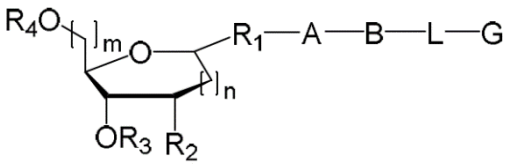
CLAIMS

1. A compound represented by formula (I) or a pharmaceutically acceptable salt thereof:



I

wherein,

R_1 is oxygen or sulfur;

R_2 is hydrogen, C_{1-4} alkyl, C_{1-4} alkoxy or halogen;

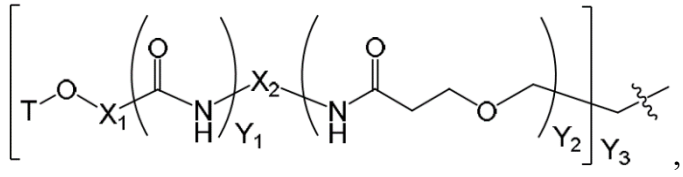
R_3 is hydrogen, a hydroxyl protecting group, a phosphorus-containing active reactive group, $-CO(CH_2)_xCONH-$ ● or $-CO(CH_2)_xCOOH$, wherein x is an integer selected from 1 to 10, and ● is controlled pore glass or polystyrene;

R_4 is hydrogen or a hydroxyl protecting group;

A is $-(CH_2)_a-$, $-(CH_2CH_2O)_b-$, $-((CH_2)_cNHCO)_d-$, or $-((CH_2)_cCONH)_d-$, wherein a is an integer selected from 1 to 15, b is an integer selected from 1 to 7, c is an integer selected from 1 to 7, and d is an integer selected from 1 to 5;

B is $-(CH_2)_e-$, wherein e is an integer selected from 0 to 7;

L is -CONH- or -NHCO-;

G is ,

wherein,

T is N-acetyl-galactosamine with hydroxyl fully protected by acyl, galactose with hydroxyl fully protected by acyl, galactosamine with hydroxyl fully protected by acyl, N-formyl-galactosamine with hydroxyl fully protected by acyl, N-propionyl-galactosamine with hydroxyl fully protected by acyl, N-n-butyryl-galactosamine with hydroxyl fully protected by acyl, or N-

isobutyryl-galactosamine with hydroxyl fully protected by acyl, wherein the acyl is acetyl or benzoyl;

X_1 is $-(CH_2)_f-$ or $-(CH_2CH_2O)_fCH_2-$, wherein f is an integer selected from 1 to 5;

X_2 is $-(CH_2)_g-$, wherein g is an integer selected from 1 to 6;

Y_1 is 0 or 1;

Y_2 is 0, 1 or 2;

Y_3 is 1, 2 or 3;

m is an integer selected from 0 to 4; and

n is an integer selected from 0 to 4.

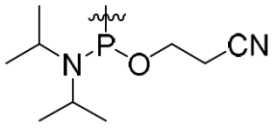
2. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof according to claim 1, wherein A is $-(CH_2)_{10}-$, $-(CH_2)_7-$, $-(CH_2)_8-$, $-(CH_2)_9-$, $-(CH_2)_{11}-$, $-(CH_2)_{12}-$, $-(CH_2CH_2O)_3-$, $-(CH_2)_4NHCO-$, or $-(CH_2)_6NHCO-$;

or, B is $-(CH_2)_0-$, $-CH_2-$, $-(CH_2)_2-$, $-(CH_2)_4-$, or $-(CH_2)_3-$;

or, R_1 is oxygen;

or, R_1 has an α configuration or a β configuration;

or, R_2 is hydrogen or $-OCH_3$.

3. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof according to claim 1 or 2, wherein R_3 is a hydroxyl protecting group or a phosphorus-containing active reactive group; preferably, R_3 is acetyl, 1,1,3,3-tetraisopropyldisiloxanyl, tert-butyldimethylsilyl, phenyldimethylsilyl, 4,4'-dimethoxytrityl, or 

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4. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof according to claim 1 or 2, wherein R_3 is 

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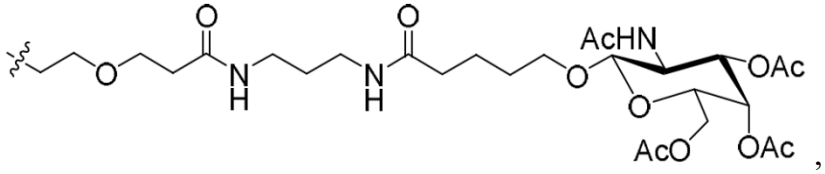
or, R_3 is $-CO(CH_2)_2COOH$;

or, m is 1;

or, n is 0;

or, G is



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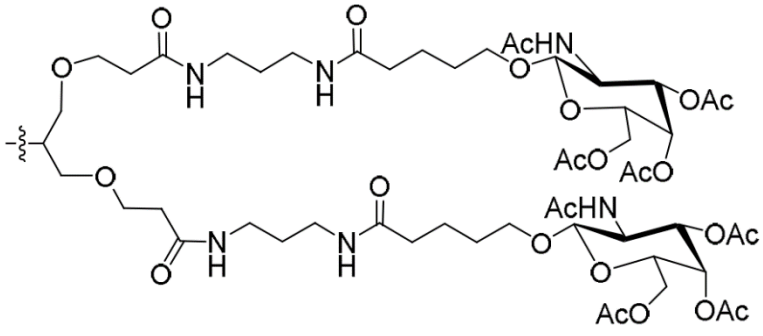

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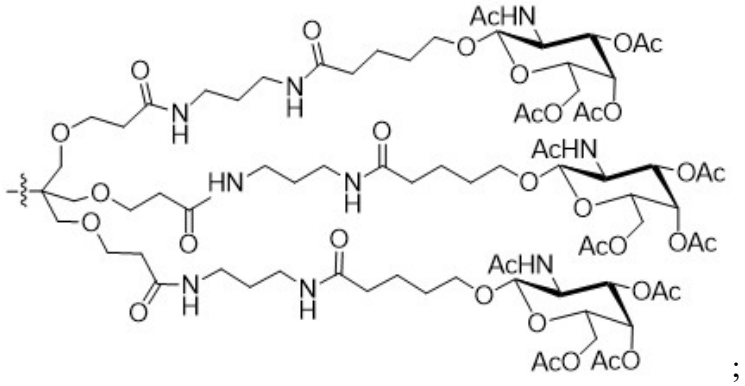


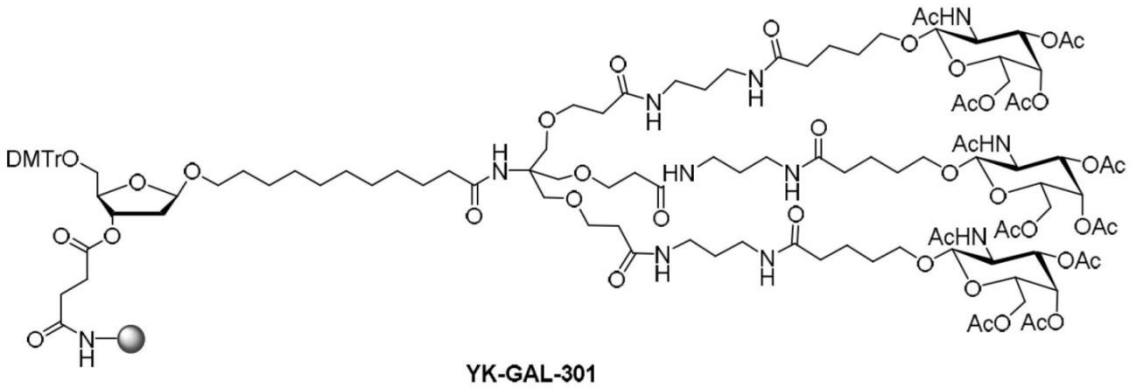
;

or, the compound is capable of binding to asialoglycoprotein receptor (ASGPR).

5. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof according to claim 1 or 2, wherein R_4 is a hydroxyl protecting group; preferably, R_4 is trityl, monomethoxytrityl or 4,4'-dimethoxytrityl.

6. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof

according to claim 1, wherein the compound represented by formula (I) is YK-GAL-301, YK-GAL-302, YK-GAL-303, YK-GAL-304, YK-GAL-305, YK-GAL-306, YK-GAL-307, YK-GAL-308, YK-GAL-309, YK-GAL-310, YK-GAL-311, YK-GAL-312, or YK-GAL-313:



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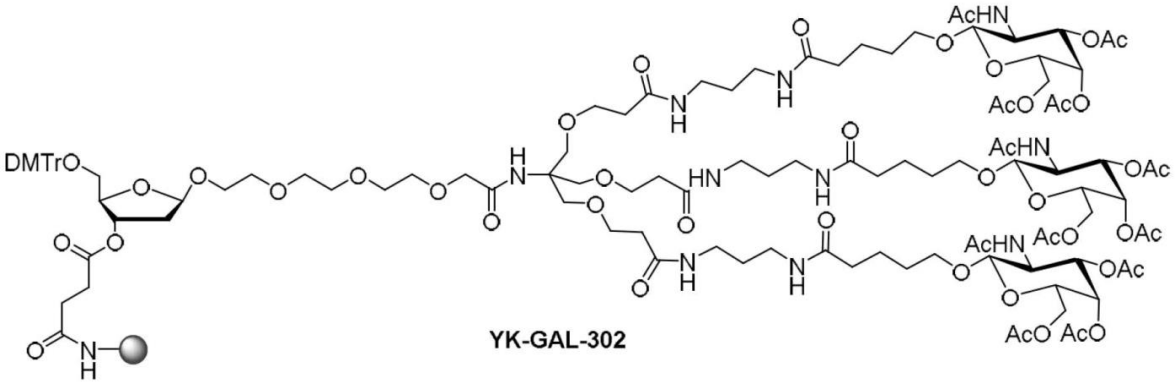

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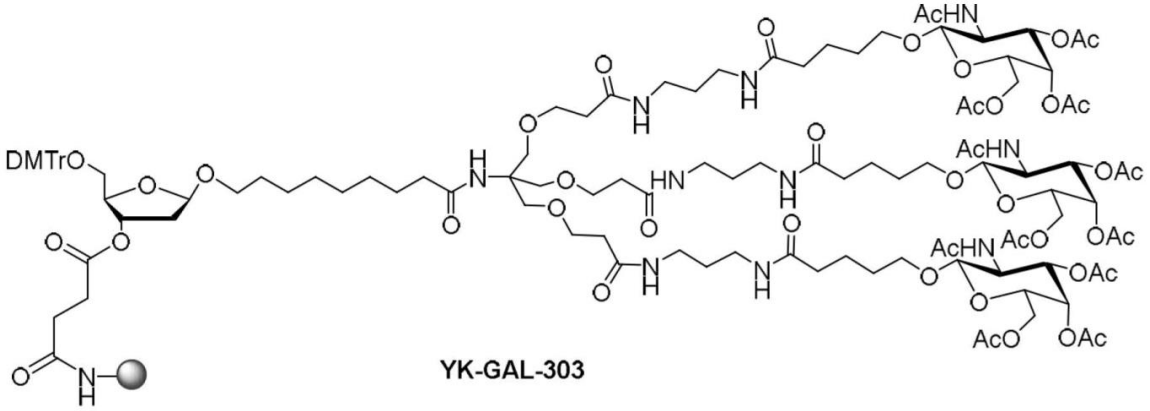

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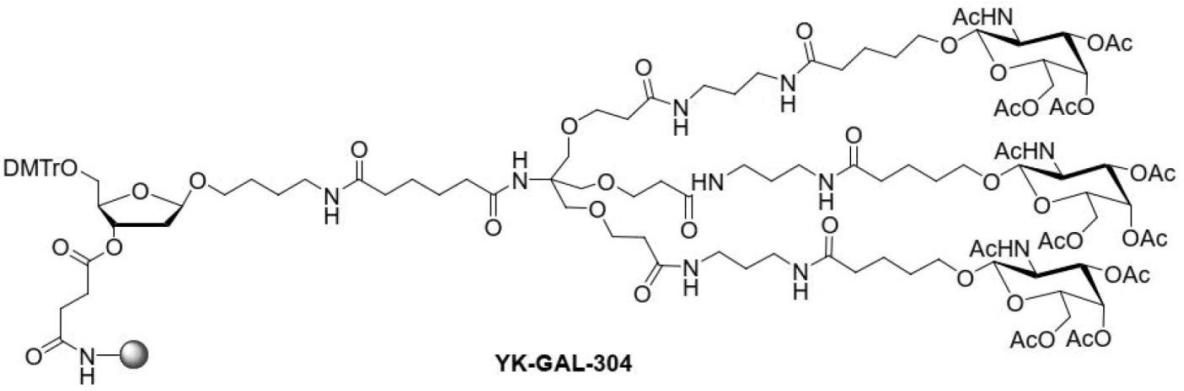

YK-GAL-304

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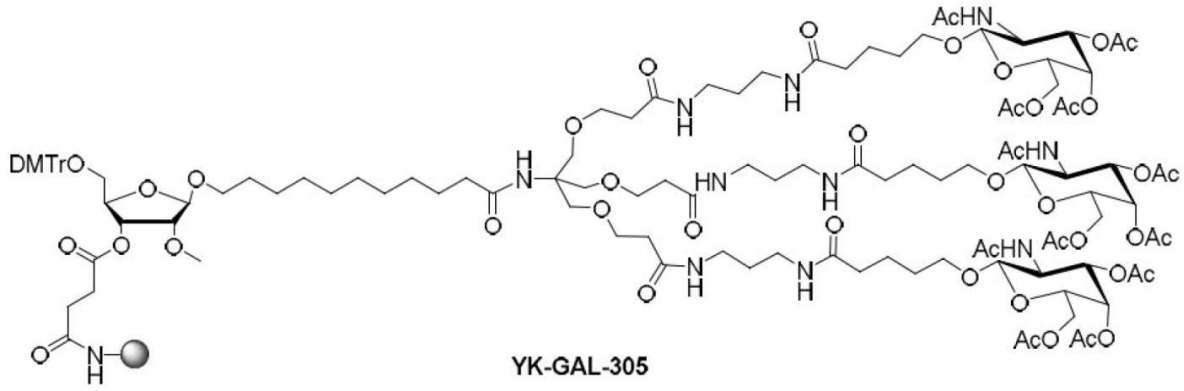

YK-GAL-305

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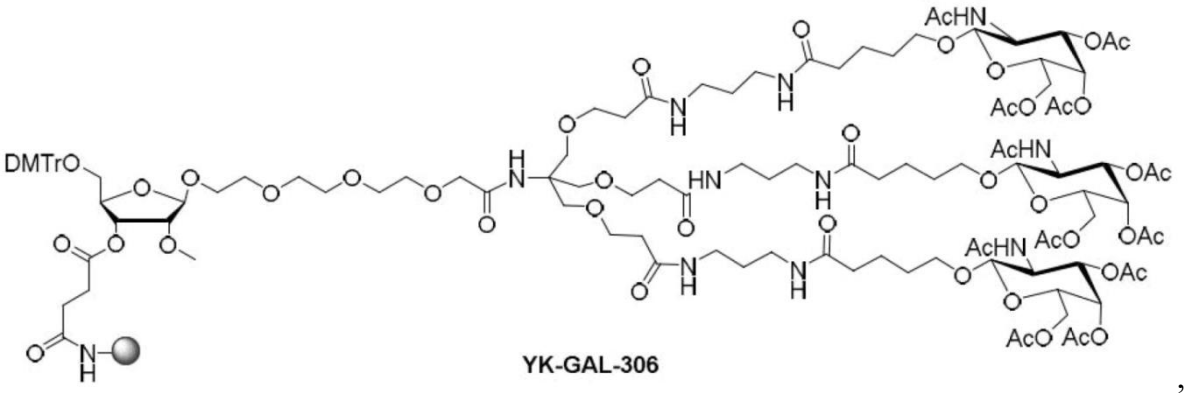

YK-GAL-306

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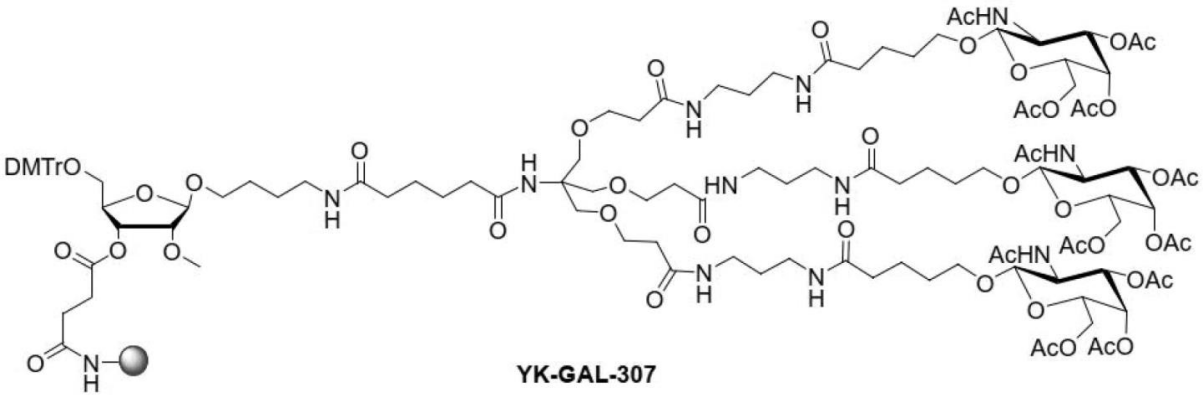

YK-GAL-307

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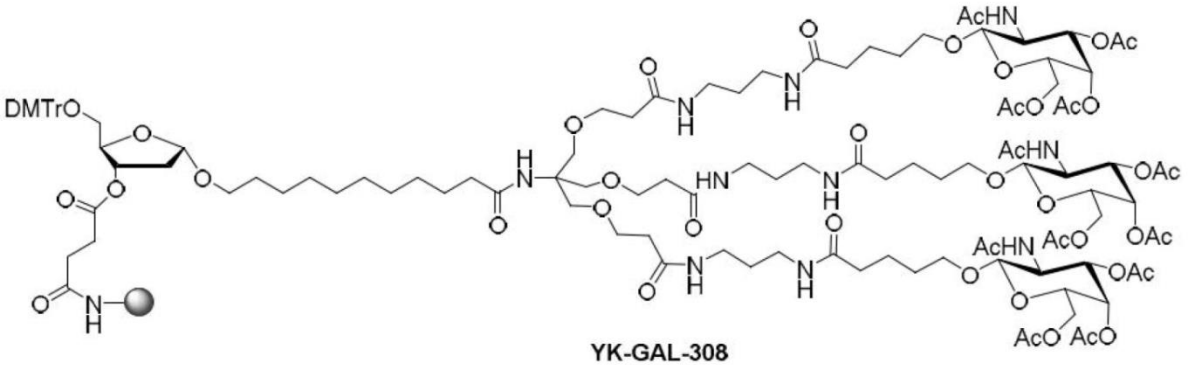

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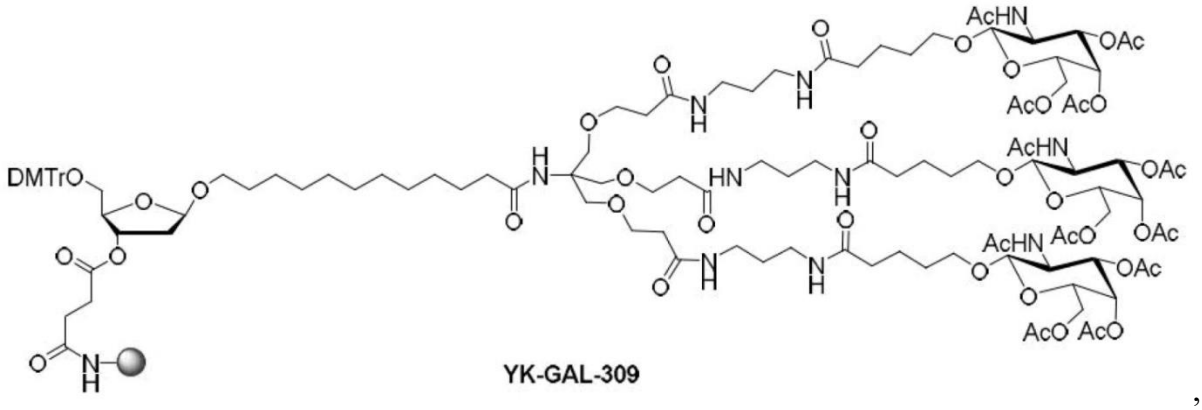

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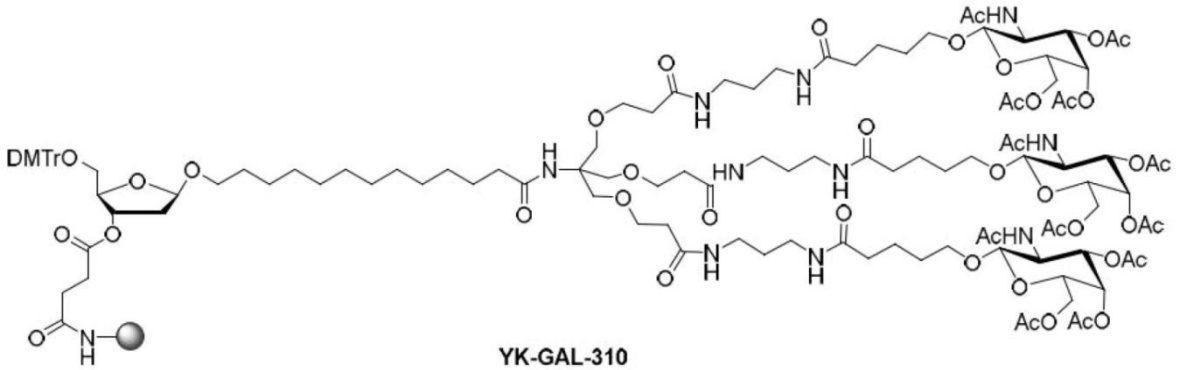

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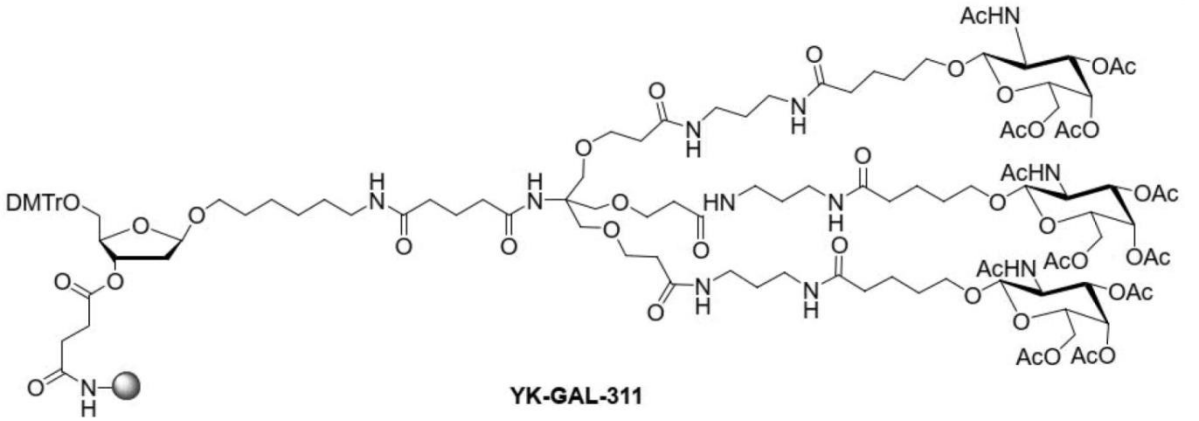
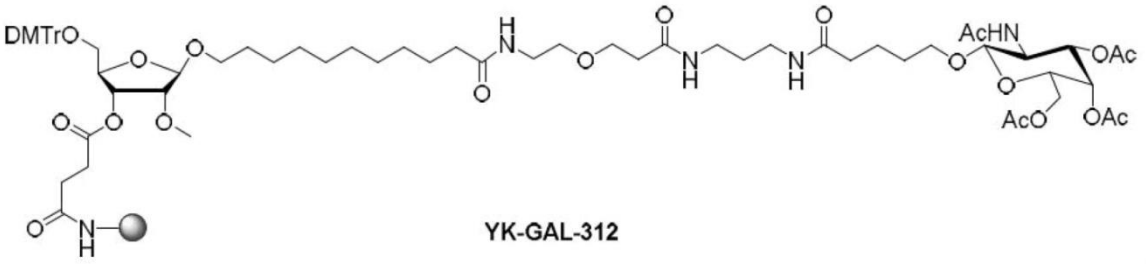


YK-GAL-311 ,



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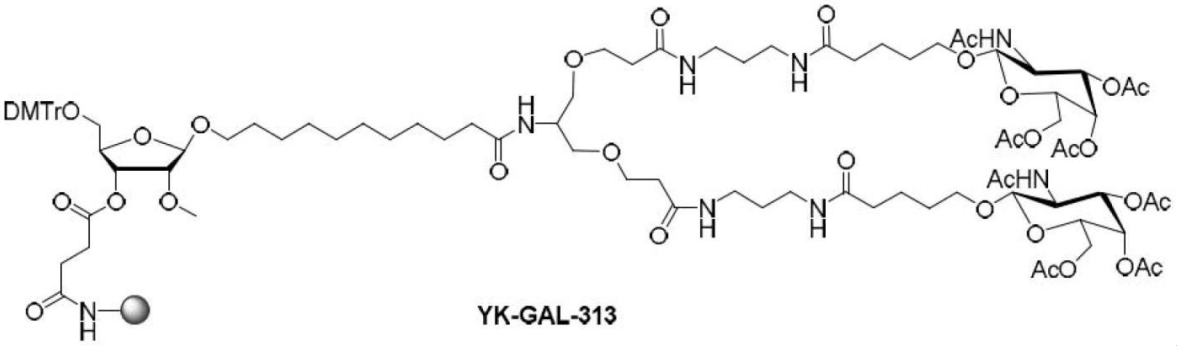

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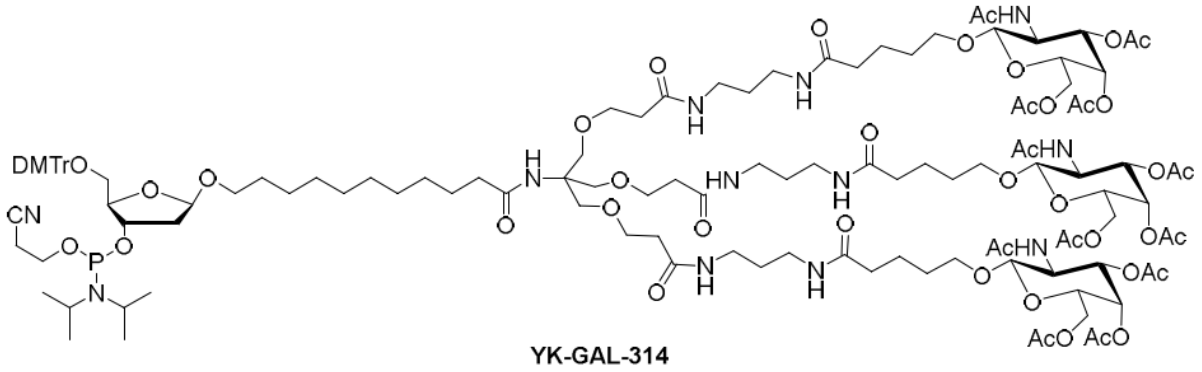
wherein  is controlled pore glass.

7. The compound represented by formula (I) or the pharmaceutically acceptable salt thereof according to claim 1, wherein the compound represented by formula (I) is YK-GAL-314, YK-GAL-315, YK-GAL-316, YK-GAL-317, YK-GAL-318, YK-GAL-319, YK-GAL-320, YK-GAL-321, YK-GAL-322, YK-GAL-323, YK-GAL-324, YK-GAL-325, or YK-GAL-326:



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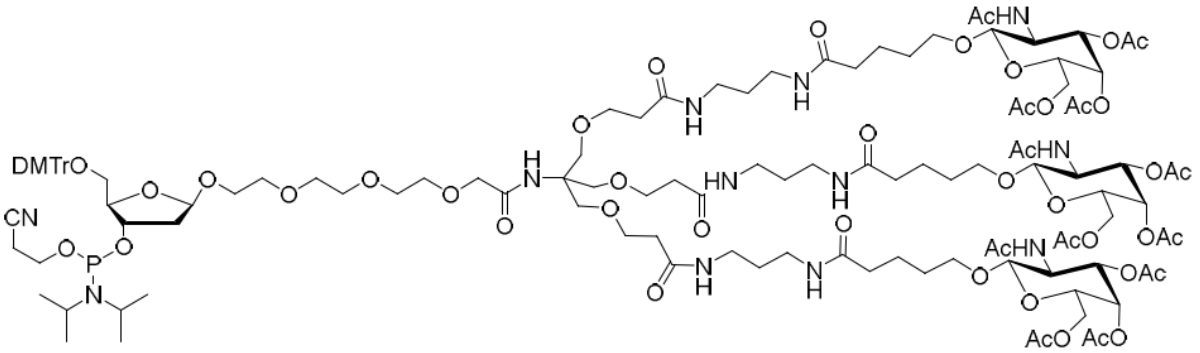

YK-GAL-315

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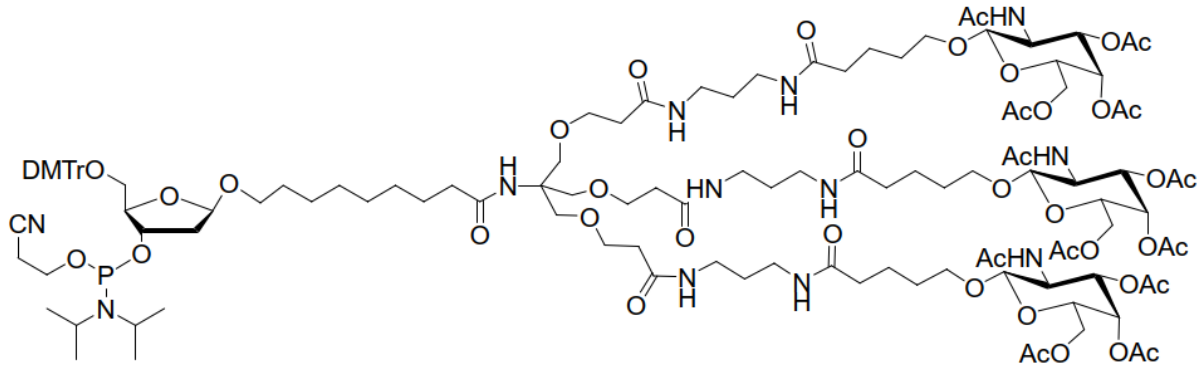

YK-GAL-316

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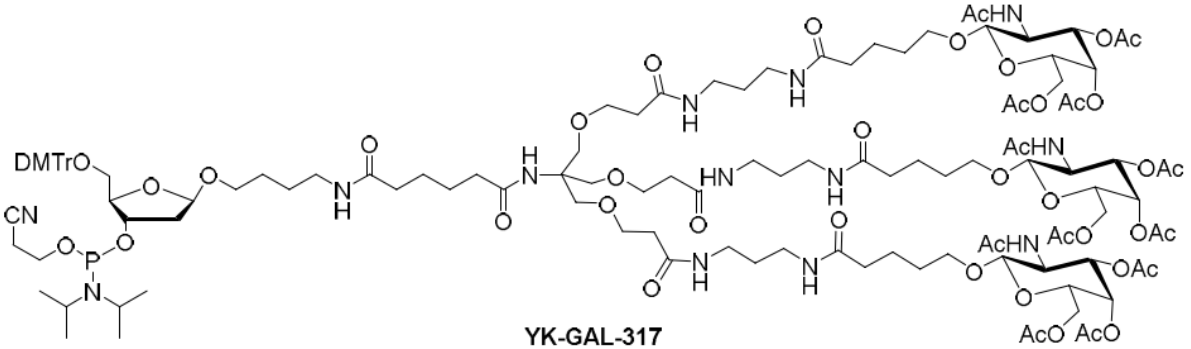

YK-GAL-317

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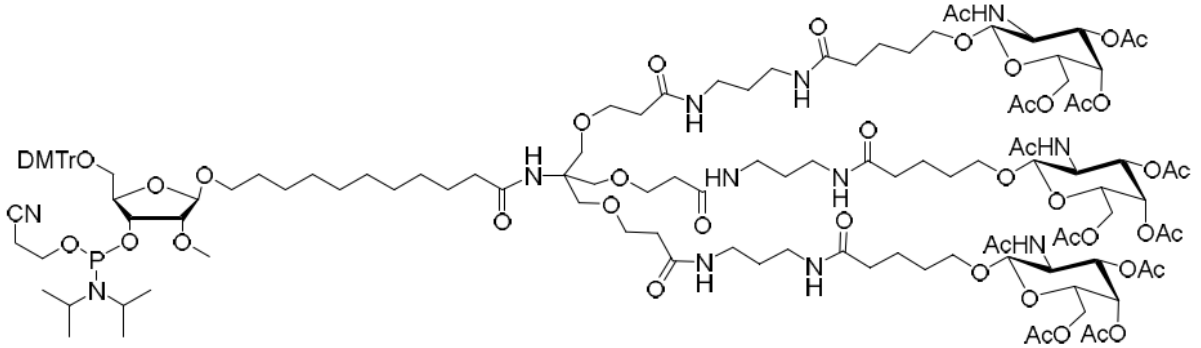

YK-GAL-318

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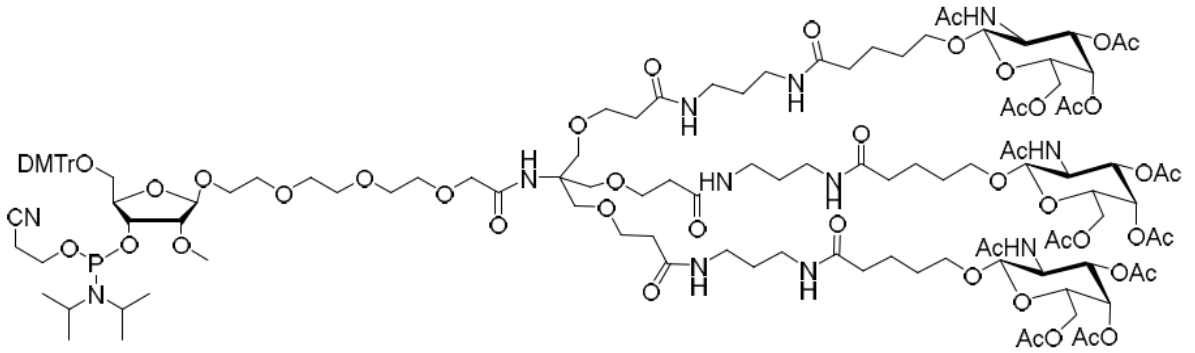

YK-GAL-319

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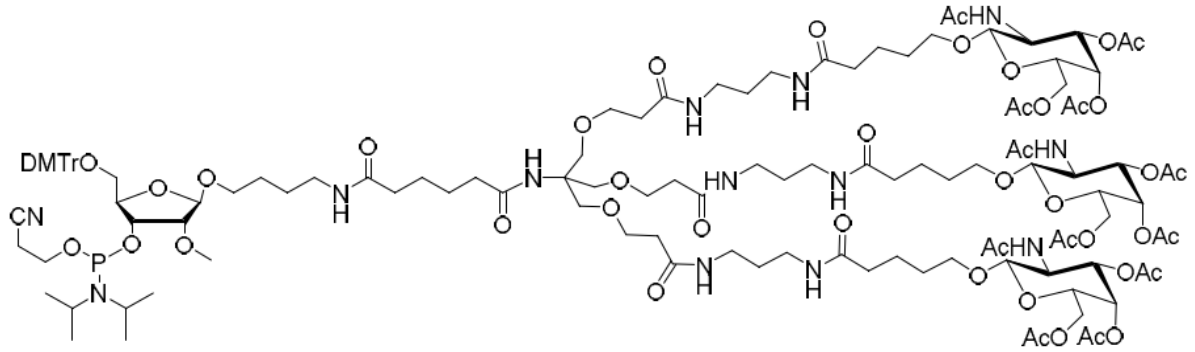

YK-GAL-320

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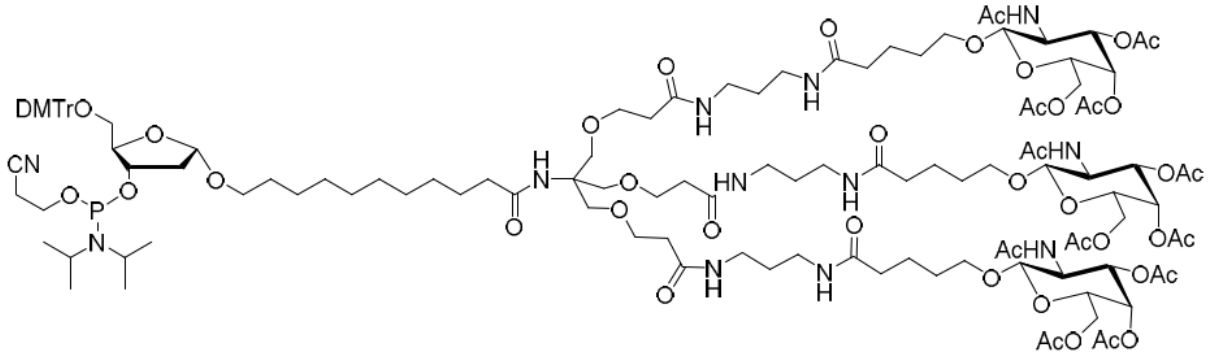

YK-GAL-321

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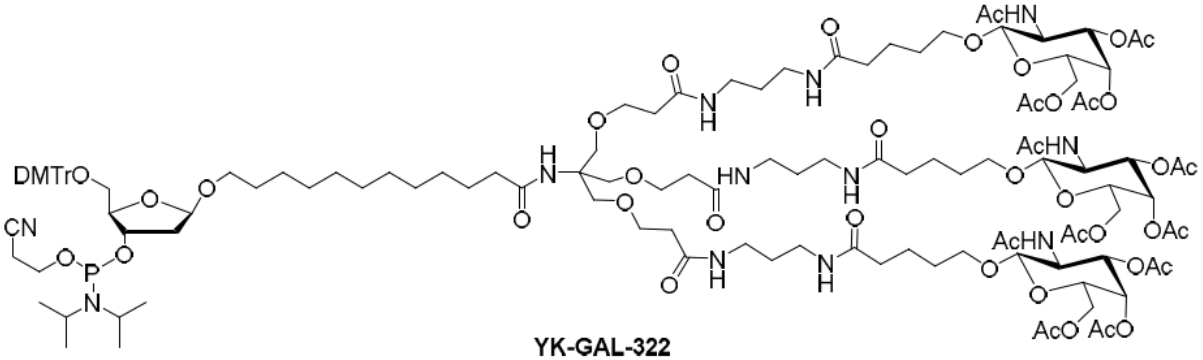

YK-GAL-322

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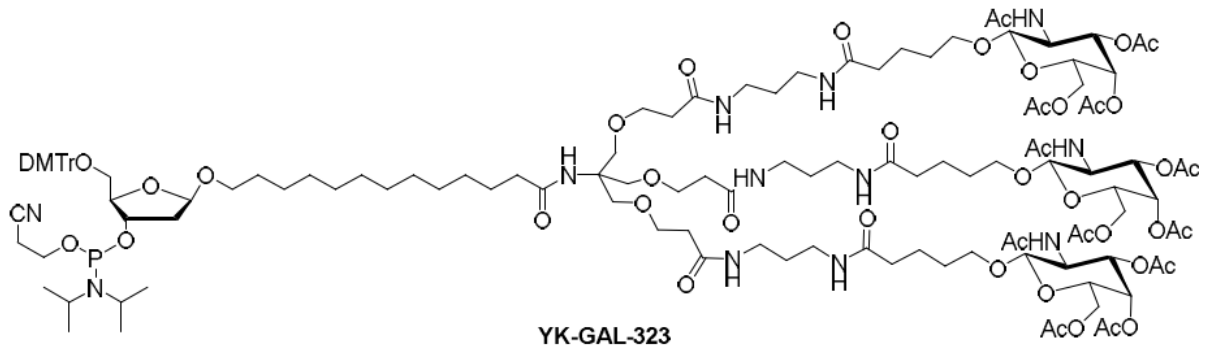

YK-GAL-323

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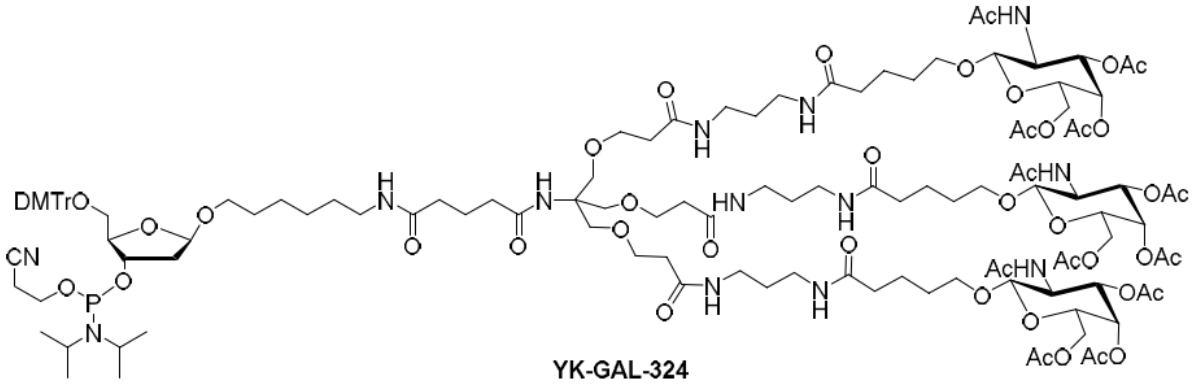

YK-GAL-324

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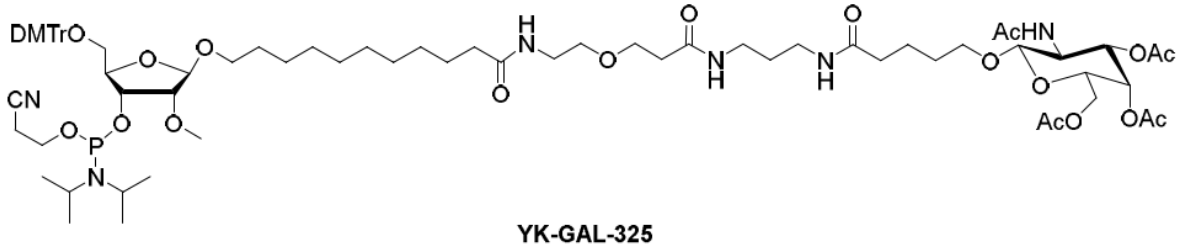

YK-GAL-325

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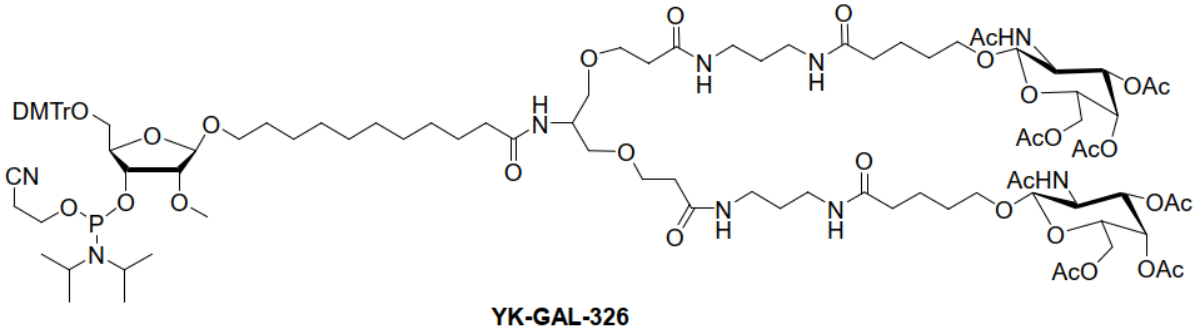

YK-GAL-326

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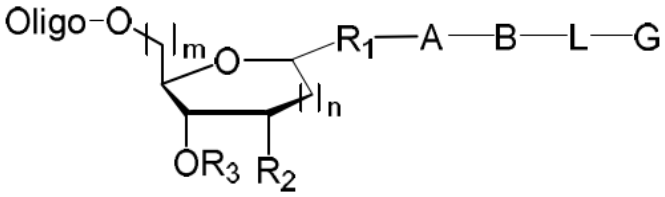
8. A conjugate comprising an oligonucleotide and a GalNAc moiety, wherein the conjugate has a structure of



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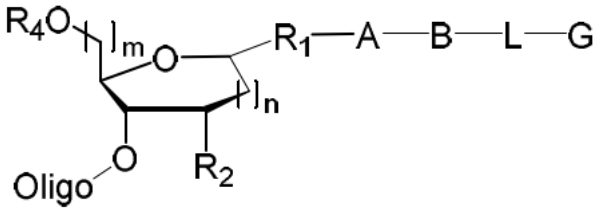

wherein, Oligo represents oligonucleotide, and R_1, R_2, R_3, R_4, A, B, L, G, m and n are the same as those defined in claim 1.

9. The conjugate according to claim 8, wherein the hydroxyl protecting group acetyl in the N-acetyl-galactosamine of G is removed.

10. The conjugate according to claim 8 or 9, wherein the oligonucleotide is a non-thio oligonucleotide or a thio oligonucleotide.

11. The conjugate according to claim 10, wherein the non-thio oligonucleotide and the GalNAc moiety are linked by a phosphate bond;

or, the thio-oligonucleotide and the GalNAc moiety are linked by a phosphorothioate bond;

or, the oligonucleotide is a small interfering RNA (siRNA), a DNA, a micro RNA (miRNA), a small activating RNA (saRNA), a small guide RNA (sgRNA), a transfer RNA (tRNA), an antisense oligonucleotide (ASO), or an aptamer; preferably, each nucleotide in the antisense oligonucleotide (ASO) or small interfering RNA (siRNA) is independently a modified or unmodified nucleotide;

or, the oligonucleotide modulates expression of a target gene.

12. A pharmaceutical composition comprising the conjugate according to any one of claims 8

to 11 and at least one pharmaceutically acceptable excipient.

13. Use of the conjugate according to any one of claims 8 to 11 or the pharmaceutical composition according to claim 12 in the manufacture of a medicament for treating and/or preventing a pathological condition or disease caused by the expression of a specific gene in a hepatocyte; optionally, the specific gene is hepatitis B virus gene, angiopoietin 3 gene or apolipoprotein C3 gene.

14. The use according to claim 13, wherein the disease is selected from chronic liver disease, hepatitis, liver fibrosis, liver proliferative disease and dyslipidemia; optionally, the dyslipidemia is hypercholesterolemia, hypertriglyceridemia or atherosclerosis.

15. A kit comprising the conjugate according to any one of claims 8 to 11.