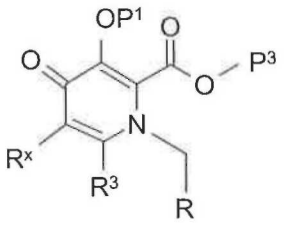
What is Claimed is:

1. A process for the preparation of a compound of formula (I):



(I)

wherein

R is –CHO, $–CH(OH)_2$ or $–CH(OH)(OR^4)$;

P^1 is H or a hydroxyl protecting group;

P^3 is H or a carboxy protecting group;

R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^4 is lower alkyl;

R^x is H, halo or R^2-X-NR^1-C(O)-;

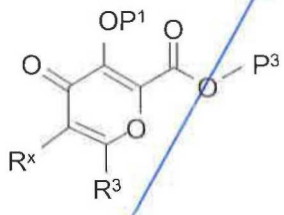
R^2 is optionally substituted aryl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2, and NH or loweralkylene or lower alkenylene wherein each may be intervened by the heteroatom; and

R^1 is H or lower alkyl,

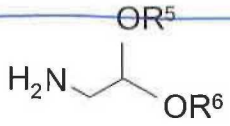
which comprises the steps of:

i) reacting a compound of formula (II):



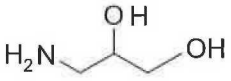
(II)

with an amine of formula (III) or (IV):



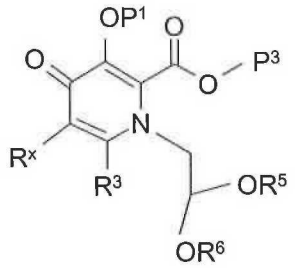
(III)

wherein R^5 and R^6 are independently lower alkyl or R^5 and R^6 can be alkyl and joined to form a 5-, 6-, or 7-membered ring,

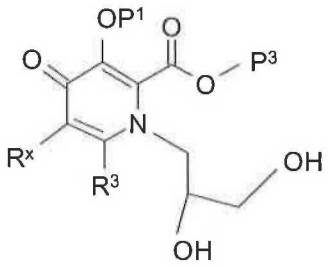


(IV)

to produce an intermediate of formula (V) or (VI), respectively:



(V)



(VI)

and

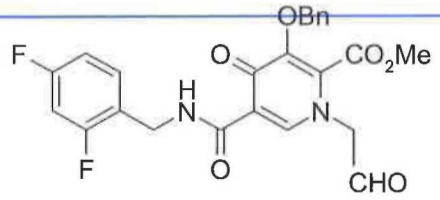
ii) refunctionalizing (V) or (VI) to produce (I).

2. The process of Claim 1, wherein in said compound of formula (I), R is –CHO.

3. The process of Claim 1, wherein in said compound of formula (I), R is $-CH(OH)_2$.

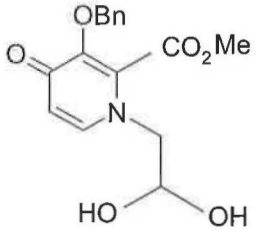
4. The process of Claim 1, wherein in said compound of formula (I), R is $-CH(OH)(OR^4)$.

5. The process of Claim 2, wherein said compound of formula (I) is of the formula (VII):



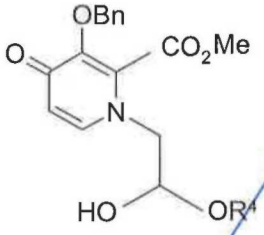
(VII)

6. The process of Claim 3, wherein said compound of formula (I) is of the formula (Ia):



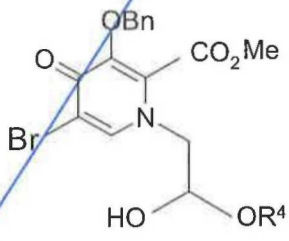
(Ia)

7. The process of Claim 4, wherein said compound of formula (I) is of the formula (VIII):



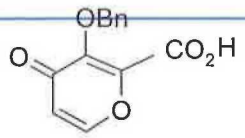
(VIII)

8. The process of Claim 4, wherein said compound of formula (I) is of the formula (IX):



(IX)

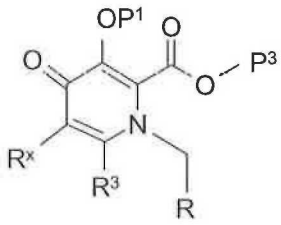
9. The process of Claim 1, wherein said compound of formula (II) is of the formula (IIa):



(IIa)

10. A process according to claim 1 wherein in in said compound of formula (I), R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy.

11. A process for preparing a compound of formula (I):



(I)

wherein

R is $-CH(OH)(OR^4)$;

P^1 is a hydroxyl protecting group;

P^3 is H;

R^3 is H;

R^4 is lower alkyl;

R^x is R^2-X-NR^1-C(O)-;

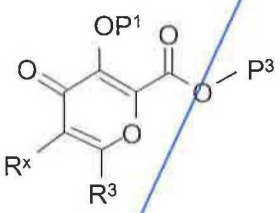
R^2 is aryl optionally subsituted with one or more halogen;

X is lower alkylene; and

R^1 is H;

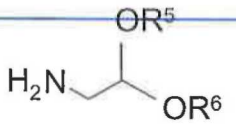
comprising the steps of:

i) reacting a compound of formula (II):



(II)

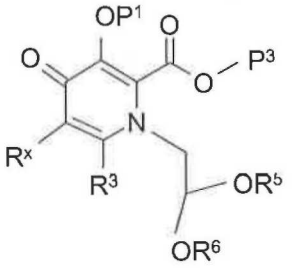
with an amine of formula (III):



(III)

wherein R^5 and R^6 are independently lower alkyl,

to produce an intermediate of formula (V)



(V)

and

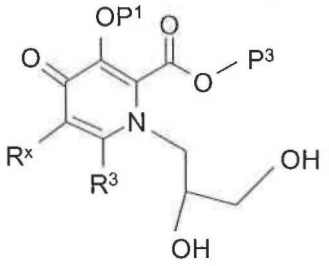
ii) refunctionalizing (V) to produce (I).

12. The process of Claim 1, wherein said refunctionalizing step ii) comprises demethylating the intermediate of formula (V) to produce the compound of formula (I).

13. The process of Claim 1, wherein said refunctionalizing step ii) comprises reacting the intermediate of formula (VI) with $NaIO_4$ to produce the compound of formula (I).

14. The process of Claim 1, wherein R^3 is H.

15. A compound of the following formula (VI):



(VI)

wherein

P^1 is H or a hydroxyl protecting group;

P^3 is H or a carboxy protecting group;

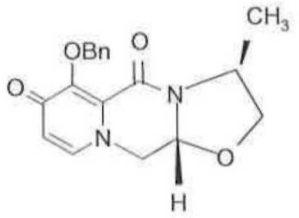
R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally

substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^x is H, or halo.

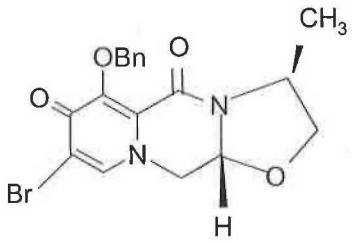
16. A compound of Claim 15, wherein R^3 is –H.

17. A compound of the following formula (**14**):



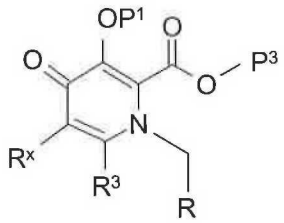
(14)

18. A compound of the following formula (**15**):



(**15**)

19. A compound of the following formula (I):



(I)

wherein

R is–$CH(OH)_2$;

P^1 is H or a hydroxyl protecting group;

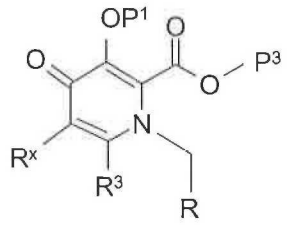
P^3 is H or a carboxy protecting group;

R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^x is H or halo

What is Claimed is:

1. A process for the preparation of a compound of formula (I):



(I)

wherein

R is –CHO, $–CH(OH)_2$ or $–CH(OH)(OR^4)$;

P^1 is H or benzyl;

P^3 is H or methyl;

R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^4 is lower alkyl;

R^x is H, halo or R^2-X-NR^1-C(O)-;

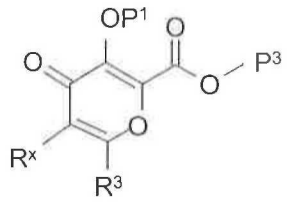
R^2 is optionally substituted aryl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2 and NH or loweralkylene or lower alkenylene wherein each may be intervened by the heteroatom; and

R^1 is H or lower alkyl,

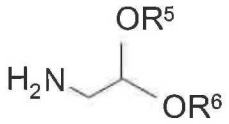
which comprises the steps of:

i) reacting a compound of formula (II):



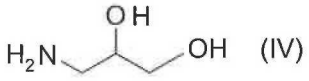
(II)

with an amine of formula (III) or (IV):



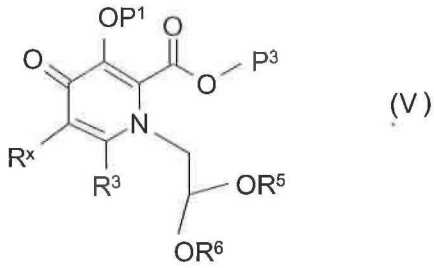
(III)

wherein R^5 and R^6 are independently lower alkyl or R^5 and R^6 can be alkyl and joined to form a 5-, 6-, or 7-membered ring,

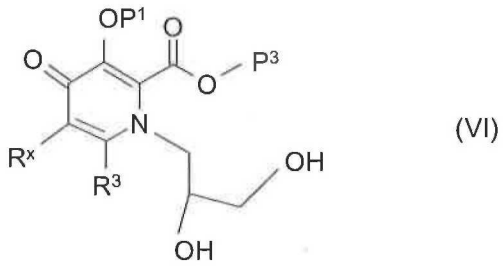


(IV)

to produce an intermediate of formula (V) or (VI), respectively:



(V)



(VI)

and

ii) refunctionalizing (V) or (VI) to produce (I).

2. The process of Claim 1, wherein in said compound of formula (I), R is –CHO.

3. The process of Claim 1, wherein in said compound of formula (I), R is $-CH(OH)_2$.

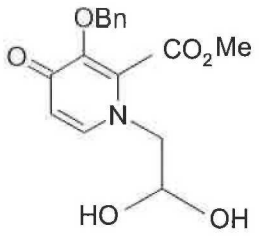
4. The process of Claim 1, wherein in said compound of formula (I), R is $-CH(OH)(OR^4)$.

5. The process of Claim 2, wherein said compound of formula (I) is of the formula (VII):



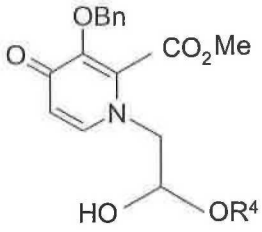
(VII)

6. The process of Claim 3, wherein said compound of formula (I) is of the formula (Ia):



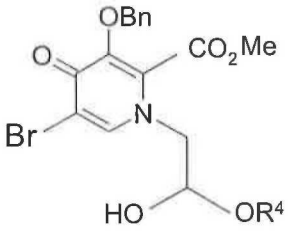
(Ia)

7. The process of Claim 4, wherein said compound of formula (I) is of the formula (VIII):



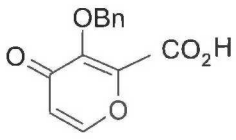
(VIII)

8. The process of Claim 4, wherein said compound of formula (I) is of the formula (IX):



(IX)

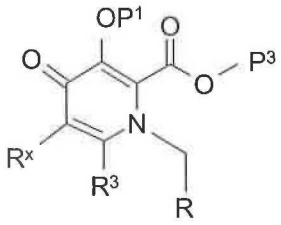
9. The process of Claim 1, wherein said compound of formula (II) is of the formula (IIa):



(IIa)

10. A process according to claim 1 wherein in said compound of formula (I), R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy.

11. A process for preparing a compound of formula (I):



(I)

wherein

R is $-CH(OH)(OR^4)$;

P^1 is benzyl;

P^3 is H;

R^3 is H;

R^4 is lower alkyl;

R^x is R^2-X-NR^1-C(O)-;

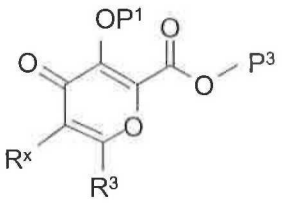
R^2 is aryl optionally subsituted with one or more halogen;

X is lower alkylene; and

R^1 is H;

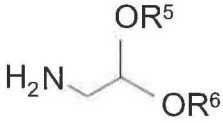
comprising the steps of:

i) reacting a compound of formula (II):



(II)

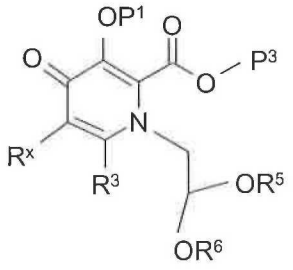
with an amine of formula (III):



(III)

wherein R^5 and R^6 are independently lower alkyl,

to produce an intermediate of formula (V)



(V)

and

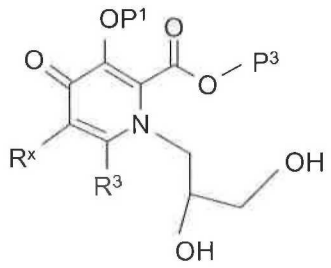
ii) refunctionalizing (V) to produce (I).

12. The process of Claim 1, wherein said refunctionalizing step ii) comprises demethylating the intermediate of formula (V) to produce the compound of formula (I).

13. The process of Claim 1, wherein said refunctionalizing step ii) comprises reacting the intermediate of formula (VI) with $NaIO_4$ to produce the compound of formula (I).

14. The process of Claim 1, wherein R^3 is H.

15. A compound of the following formula (VI):



(VI)

wherein

P^1 is H or benzyl;

P^3 is H or methyl;

R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^x is H or halo;

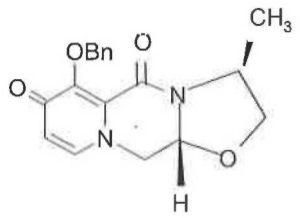
R^2 is optionally substituted aryl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2 and NH or loweralkylene or lower alkenylene wherein each may be intervened by the heteroatom; and

R^1 is H or lower alkyl.

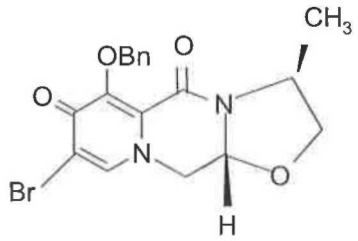
16. A compound of Claim 15, wherein R^3 is –H.

17. A compound of the following formula (**14**):



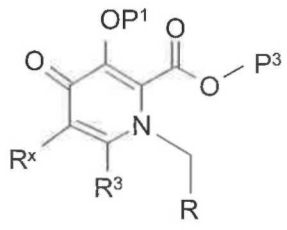
(**14**)

18. A compound of the following formula (**15**):



(**15**)

19. A compound of the following formula (I):



(I)

wherein

R is–$CH(OH)_2$;

P^1 is H or benzyl;

P^3 is H or methyl;

R^3 is H, halogen, hydroxy, optionally substituted lower alkyl, optionally substituted cycloalkyl, optionally substituted lower alkenyl, optionally substituted lower alkoxy, optionally substituted lower alkenyloxy, optionally substituted aryl, optionally substituted aryloxy, optionally substituted heterocyclic group, optionally substituted heterocycleoxy and optionally substituted amino;

R^1 is H or lower alkyl;

R^x is H or halo;

R^2 is optionally substituted aryl; and

X is a single bond, a heteroatom group selected from O, S, SO, SO_2 and NH or loweralkylene or lower alkenylene wherein each may be intervened by the heteroatom.