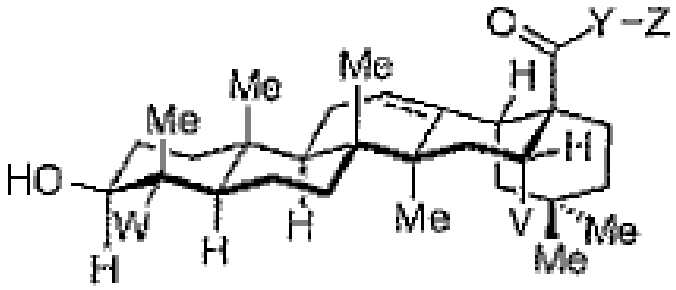
Claims

1. A compound of formula (I), or a pharmaceutically acceptable salt thereof,




(I)

wherein == is a single or double bond;

W is C(O)R, $CH_2OR$ or $CH_2R$, wherein R is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups;

Vis H or OH;

Y is O;

Z is a linear tetrasaccharide or a linear trisaccharide with an acyl chain attached to a first sugar residue of the linear tetrasaccharide or a linear trisaccharide,

wherein the first sugar residue is the sugar residue that is attached directly to Y,

wherein R is not H when W is C(O)R,
and

wherein either V is OH, or, when W is $CH_2R$, R is not H.

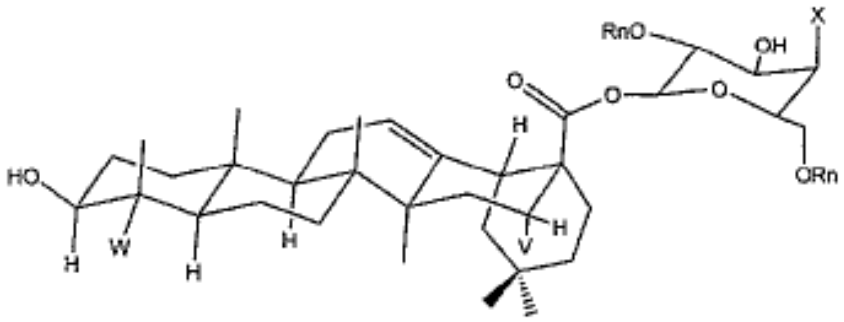
2. The compound of Claim 1, or a pharmaceutically acceptable salt thereof, wherein W is not C(O)R, and wherein R is H.

3. The compound of Claim 1, or a pharmaceutically acceptable salt thereof, wherein W is Me.

4. The compound of Claim 2, or a pharmaceutically acceptable salt thereof, W is $CH_2OH$ and V is OH.

5. The compound of any one of Claims 1 to 4, or a pharmaceutically acceptable salt thereof, wherein the acyl chain attached to the first sugar residue is 6-(4-iodobenzoylamino)hexanoyl.

6. A compound of formula (II), or a pharmaceutically acceptable salt thereof,




(II)

(II)

or a pharmaceutically acceptable salt thereof, wherein

W is C(O)R, $CH_2OR$ or $CH_2R$; wherein R is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups;

V is H or OH,

with the proviso that W is other than Me or that V is OH, and R is not H when W is C(O)R,

X is $CH_2R_m$, $C(O)R_m$, $CH_2OR_m$, $CH_2R_m$, $OR_m$, or $NHR_m$, wherein

$R_m$ is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups,

and

one occurrence of $R_n$ is hydrogen, and the other is a monosaccharide, a disaccharide or a trisaccharide.

7. The compound of Claim 6, or a pharmaceutically acceptable salt thereof, wherein W is not C(O)R, and R is H.

8. The compound of Claim 7, or a pharmaceutically acceptable salt thereof, wherein W is Me and V is OH.

9. The compound of Claim 7, or a pharmaceutically acceptable salt thereof, W is $CH_2OH$ and V is OH.

10. The compound of any one of Claims 6 to 8 or 9, or a pharmaceutically acceptable salt thereof, wherein X is $NHR^m$ and wherein $R^m$ is 6-(4-iodobenzoylamino)-hexanoyl.

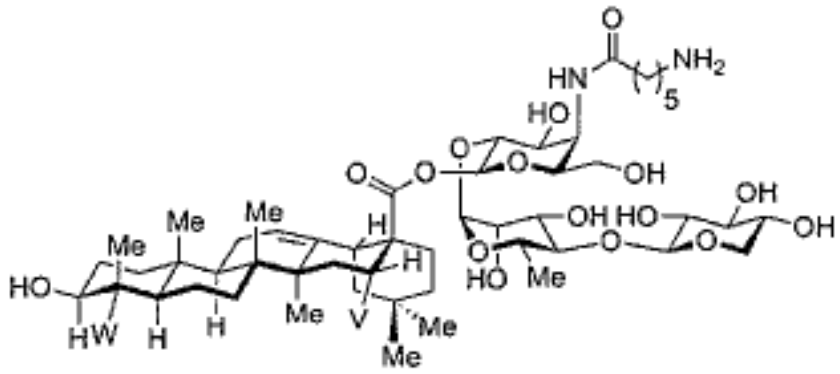
11. A pharmaceutical composition, comprising: the compound of any one of Claims 1-10, or a pharmaceutically acceptable salt thereof; and an immunologically effective amount of an antigen.

12. The use of the pharmaceutical composition of Claim 11 in the manufacture of a medicament for immunizing a subject.

13. A pharmaceutical composition, comprising: the compound of any one of Claims 1-3, 4-8 or 9-10, or a pharmaceutically acceptable salt thereof; and an effective amount of a cytotoxic drug.

14. The use of the pharmaceutical composition of Claim 13 in the manufacture of a medicament for enhancing the effect of a cytotoxic drug against a tumor in a subject.

15. A compound of formula (III),



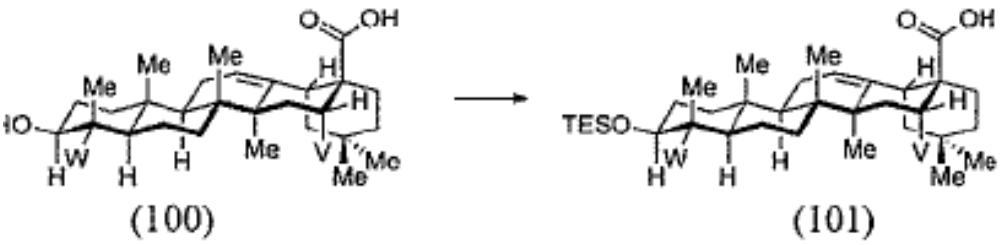
(III),

wherein W is Me, or $-CH_2OH$, and V is H or OH.

16. The use of the compound of Claim 15 as an intermediate in the synthesis of a saponin analogue.

17. A process for preparing the compound of Claim 15, comprising the steps of:

a) reacting a compound of formula (100) with a protecting group to form a compound of formula (101),



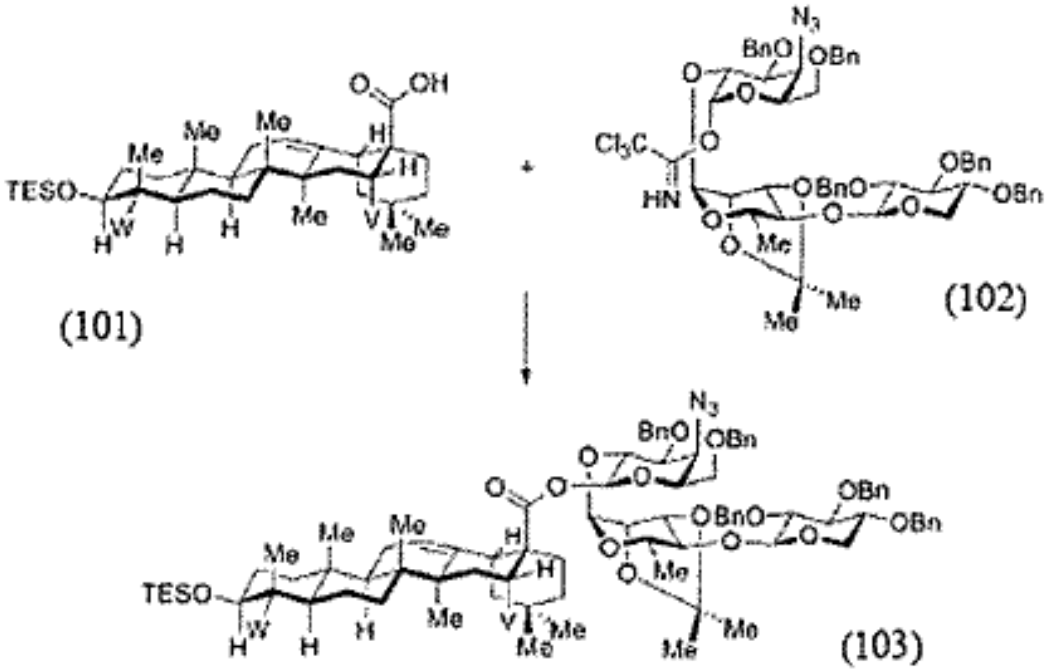
(100) (101)

wherein W is Me, CHO, $CH_2OH$, or $CH_2OR^p$; wherein

Rp is H or a suitable protecting group as necessary to achieve regioselectivity; V is H or $OR^p$, and TES is a triethylsilyl protecting group;

b) reacting the compound of formula (101) with the compound of formula (102)

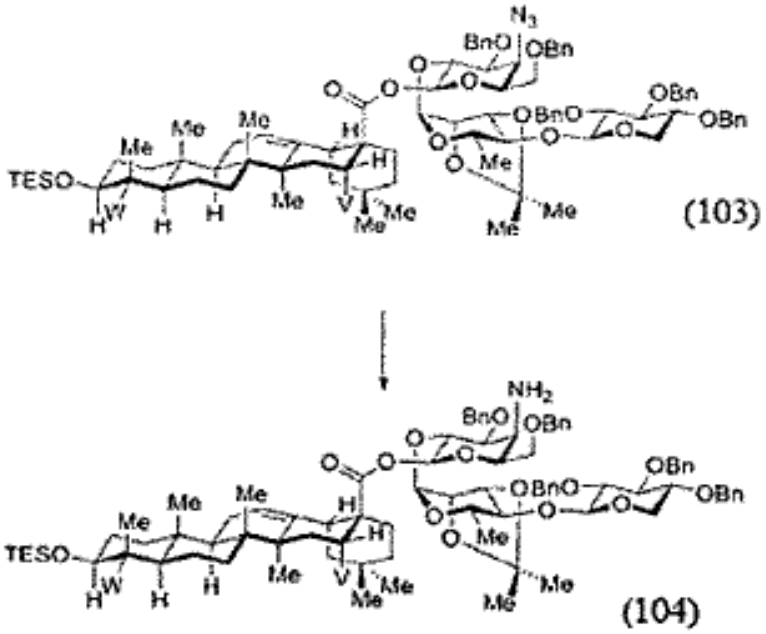
to form the compound of formula (103), wherein Bn is a benzyl protecting group;



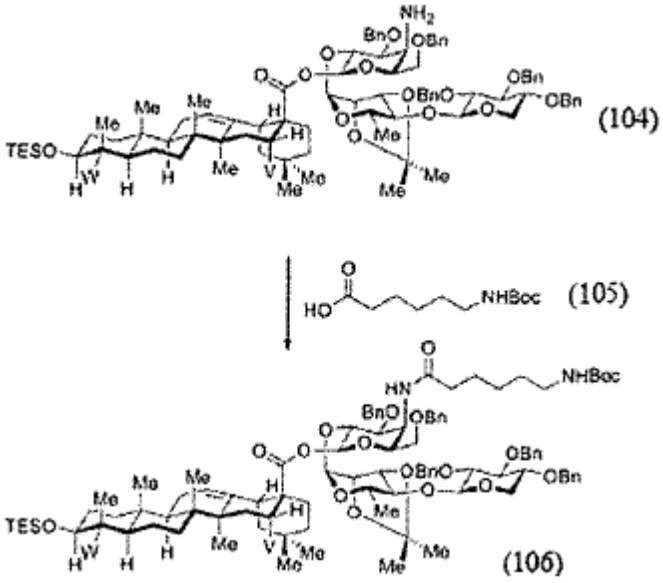
(101) (102) (103)

c) reacting the compound of formula (103) with a reducing agent to form the compound of formula (104);

(103)



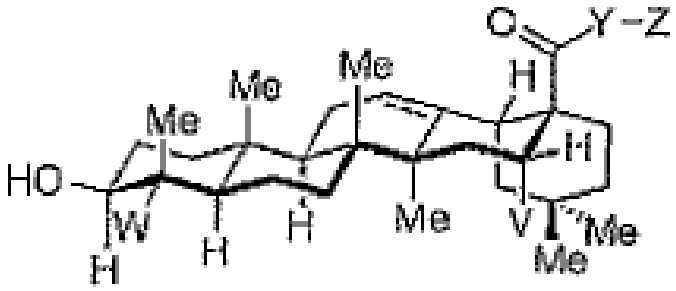

d) coupling the compound of formula (104) with compound of formula (105) in the presence of an activating agent to form the compound of formula (106), wherein Boc is a tertbutyloxycarbonyl protecting group;




e) deprotecting the compound of formula (106) to form the compound of formula (III).

18. A pharmaceutical composition, comprising:

a) a compound of Formula I,




(I)

or a pharmaceutically acceptable salt thereof;

== is a single or double bond;

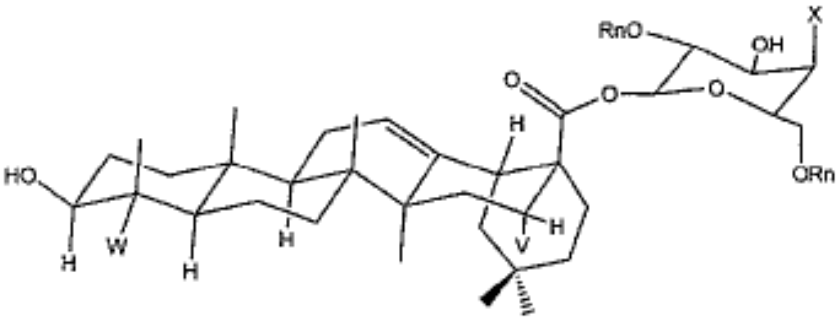
W is $CH_2OR$ or $CH_2R$, wherein R is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups;

Vis H or OH;

Y is O; and

Z is a linear oligosaccharide; or

b) a compound of formula (II), or a pharmaceutically acceptable salt thereof,




(II)

or a pharmaceutically acceptable salt thereof, wherein

W is C(O)R, $CH_2OR$ or CH2R; wherein R is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups;

V is H or OH,

with the proviso that W is other than Me or that V is OH, and R is not H when W is C(O)R,

X is $CH_2R^m$, $C(O)R^m$, $CH_2OR^m$, $CH_2R^m$, $OR^m$, or $NHR^m$, wherein

$R^m$ is H, or an optionally substituted group selected from acyl, arylalkyl, aryl, heteroaryl, aliphatic, heteroaliphatic, cycloaliphatic and heterocyclyl groups, and

each occurrence of $R^n$ is independently a hydrogen, a monosaccharide, a disaccharide or a trisaccharide, and

c) and an immunologically effective amount of an antigen.

19. The composition of Claim 18, wherein Z is a linear tetrasaccharide or a linear trisaccharide with an acyl chain attached to a first sugar residue of the linear tetrasaccharide or a linear trisaccharide, wherein the first sugar residue is the sugar residue that is attached directly to Y.

20. The composition of Claim 19, wherein R is H.

21. The composition of Claim 20, wherein W is Me and V is OH.

22. The composition of Claim 20, wherein W is CHO and V is OH.

23. The composition of Claim 20, wherein W is $CH_2OH$ and V is OH.

24. The composition of any one of Claims 19 to 23, wherein the acyl chain attached to the first sugar residue is 6-(4-iodobenzoylamino)hexanoyl.

25. The use of the pharmaceutical composition of any of Claims 18 to 24 in the manufacture of a medicament for immunizing a subject.