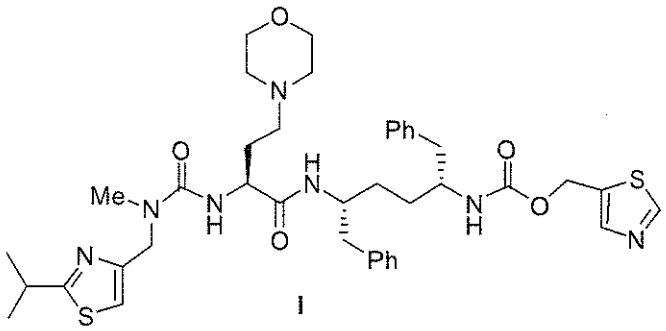
CLAIMS

What is claimed is:

1. A method for preparing a compound of formula **I:**



I

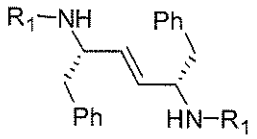
or a salt thereof comprising:

a) dimerizing a corresponding compound of formula **II**:



II

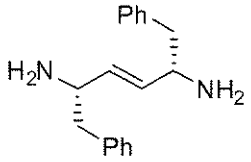
wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1\text{-}C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms to provide a corresponding compound of formula **V**:



V

or a salt thereof;

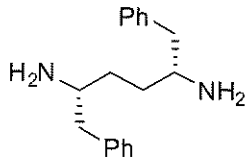
b) deprotecting the compound of formula **V** or the salt thereof to provide a compound of formula **VI**:



VI

or a salt thereof;

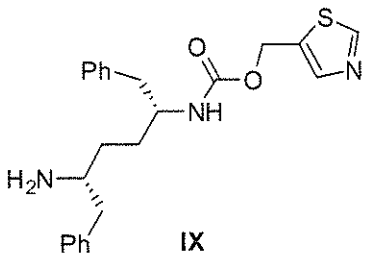
c) reducing the compound of formula **VI** or the salt thereof to a compound of formula **VII**:



VII

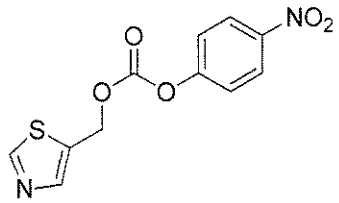
d) converting the compound of formula **VII** to a corresponding salt by treatment with an acid, wherein the acid is hydrochloric acid, hydrobromic acid, hydroiodic acid, or sulfuric acid; in an organic solvent, wherein the organic solvent is dichloromethane, ethyl ether, tetrahydrofuran, *tert*-butyl methyl ether, 1,4-dioxane, 1,2 dimethoxyethane, chloroform, 1,2-dichloromethane, toluene, or anisole;

e) converting the corresponding salt from d) to a compound of formula **IX:**



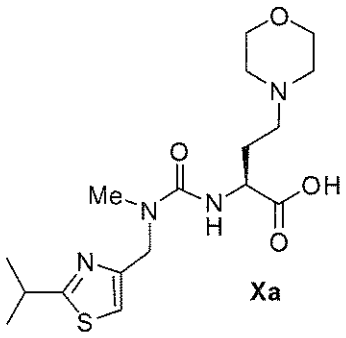
IX

or a salt thereof, wherein the converting comprises contacting the corresponding salt with a compound of formula VIII



(VIII); and

f) coupling the compound of formula **IX** or the salt thereof with an acid of formula **Xa**:



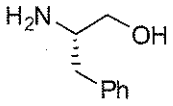
Xa

or a salt thereof to provide the compound of formula **I.**

2. The method of claim 1 further comprising preparing the compound of formula **II** by reacting (*S*)-2-benzylaziridine with a corresponding compound R_1-X, wherein X is a leaving group and R_1 is -S(=O)$_2$NR_aR$_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms to provide the compound of formula **II**.

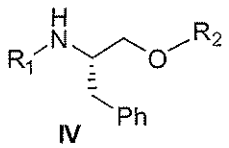
3. The method of claim 1 further comprising preparing the compound of formula **II** by:

a) treating a compound of formula **III**:



III

or a salt thereof with a corresponding compound of formula R_1-X and R_2-X, wherein X is a leaving group, R_1 is -S(=O)$_2$NR_aR$_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms and R_2 is a suitable protecting group to provide a corresponding compound of formula **IV**:



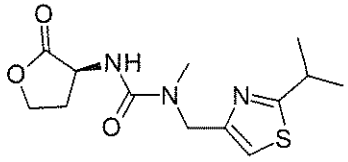
IV

or a salt thereof; and

b) treating the compound of formula **IV** or the salt thereof with a suitable base to provide the compound of formula **II**.

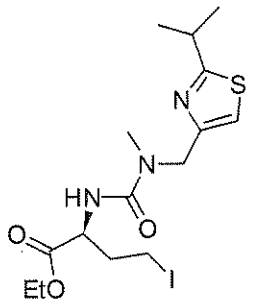
4. The method of any one of claims 1-3 further comprising preparing the acid of formula **Xa** or the salt thereof by:

a) treating a compound of formula **XII**:



XII

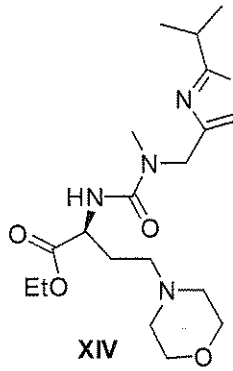
or a salt thereof with a suitable iodide source to provide a compound of formula **XIII**:



XIII

or a salt thereof;

b) treating the compound of formula **XIII** or the salt thereof with morpholine to provide an ester of formula **XIV**:



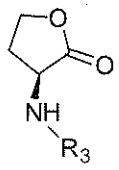
XIV

or a salt thereof; and

c) hydrolyzing the ester of formula **XIV** to provide the acid of formula **Xa** or the salt thereof.

5. The method of claim 4 further comprising preparing the compound of formula **XII** or the salt thereof by:

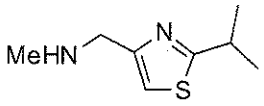
a) treating L-methionine with an alkylating agent and optionally protecting the amine to provide an amine of formula **XI**:



XI

wherein R_3 is H or a protecting group, or a salt thereof; and

b) treating the amine of formula **XI** or the salt thereof with a compound of formula **XIX**:

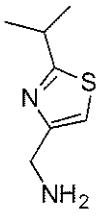


XIX

or a salt thereof to provide the compound of formula **XII** or the salt thereof.

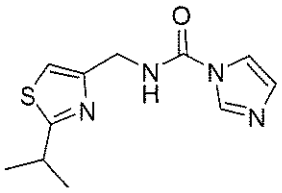
6. The method of claim 4 further comprising preparing the compound of formula **XII** or the salt thereof by:

a) treating a compound of formula **XV**:



XV

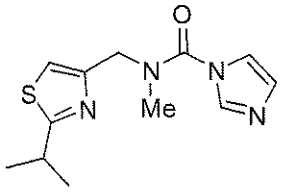
or a salt thereof with carbonyldiimidazole in the presence of a base to provide a compound of formula **XVI**:



XVI

or a salt thereof;

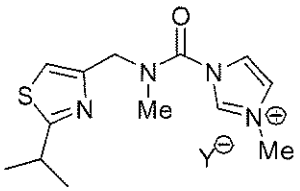
b) treating the compound of formula **XVI** or the salt thereof with a suitable methylating agent in the presence of a base to provide a compound of formula **XVII**:



XVII

or a salt thereof;

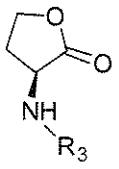
c) methylating the compound of formula **XVII** or the salt thereof to provide a salt of formula **XVIII**:



XVIII

wherein Y^- is a suitable counterion; and

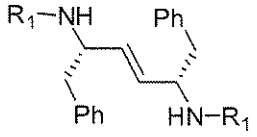
d) treating the salt of formula **XVIII** with an amine of formula **XI**:



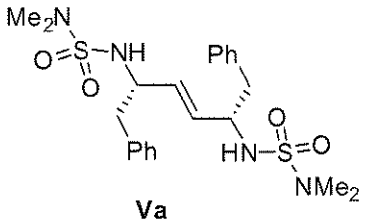
XI

or a salt thereof wherein R_3 is H or a protecting group with a suitable base, and deprotecting to remove R_3 if it is a protecting group, to provide the compound of formula **XII** or the salt thereof.

7. A compound of formula V or Va:



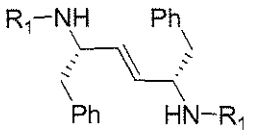
V



Va

or a salt thereof, wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1$-$C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms.

8. A method for preparing a compound of formula **V**:



V

wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1$-$C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms, or a salt thereof, characterized in that the compound of formula **V** is prepared from a corresponding compound of formula **II**:



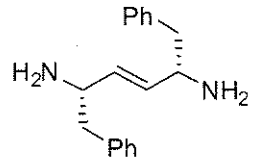
II

or a salt thereof, by dimerizing the compound of formula **II**.

9. The method of claim 8, further comprising preparing the compound of formula **II** by reacting (*S*)-2-benzylaziridine with a corresponding compound R_1-X, wherein X is a leaving group and R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1$-$C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated

ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms to provide the compound of formula **II**.

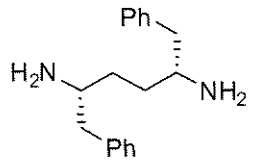
10. The method of claim 8, further comprising deprotecting the compound of formula **V** or the salt thereof to provide a compound of formula **VI**:



VI

or a salt thereof.

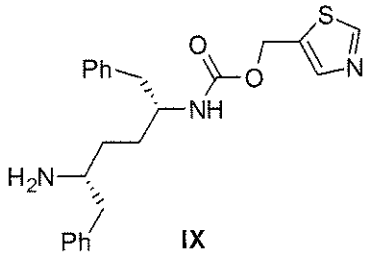
11. The method of claim 10, further comprising reducing the compound of formula **VI** or the salt thereof to a compound of formula **VII**:



VII

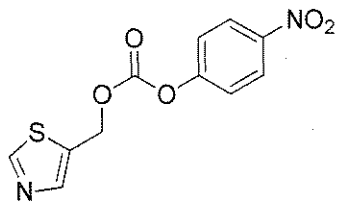
12. The method of claim 11, further comprising converting the compound of formula **VII** to a corresponding salt by treatment with an acid in an organic solvent.

13. The method of claim 12, further comprising converting the corresponding salt of formula **VII** to a compound of formula **IX:**



IX

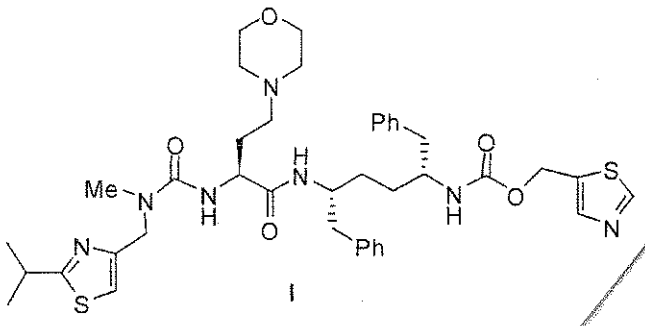
or a salt thereof, wherein the converting comprises contacting the corresponding salt with a compound of formula VIII



(VIII).

CLAIMS

1. A method for preparing a compound of formula **I**:



I

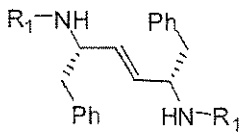
or a salt thereof comprising:

a) dimerizing a corresponding compound of formula **II**:



II

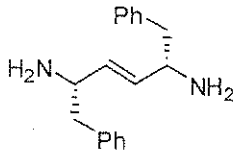
wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1\text{-}C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms to provide a corresponding compound of formula **V**:



V

or a salt thereof;

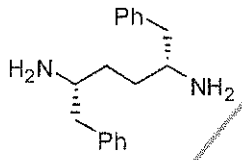
b) deprotecting the compound of formula V or the salt thereof to provide a compound of formula **VI**:



VI

or a salt thereof;

c) reducing the compound of formula **VI** or the salt thereof to a compound of formula **VII**:

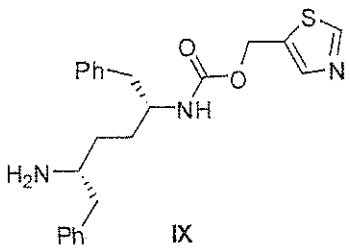


VII

;

d) converting the compound of formula **VII** to a corresponding salt by treatment with an acid in an organic solvent;

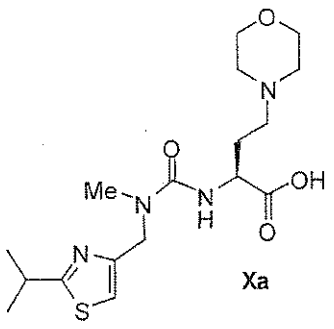
e) converting the corresponding salt from d) to a compound of formula **IX:**



IX

or a salt thereof; and

f) coupling the compound of formula **IX** or the salt thereof with an acid of formula **Xa**:



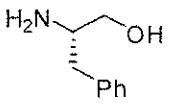
Xa

or a salt thereof to provide the compound of formula **I**.

2. The method of claim 1 further comprising preparing the compound of formula **II** by reacting (*S*)-2-benzylaziridine with a corresponding compound R_1-X, wherein X is a leaving group and R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms to provide the compound of formula **II**.

3. The method of claim 1 further comprising preparing the compound of formula **II** by:

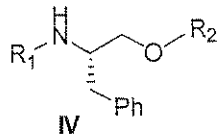
a) treating a compound of formula **III**:



III

or a salt thereof with a corresponding compound of formula R_1-X and R_2-X, wherein X is a leaving group, R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4

membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms and R_2 is a suitable protecting group to provide a corresponding compound of formula **IV**:



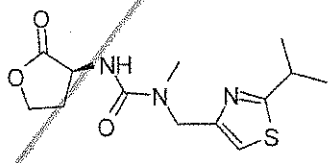
IV

or a salt thereof; and

b) treating the compound of formula **IV** or the salt thereof with a suitable base to provide the compound of formula **II**.

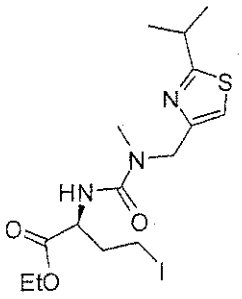
4. The method of any one of claims 1-3 further comprising preparing the acid of formula **Xa** or the salt thereof by:

a) treating a compound of formula **XII**:



XII

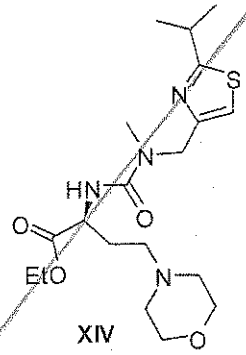
or a salt thereof with a suitable iodide source to provide a compound of formula **XIII**:



XIII

or a salt thereof;

b) treating the compound of formula **XIII** or the salt thereof with morpholine to provide an ester of formula **XIV**:



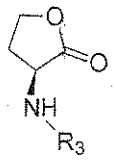
XIV

or a salt thereof; and

c) hydrolyzing the ester of formula **XIV** to provide the acid of formula **Xa** or the salt thereof.

5. The method of claim 4 further comprising preparing the compound of formula **XII** or the salt thereof by:

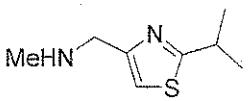
a) treating L-methionine with an alkylating agent and optionally protecting the amine to provide an amine of formula **XI**:



XI

wherein R_3 is H or a protecting group, or a salt thereof; and

b) treating the amine of formula **XI** or the salt thereof with a compound of formula **XIX**:

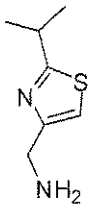


XIX

or a salt thereof to provide the compound of formula **XII** or the salt thereof.

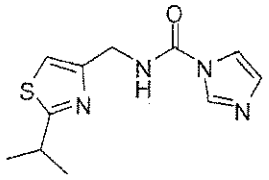
6. The method of claim 4 further comprising preparing the compound of formula **XII** or the salt thereof by:

a) treating a compound of formula **XV**:



XV

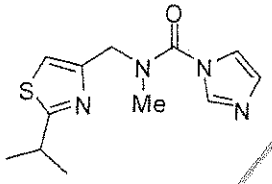
or a salt thereof with carbonyldiimidazole in the presence of a base to provide a compound of formula **XVI**:



XVI

or a salt thereof;

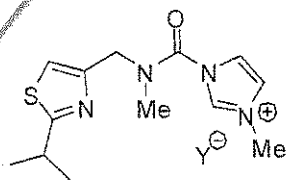
b) treating the compound of formula **XVI** or the salt thereof with a suitable methylating agent in the presence of a base to provide a compound of formula **XVII**:



XVII

or a salt thereof;

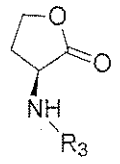
c) methylating the compound of formula **XVII** or the salt thereof to provide a salt of formula **XVIII**:



XVIII

wherein Y^- is a suitable counterion; and

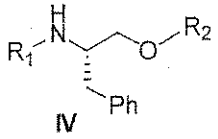
d) treating the salt of formula **XVIII** with an amine of formula **XI**:



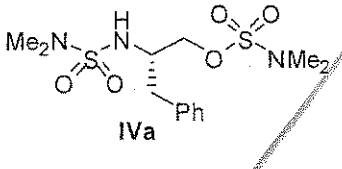
XI

or a salt thereof wherein R_3 is H or a protecting group with a suitable base, and deprotecting to remove R_3 if it is a protecting group, to provide the compound of formula **XII** or the salt thereof.

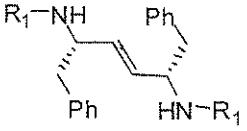
7. A compound of formula **IV, IVa, V, Va, XIV , XVI, XVII or XVIII**:



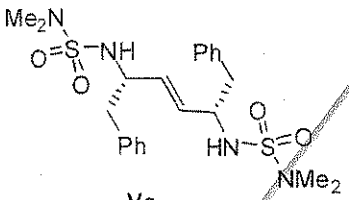
IV



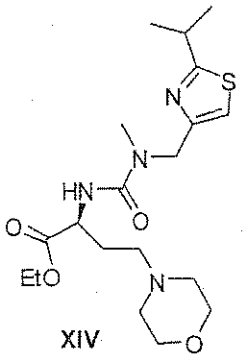
IVa



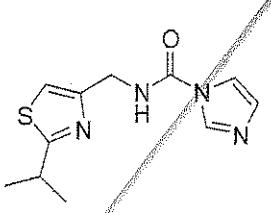
V



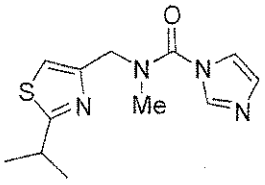
Va



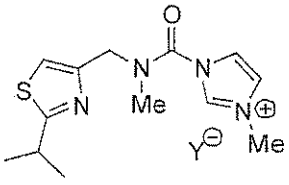
XIV



XVI



XVII

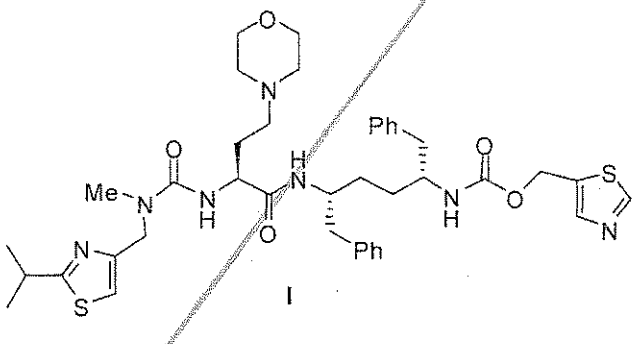


XVIII

or a salt thereof, wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms; R_2 is a suitable protecting group; and wherein Y^- is a suitable counterion.

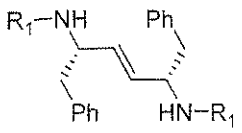
8. The compound of claim 7 wherein the compound of formula **XIV** is an oxalate salt.

9. A method for preparing a compound of formula **I**:



I

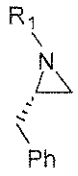
or a salt thereof, wherein a compound of formula **V**:



V

wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently (C_1-C_8)alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms, or a salt thereof is prepared and converted into a compound of

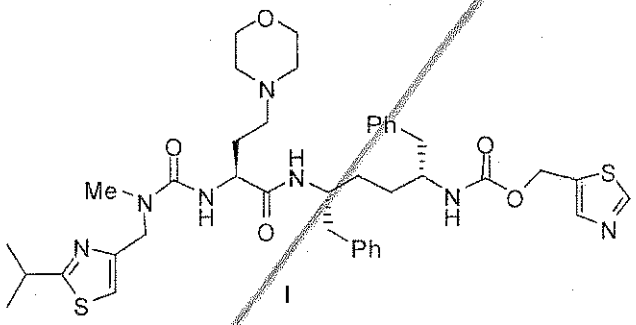
formula **I**, characterized in that the compound of formula **V** is prepared from a corresponding compound of formula **II**:



II

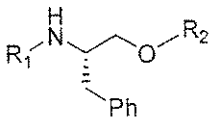
or a salt thereof, by dimerizing the compound of formula **II**.

10. A method for preparing a compound of formula **I**:



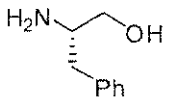
I

or a salt thereof, wherein a compound of formula **IV**:



IV

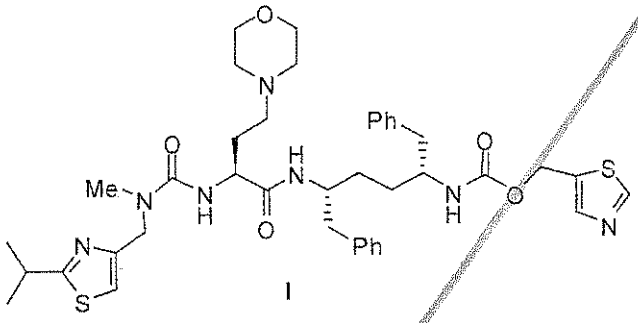
wherein R_1 is $-S(=O)_2NR_aR_b$ wherein each of R_a and R_b is independently $(C_1\text{-}C_8)$alkyl; or R_a and R_b together with the nitrogen to which they are attached form a 3 or 4 membered saturated ring or a 5, 6, or 7 membered saturated or partially unsaturated ring comprising 1 or 2 heteroatoms and R_2 is a suitable protecting group, or a salt thereof is prepared and converted into a compound of formula **I**, characterized in that the compound of formula **IV** is prepared from a compound of formula **III**:



III

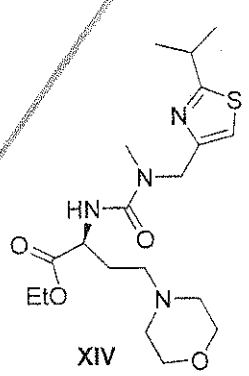
or a salt thereof, by protecting the compound of formula **III**.

11. A method for preparing a compound of formula **I**:



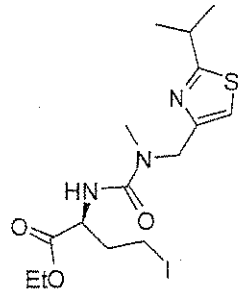
I

or a salt thereof, wherein a compound of formula **XIV**:



XIV

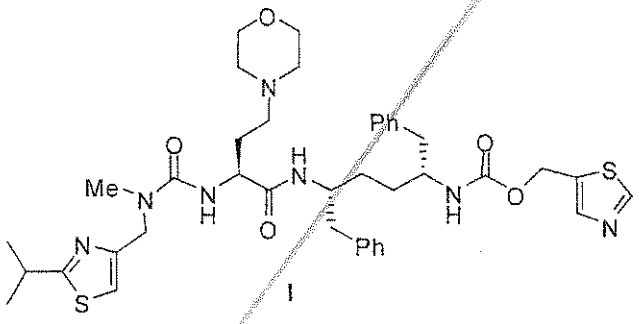
or a salt thereof is prepared and converted into a compound of formula **I**, characterized in that the compound of formula **XIV** or the salt thereof is prepared from a corresponding compound of formula **XIII**:



XIII

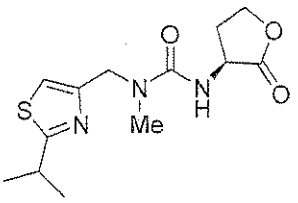
or a salt thereof, by displacing the iodide with a suitable morpholine reagent.

12. A method for preparing a compound of formula **I**:



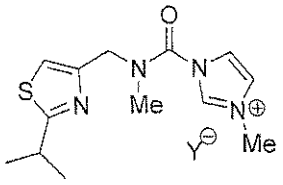
I

or a salt thereof, wherein a compound of formula **XII**:



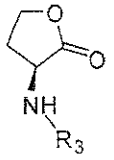
XII

or a salt thereof is prepared and converted into a compound of formula **I**, characterized in that the compound of formula **XII** is prepared from a corresponding compound of formula **XVIII**:



XVIII

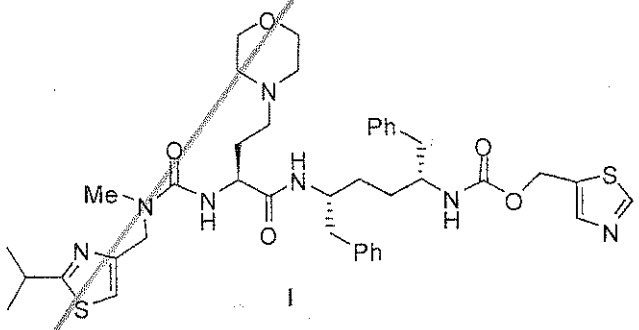
wherein Y^- is a suitable counterion, by treatment with a compound of formula **XI**:



XI

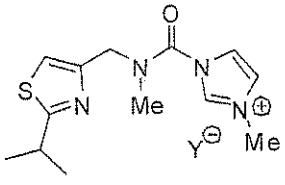
wherein R_3 is H or a protecting group in the presence of a base and optionally removing R_3 if it is a protecting group to provide the compound of formula **XII**.

13. A method for preparing a compound of formula **I**:



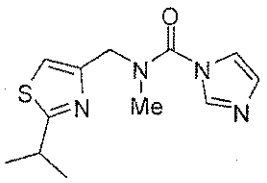
I

or a salt thereof, wherein a salt of formula **XVIII**:



XVIII

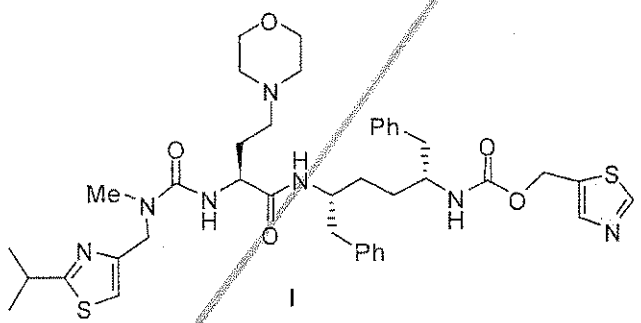
wherein Y^- is a suitable counterion is prepared and converted into a compound of formula **I**, characterized in that the salt of formula **XVIII** is prepared from a corresponding compound of formula **XVII**:



XVII

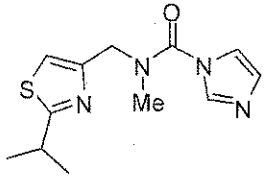
or a salt thereof by treatment with a methylating agent to provide the salt of formula **XVIII**.

14. A method for preparing a compound of formula **I**:



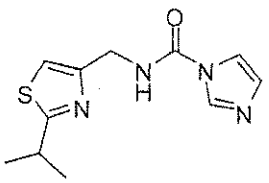
I

or a salt thereof, wherein a compound of formula **XVII**:



XVII

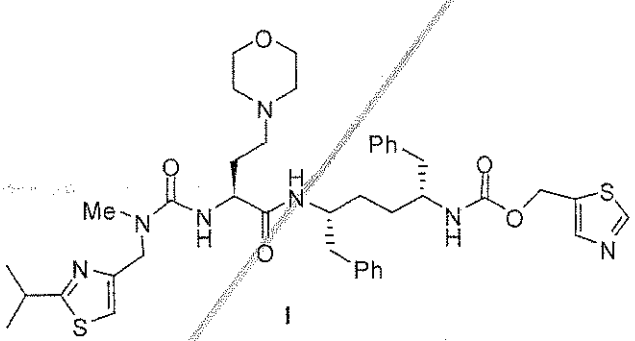
or a salt thereof is prepared and converted into a compound of formula **I**, characterized in that the compound of formula **XII** is prepared from a corresponding compound of formula **XVI**:



XVI

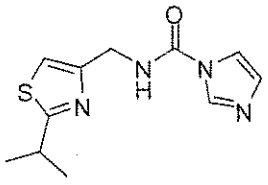
or a salt thereof by treatment with a methylating agent to provide the compound of formula **XVII** or the salt thereof.

15. A method for preparing a compound of formula **I**:



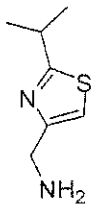
I

or a salt thereof, wherein a compound of formula **XVI**:



XVI

or a salt thereof is prepared and converted into a compound of formula **I**, characterized in that the compound of formula **XVI** is prepared from a corresponding compound of formula **XV**:



XV

or a salt thereof by treatment with carbonyldiimidazole, in the presence of a base to provide the compound of formula **XVI**.