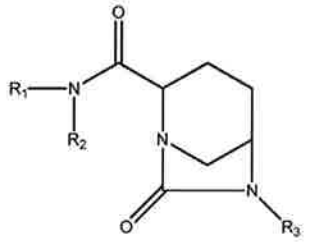
WHAT IS CLAIMED IS:

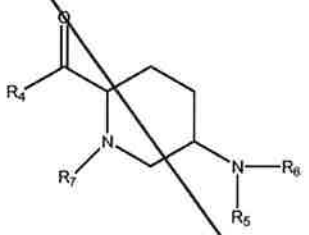
1. A process for preparing a compound of Formula (I):



(I)

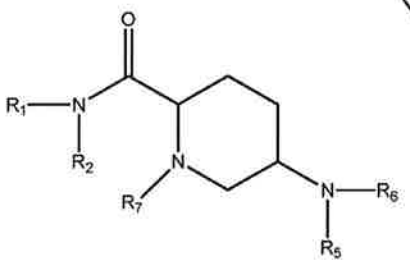
or a pharmaceutically acceptable salt, solvate, hydrate, enantiomer or diastereomer thereof; comprising

(a) treating a compound of Formula (II):



(II)

with a source of nitrogen or an amine to prepare a compound of Formula (III):



(III);

and

(b) treating the compound of Formula (III) with a protecting group and a carbonylation agent; wherein

R1, R2, R3, R4, R5, R6 and R7 are identical or different and are independently selected from the group consisting of hydrogen, oxygen, nitrogen, amino, carbonyl, carbamoyl, alkyl, alkenyl, alkynyl, alkoxy, cylcoalkyl, aryl, aralkyl, trialkylsilyl and heterocycle; wherein each of R1, R2, R3, R4, R5, R6 and R7 is optionally substituted by one or more halogen, oxygen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, allyl, halogenated alkyl, trialkylsilyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkylthio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl, alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R1 and R2 together form a heterocycle; optionally substituted by one or more halogen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, halogenated alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R3, R5 and R6 are independently COH, COB′, COOB′, $CONH_2$, CONHB′, CONHOH, $CONHSO_2B'$, CH_2COOH, CH_2COOB', $CH_2CONHOH$, $CH_2CONHCN$, CH_2tetrazole, protected CH_2tetrazole, CH_2SO_3H, CH_2SO_2B', $CH_2PO(OB')_2$, $CH_2PO(OB')(OH)$, $CH_2PO(B')(OH)$ and $CH_2PO(OH)_2$; wherein B′ is selected from the group consisting of alkyl containing 1 to 6 carbon atoms optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms; or

R3, R5 and R6 are independently OR′ or OP′; wherein

R′ is selected from the group consisting of SO_3, SO_2, SO_2NHCOH, SO_2NHCO, SO_2NHCOO, $SO_2NHCONH$ and $SO_2NHCONH_2$; and R′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.; and

P′ is selected from the group consisting of $PO(OH)_2$, PO_3, PO_2, PO, PO(OH)(O-), PO_2NHCOH, PO_2NHCO, PO_2NHCOO, $PO_2NHCONH$ and $PO_2NHCONH_2$; and P′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.

2. The process of claim 1, wherein R1, R2 and R7 are hydrogen and R3 is OSO_3H.

3. The process of claim 1, wherein R1 is piperidinyl, R2 and R7 are hydrogen and R3 is OSO_3H.

4. The process of claim 1, wherein R4 is benzyloxy.

5. The process of claim 1, wherein R5 is benzyloxy and R6 and R7 are hydrogen.

6. The process of claim 1, wherein R5 is allyl or trialkylsilyl and R6 is hydrogen.

7. The process of claim 1, comprising treating the compound of Formula (III) with 9-fluorenylmethoxycarbonyl.

8. The process of claim 1, comprising treating the compound of Formula (III) with N,N-carbonyl diimidazole.

9. The process of claim 1, further comprising treating the compound formed after treatment of compound of Formula (III) with a SO_3 complex.

10. The process of claim 1, wherein the compound of Formula (I) is trans-7-oxo-6-(sulphooxy)-1,6-diazabicyclo[3,2,1]octane-2-carboxamide or a pharmaceutically acceptable salt thereof.

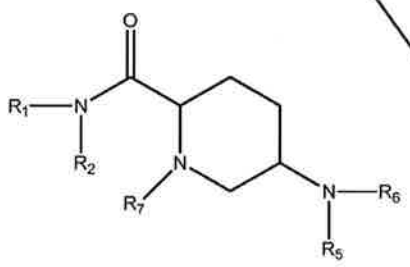
11. The process of claim 1, wherein the compound of Formula (I) is sodium ({[(2S,5R)-2-carbamoyl-7-oxo-1,6-diazabicyclo[3.2.1]oct-6-yl]oxy}sulphonyl)oxidanide.

12. The process of claim 1, wherein the compound of Formula (II) is benzyl (2S,5R)-5-[(benzyloxy)amino]piperidine-2-carboxylate ethanedioate.

13. The process of claim 1, wherein the compound of Formula (III) is (2S,5R)-5-[(benzyloxy)amino]piperidine-2-carboxamide.

14. The process of claim 13, comprising treating (2S,5R)-5-[(benzyloxy)amino]piperidine-2-carboxamide to prepare (2S,5R)-6-(benzyloxy)-7-oxo-1,6-diazabicyclo[3.2.1]octane-2-carboxamide.

15. A compound of Formula (III) or a salt, solvate, hydrate, enantiomer, diastereomer or analog thereof;



(III)

wherein

R1, R2, R5, R6 and R7 are identical or different and are independently selected from the group consisting of hydrogen, oxygen, nitrogen, amino, carbonyl, carbamoyl, alkyl,

alkenyl, alkynyl, alkoxy, cylcoalkyl, aryl, aralkyl, trialkylsilyl and heterocycle; wherein each of R1, R2, R5, R6 and R7 is optionally substituted by one or more halogen, oxygen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, allyl, halogenated alkyl, trialkylsilyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R1 and R2 together form a heterocycle; optionally substituted by one or more halogen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, halogenated alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R5 or R6 are independently selected from the group consisting of COH, COB′, COOB′, $CONH_2$, CONHB′, CONHOH, $CONHSO_2B'$, CH_2COOH, CH_2COOB', $CH_2CONHOH$, $CH_2CONHCN$, CH_2tetrazole, protected CH_2tetrazole, CH_2SO_3H, CH_2SO_2B', $CH_2PO(OB')_2$, $CH_2PO(OB')(OH)$, $CH_2PO(B')(OH)$ and $CH_2PO(OH)_2$; wherein B′ is selected from the group consisting of alkyl containing 1 to 6 carbon atoms optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms; wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms; or

R5 or R6 are independently OR′ or OP′; wherein

R′ is selected from the group consisting of SO_3, SO_2, SO_2NHCOH, SO_2NHCO, SO_2NHCOO, $SO_2NHCONH$ and $SO_2NHCONH_2$; and R′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.; and

P′ is selected from the group consisting of $PO(OH)_2$, PO_3, PO_2, PO, PO(OH)(O-), PO_2NHCOH, PO_2NHCO, PO_2NHCOO, $PO_2NHCONH$ and $PO_2NHCONH_2$; and P′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.

16. The compound of claim 15, wherein R5 is benzyloxy and R6 and R7 are hydrogen.

17. The compound of claim 15, wherein R5 is allyl or trialkylsilyl and R6 and R7 are hydrogen.

18. The compound of claim 15, wherein R5 is benzyloxy and R1, R2, R6 and R7 are hydrogen.

19. The compound of claim 15, wherein R1 is a heterocycle.

20. The compound of claim 15, wherein R7 is amide.

21. The compound of claim 15, wherein R1 is piperidinyl, R5 is benzyloxy and R2, R6 and R7 are hydrogen.

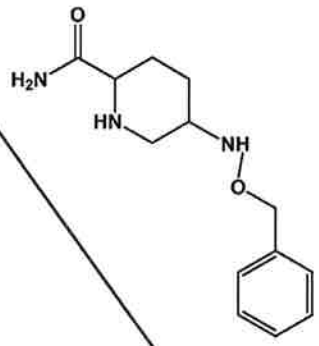
22. The compound of claim 15, wherein R1, R2 and R6 are hydrogen.

23. The compound of claim 15, wherein R5 is OSO3H.

24. The compound of claim 15, wherein R1, R2 and R6 are hydrogen, R5 is OSO3H and R7 is carbamoyl.

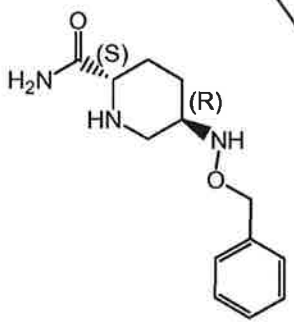
25. The compound of claim 15, wherein R1 is piperidinyl, R2 and R6 are hydrogen, R5 is OSO3H and R7 is carbamoyl.

26. A compound of Formula (VI) or a salt or an analog thereof.



(VI)

27. The compound according to claim 26, wherein the compound has Formula (VII):



(VII).

28. A process for preparing the compound of claim 15.

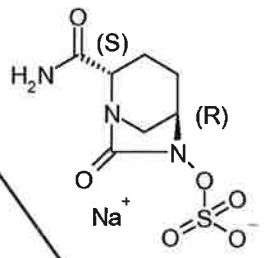
29. A process comprising using the compound according to claim 15 or an analog thereof to prepare a compound wherein R7 is carbamoyl.

30. The process of claim 29, wherein R1, R2 and R6 are hydrogen and R5 is OSO_3H

31. The process of claim 29, wherein R1 is piperidinyl, R2 and R6 are hydrogen and R5 is OSO_3H.

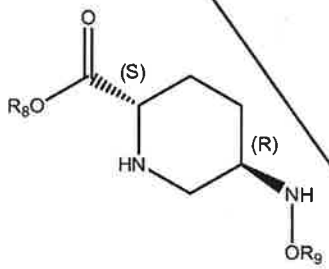
32. ({[(2S,5R)-2-carbamoyl-7-oxo-1,6-diazabicyclo[3.2.1]oct-6-yl]oxy}sulphonyl)oxidanide prepared according to the process of claim 1.

33. A process for preparing a compound of Formula (IX) comprising:



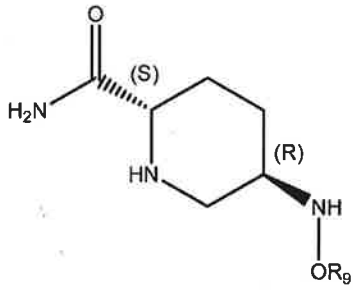
(IX)

(a) treating a compound of Formula (XI)



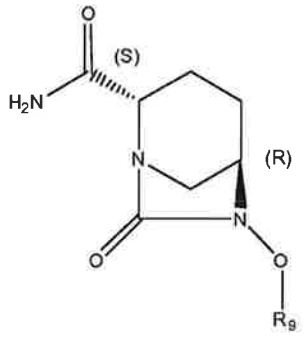
(XI)

with a source of ammonia or ammonia proxy to yield a compound of Formula (XIV):



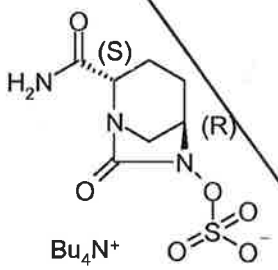
(XIV);

(b) treating the compound of Formula (XIV) with a protecting group and a carbonylation agent to yield a compound of Formula (XVII):



(XVII);

(c) treating the compound of Formula (XVII) with a source of tetra n-butylammonium ion to yield a compound of Formula (XIX):



(XIX); and

(d) treating the compound of Formula (XIX) with a source of sodium; wherein R8 is selected from the group consisting of substituted or unsubstituted alkyl, allyl, aryl and benzyl and R9 is a hydroxylamine protecting group.

34. The process of claim 33, wherein R8 is selected from the group consisting of methyl, ethyl and benzyl.

35. The process of claim 33, wherein R8 is benzyl.

36. The process of claim 33, wherein R9 is selected from the group consisting of allyl and trialkylsilyl.

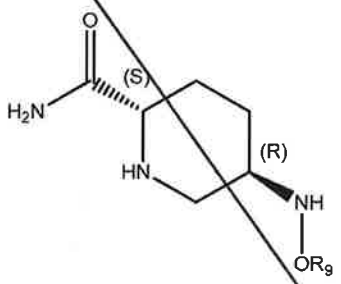
37. The process of claim 33, wherein R9 is benzyl.

38. The process of claim 33, comprising treating the compound of Formula (XIV) with 9-fluorenylmethoxycarbonyl.

39. The process of claim 27, comprising treating the compound of Formula (XIV) with N,N-carbonyl diimidazole.

40. The process of claim 33, comprising treating the compound of Formula (XVII) with a SO_3 complex.

41. A compound of Formula (XIV):



(XIV)

or a salt or analog thereof; wherein R9 is a hydroxylamine protecting group.

42. The compound according to claim 41, wherein R9 is selected from the group consisting of allyl, benzyl and trialkylsilyl.

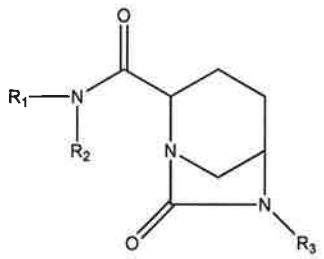
43. The compound according to claim 41, wherein R9 is benzyl.

44. A process for preparing the compound of claim 41.

45. ({[(2S,5R)-2-carbamoyl-7-oxo-1,6-diazabicyclo[3.2.1]oct-6-yl]oxy}sulphonyl)oxidanide prepared according to the process of claim 33.

WHAT IS CLAIMED IS:

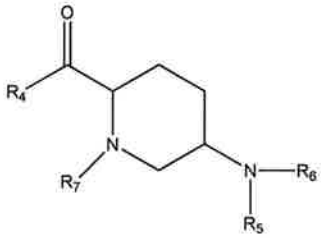
1. A process for preparing a compound of Formula (I):



(I)

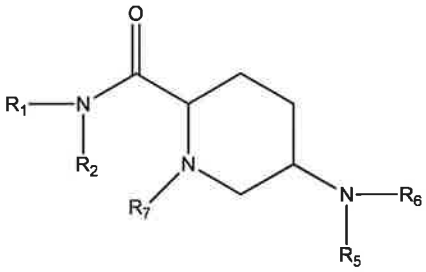
or a pharmaceutically acceptable salt, solvate, hydrate, enantiomer or diastereomer thereof; comprising

(a) treating a compound of Formula (II):



(II)

with a source of nitrogen or an amine to prepare a compound of Formula (III):



(III);

and

(b) treating the compound of Formula (III) with a protecting group and a carbonylation agent; wherein

R1, R2, R3, R4, R5, R6 and R7 are identical or different and are independently selected from the group consisting of hydrogen, oxygen, nitrogen, amino, carbonyl, carbamoyl, alkyl,

alkenyl, alkynyl, alkoxy, cylcoalkyl, aryl, aralkyl, trialkylsilyl and heterocycle; wherein each of R1, R2, R3, R4, R5, R6 and R7 is optionally substituted by one or more halogen, oxygen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, allyl, halogenated alkyl, trialkylsilyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkylthio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl, alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R1 and R2 together form a heterocycle; optionally substituted by one or more halogen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, halogenated alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R3, R5 and R6 are independently COH, COB′, COOB′, $CONH_2$, CONHB′, CONHOH, $CONHSO_2B'$, CH_2COOH, CH_2COOB', $CH_2CONHOH$, $CH_2CONHCN$, CH_2tetrazole, protected CH_2tetrazole, CH_2SO_3H, CH_2SO_2B', $CH_2PO(OB')_2$, $CH_2PO(OB')(OH)$, $CH_2PO(B')(OH)$ and $CH_2PO(OH)_2$; wherein B′ is selected from the group consisting of alkyl containing 1 to 6 carbon atoms optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms; or

R3, R5 and R6 are independently OR′ or OP′; wherein

R′ is selected from the group consisting of SO_3, SO_2, SO_2NHCOH, SO_2NHCO, SO_2NHCOO, $SO_2NHCONH$ and $SO_2NHCONH_2$; and R′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon

atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.; and

P′ is selected from the group consisting of $PO(OH)_2$, PO_3, PO_2, PO, PO(OH)(O-), PO_2NHCOH, PO_2NHCO, PO_2NHCOO, $PO_2NHCONH$ and $PO_2NHCONH_2$; and P′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.

2. The process of claim 1, wherein R1, R2 and R7 are hydrogen and R3 is OSO_3H.

3. The process of claim 1, wherein R4 is benzyloxy; R5 is benzyloxy, allyl or trialkylsilyl; and R6 and R7 are hydrogen.

4. The process of claim 1, comprising treating the compound of Formula (III) with 9-fluorenylmethoxycarbonyl or N,N-carbonyl diimidazole.

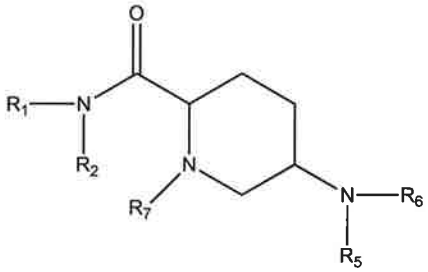
5. The process of claim 1, further comprising treating the compound formed after treatment of compound of Formula (III) with a SO_3 complex.

6. The process of claim 1, wherein the compound of Formula (I) is trans-7-oxo-6-(sulphooxy)-1,6-diazabicyclo[3,2,1]octane-2-carboxamide or a pharmaceutically acceptable salt thereof.

7. The process of claim 1, wherein the compound of Formula (I) is sodium ({[(2S,5R)-2-carbamoyl-7-oxo-1,6-diazabicyclo[3.2.1]oct-6-yl]oxy}sulphonyl)oxidanide.

8. The process of claim 1, wherein the compound of Formula (II) is benzyl (2S,5R)-5-[(benzyloxy)amino]piperidine-2-carboxylate ethanedioate and the compound of Formula (III) is (2S,5R)-5-[(benzyloxy)amino]piperidine-2-carboxamide.

9. A compound of Formula (III) or a salt thereof;



(III)

wherein

R1, R2, R5, R6 and R7 are identical or different and are independently selected from the group consisting of hydrogen, oxygen, nitrogen, amino, carbonyl, carbamoyl, alkyl, alkenyl, alkynyl, alkoxy, cylcoalkyl, aryl, aralkyl, trialkylsilyl and heterocycle; wherein each of R1, R2, R5, R6 and R7 is optionally substituted by one or more halogen, oxygen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, allyl, halogenated alkyl, trialkylsilyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R1 and R2 together form a heterocycle; optionally substituted by one or more halogen, hydroxy, cyano, nitro, amino, alkylamino, dialkylamino, arylamino, diarylamino, amido, alkylamido, carbamoyl, ureido, dimethylamino, carboxyl, alkyl, halogenated alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkylalkyl, aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocycle, heterocyclealkyl, aroyl, acyl, alkoxy, aryloxy, heteroaryloxy, cycloalkyloxy, cycloalkylalkyloxy, arylalkyloxy, heteroarylalkyloxy, alkythio, arylthio, alkylsulfinyl, alkylsulfonyl, arylsulfinyl, arylsulfonyl, heteroarylsulfinyl, heteroarylsulfonyl alkoxycarbonyl, aryloxycarbonyl, heteroaryloxycarbonyl or a combination thereof; or

R5 or R6 are independently selected from the group consisting of COH, COB′, COOB′, $CONH_2$, CONHB′, CONHOH, $CONHSO_2B'$, CH_2COOH, CH_2COOB', $CH_2CONHOH$, $CH_2CONHCN$, CH_2tetrazole, protected CH_2tetrazole, CH_2SO_3H, CH_2SO_2B', $CH_2PO(OB')_2$,

$CH_2PO(OB')(OH)$, $CH_2PO(B')(OH)$ and $CH_2PO(OH)_2$; wherein B′ is selected from the group consisting of alkyl containing 1 to 6 carbon atoms optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms; wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms; or

R5 or R6 are independently OR′ or OP′; wherein

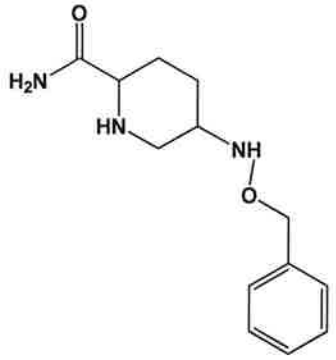
R′ is selected from the group consisting of SO_3, SO_2, SO_2NHCOH, SO_2NHCO, SO_2NHCOO, $SO_2NHCONH$ and $SO_2NHCONH_2$; and R′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.; and

P′ is selected from the group consisting of $PO(OH)_2$, PO_3, PO_2, PO, PO(OH)(O-), PO_2NHCOH, PO_2NHCO, PO_2NHCOO, $PO_2NHCONH$ and $PO_2NHCONH_2$; and P′ is optionally substituted by hydrogen or alkyl group optionally substituted by a pyridyl or carbamoyl radical, —CH_2-alkenyl containing 3 to 9 carbon atoms, aryl containing 6 to 10 carbon atoms and aralkyl containing 7 to 11 carbon atoms, wherein the nucleus of said aryl or aralkyl is optionally substituted by OH, NH_2, NO_2, alkyl containing 1 to 6 carbon atoms, alkoxy containing 1 to 6 carbon atoms or by one or more halogen atoms.

10. The compound of claim 9, wherein R5 is allyl, benzyloxy or trialkylsilyl and R1, R6 and R7 are hydrogen.

11. The compound of claim 9, wherein R1, R2 and R6 are hydrogen and R5 is OSO_3H.

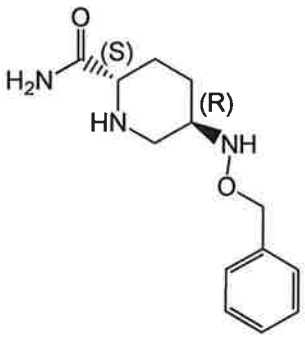
12. The compound according to claim 9, as depicted by Formula (VI):



(VI)

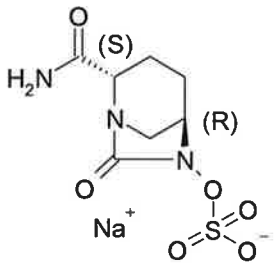
or a salt thereof.

13. The compound according to claim 12, wherein the compound has Formula (VII):



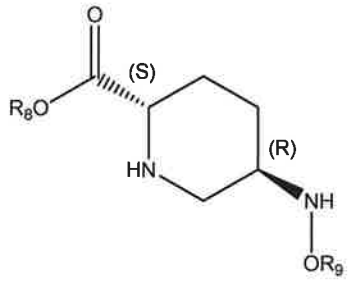
(VII).

14. A process according to claim 1 for the preparation of a compound of Formula (IX), comprising:



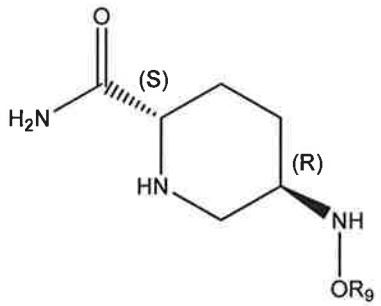
(IX)

(a) treating a compound of Formula (XI)



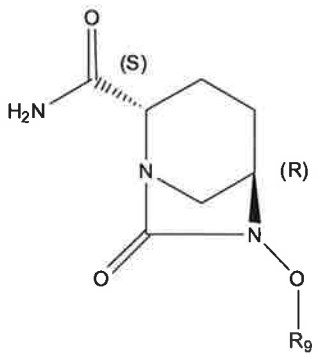
(XI)

with a source of ammonia or ammonia proxy to yield a compound of Formula (XIV):



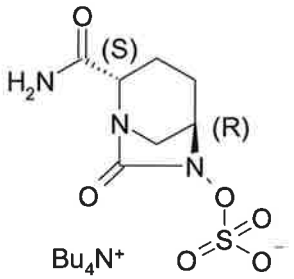
(XIV);

(b) treating the compound of Formula (XIV) with a protecting group and a carbonylation agent to yield a compound of Formula (XVII):



(XVII);

(c) treating the compound of Formula (XVII) with a source of tetra n-butylammonium ion to yield a compound of Formula (XIX):



(XIX); and

(d) treating the compound of Formula (XIX) with a source of sodium; wherein R8 is selected from the group consisting of substituted or unsubstituted alkyl, allyl, aryl and benzyl and R9 is a hydroxylamine protecting group.

15. The process of claim 14, wherein R8 is selected from the group consisting of methyl, ethyl and benzyl.

16. The process of claim 14, wherein R8 is benzyl.

17. The process of claim 14, wherein R9 is selected from the group consisting of allyl and trialkylsilyl.

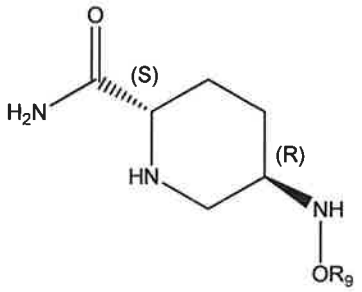
18. The process of claim 14, wherein R9 is benzyl.

19. The process of claim 14, comprising treating the compound of Formula (XIV) with 9-fluorenylmethoxycarbonyl.

20. The process of claim 13, comprising treating the compound of Formula (XIV) with N,N-carbonyl diimidazole.

21. The process of claim 14, comprising treating the compound of Formula (XVII) with a SO_3 complex.

22. A compound according to claim 9 which is a compound of Formula (XIV):



(XIV)

or a salt or analog thereof; wherein R9 is a hydroxylamine protecting group.

23. The compound according to claim 22, wherein R9 is selected from the group consisting of allyl, benzyl and trialkylsilyl.

24. The compound according to claim 22, wherein R9 is benzyl.