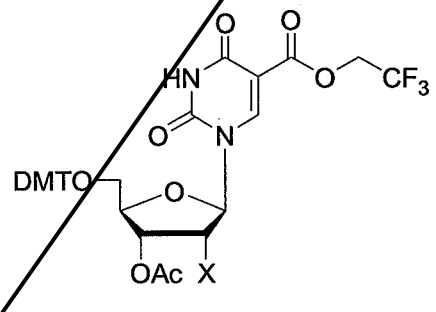
reacting a pyrimidine modified at the 5-position with a trifluoroethoxycarbonyl with an amine in the presence of a tertiary amine base; and

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;

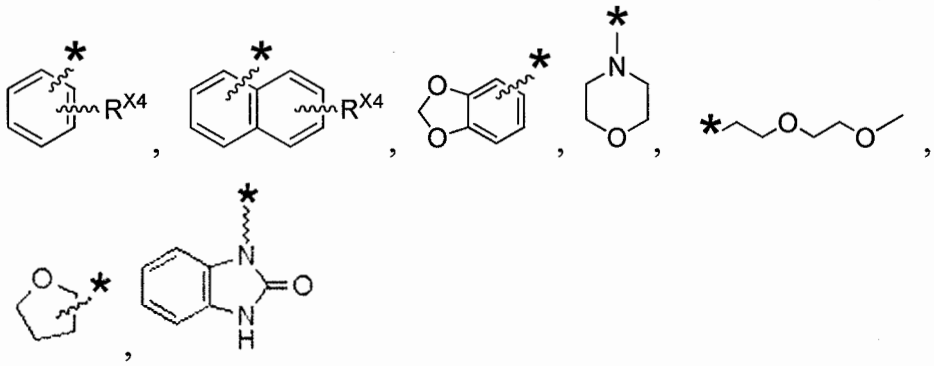
wherein said base is optionally selected from triethylamine, diisopropylamine or a related tertiary amine;

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

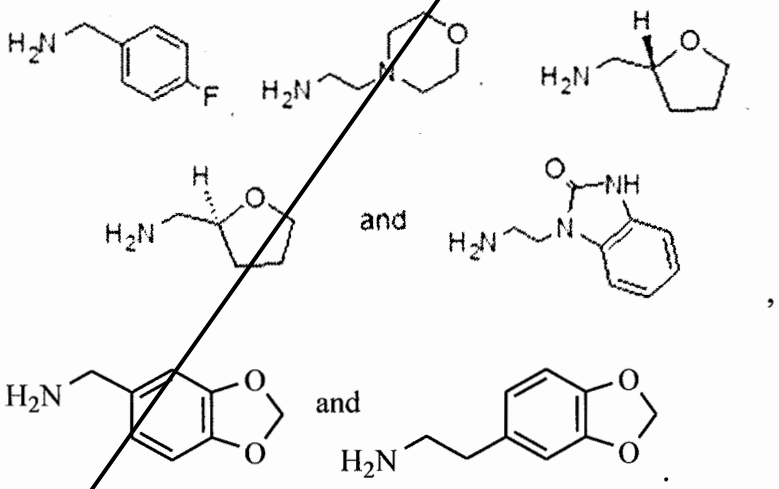
R^{X4} is selected from the group consisting of a branched or linear lower alkyl (C1-C20); halogen (F, Cl, Br, I); nitrile (CN); boronic acid (BO_2H_2); carboxylic acid (COOH); carboxylic acid ester ($COOR^{X2}$); primary amide ($CONH_2$); secondary amide ($CONHR^{X2}$); tertiary amide ($CONR^{X2}R^{X3}$); 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 $R^{X2} = R^{X3} = (CH_2)_n$; and

wherein n = 2-10.

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



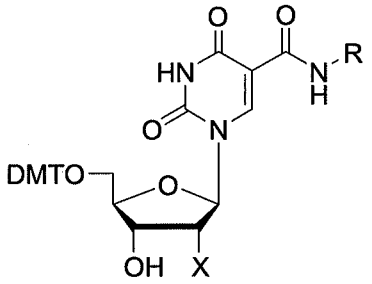
15. A method for preparing a 3'-phosporamidite of a C-5 modified aminocarbonylpyrimidine comprising:

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

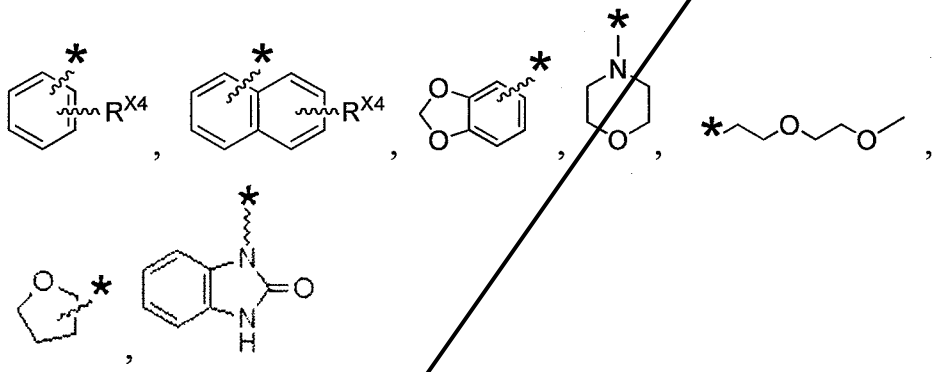
wherein said C-5 modified aminocarbonylpyrimidine has the following structure:



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}

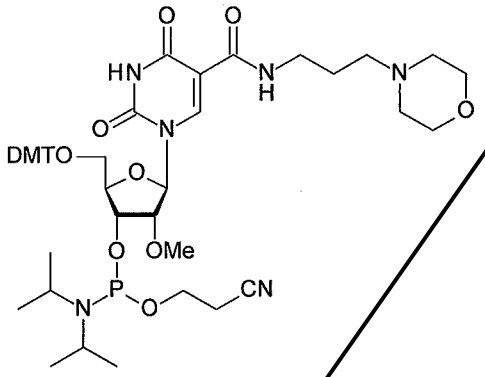
is a branched or linear lower alkyl (C1-C20); and cycloalkyl, wherein $R^{X2} = R^{X3} = (CH_2)_n$; and

wherein n = 2-10;

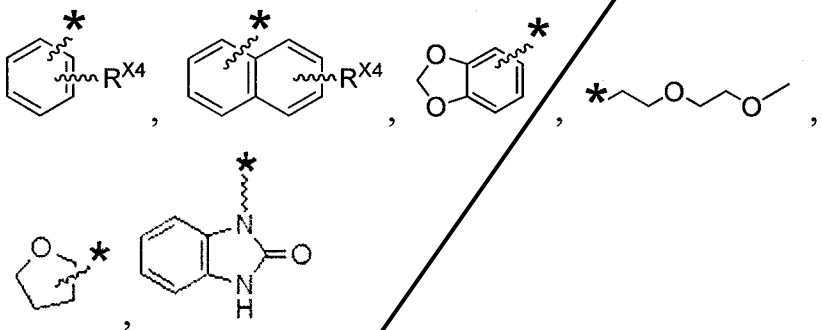
wherein

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*

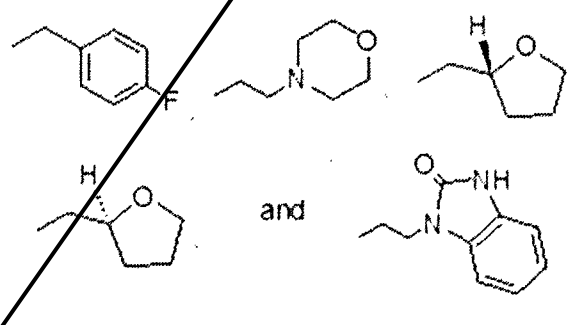


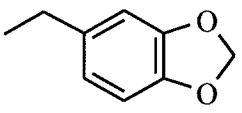
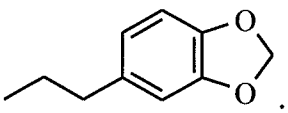
16. The method of claim 15, wherein R^{X1} is selected from the group consisting of:



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

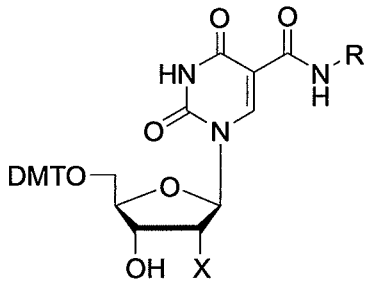
17. The method of claim 15 or claim 16 wherein R is selected from the group consisting of:



 and .

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

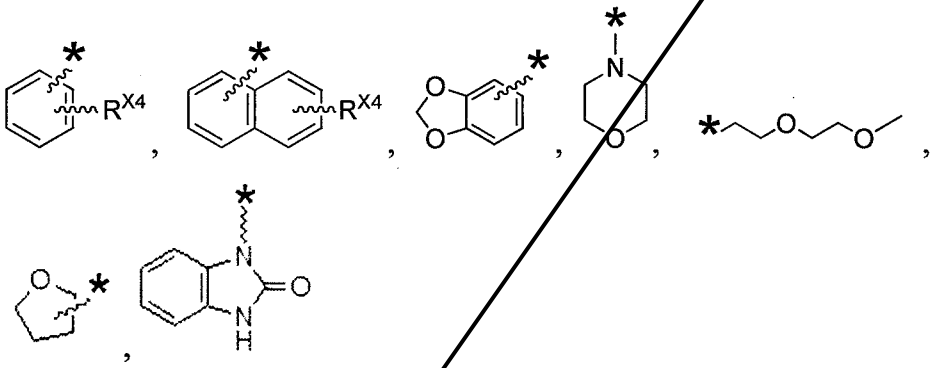
a) reacting a C-5 modified aminocarbonylpyrimidine having the formula:



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

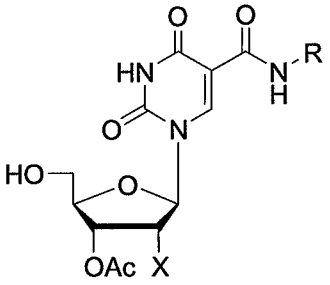
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is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

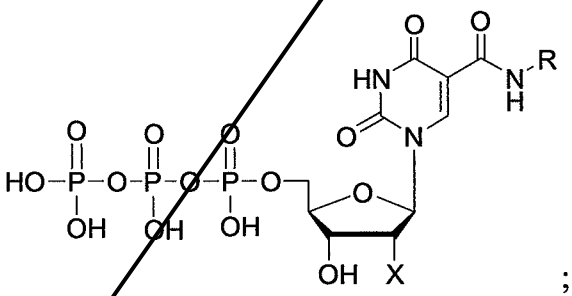
with acetic anhydride in the presence of a base, followed by cleavage of the 5'-DMTgroup with an acid to form a 3'-acetate of the following structure:



;

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:

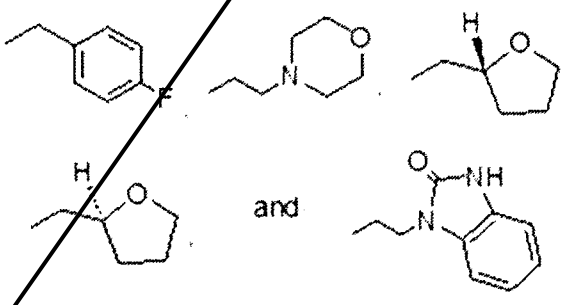


;

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

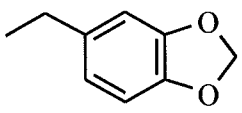
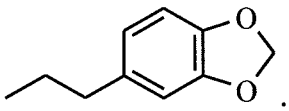
wherein said base is optionally a tertiary amine or pyridine.

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



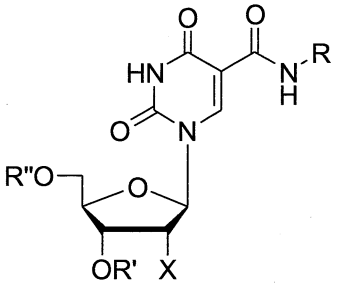
and

,

 and .

CLAIMS

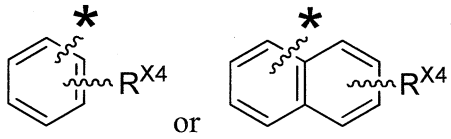
1. A compound selected from the compounds having the following structure or a salt thereof:



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 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;

°°°

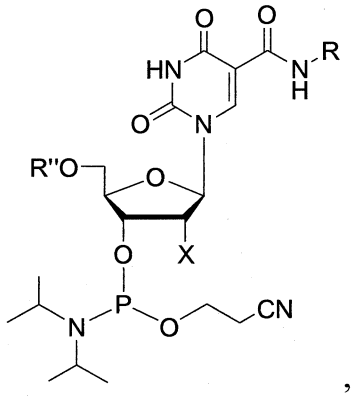
wherein

R' is selected from the group consisting of H, -Ac; $-P(N(iPr)_2(O(CH_2)_2)CN$; -Bz, $-C(O)CH_2OCH_3$, and $-SiMe_2tBu$;

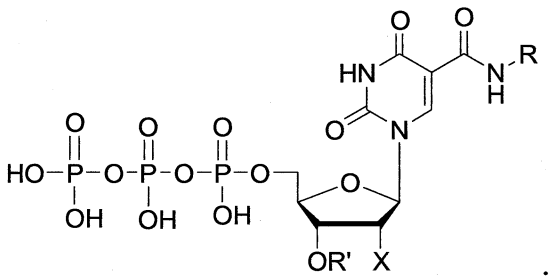
wherein

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.

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

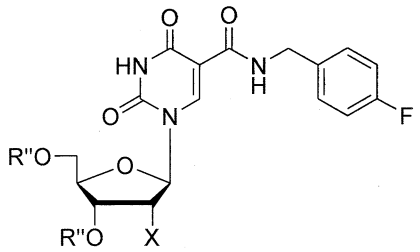


, or



.

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



wherein

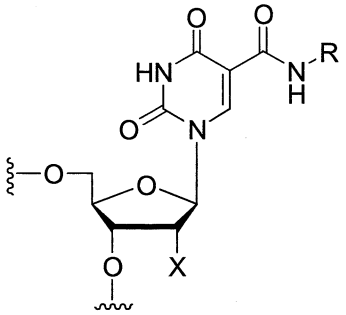
R' is selected from the group consisting of H, -Ac, -Bz, $-C(O)CH_2OCH_3$, $-P(NiPr)_2(OCH_2CH_2CN)$ and $-SiMe_2tBu$;

R" is selected from the group consisting of H, 4,4'-dimethoxytrityl (DMT) and -P(O)(OH)-O-P(O)(OH)-O-$P(O)(OH)_2$ or a salt thereof; and

°°°

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

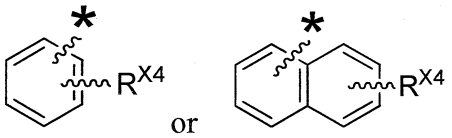
4. An oligonucleotide comprising at least one modified nucleotide having the following structure:



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

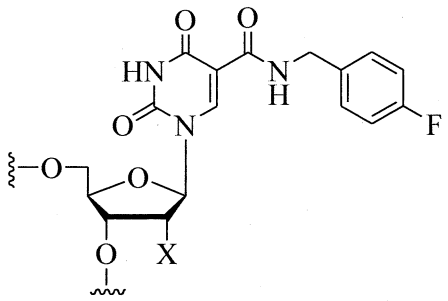
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is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

wherein 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.

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

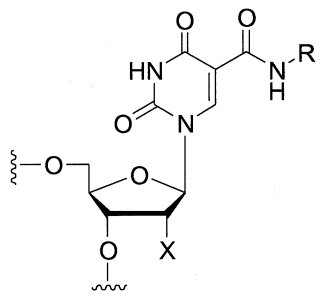


wherein

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

6. An oligonucleotide according to 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.

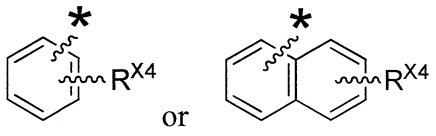
7. An aptamer comprising at least one modified nucleotide having the following structure:



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

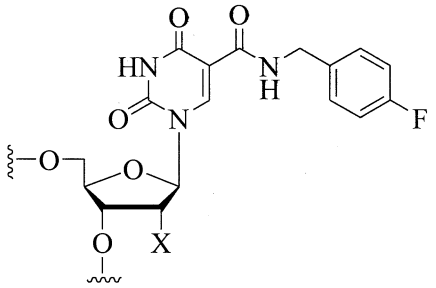
R^{X2} and R^{X3} are independently selected from the group consisting of a branched or linear lower alkyl (C1-C20); phenyl (C_6H_5); an R^{X4} substituted phenyl ring ($R^{X4}C_6H_4$), wherein R^{X4} is defined above; a carboxylic acid (COOH); a carboxylic acid ester ($COOR^{X5}$), wherein R^{X5} is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

wherein 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.

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



ooo

wherein

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

9. An aptamer according to 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.