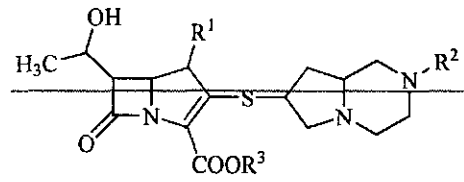
AMENDMENTS OF THE CLAIMS

CLAIMS

~~1. A compound of formula (I), or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer thereof:~~



~~(I)~~

~~Wherein~~

~~R^1 is hydrogen or C_{1-6} alkyl;~~

~~R^2 is~~

~~(1) hydrogen,~~

~~(2) C_{1-6} alkyl, C_{2-8} alkenyl or C_{2-8} alkynyl, which is optionaiiy substituted by one to three X^1;~~

~~X^1 is independently selected from halogen, carboxyl, hydroxyl, amino, cyano, nitro, C_{1-6} alkoxy, halogenated C_{1-6} alkoxy, C_{1-6} alkyl amino, bis-(C_{1-6} alkyl)amine, C_{1-6} alkyl carbonyl, C_{1-6}alkyl carboxyl, C_{1-6} alkoxy carbonyl, carbamoyl, C_{1-6} alkyl carbamoyl, bis-(C_{1-6} alkyl) carbamoyl, amino sulfonyl, C_{1-6} alkyl amino sulfonyl, bis-(C_{1-6} alkyl) amino sulfonyl, C_{1-6} alkyl sulfonyl amino, C_{1-6} alkyl sulfonyl, C_{1-6} alkyl carbonyl amino, guanidino, C_{3-8} cycloalkyl, aryl or heterocyclic,~~

~~C_{3-8} cycloalkyl, aryl or heterocyclic of said X^1 can be further substituted by the following substituents: halogen, carboxyl, hydroxyl, amino, cyano, nitro, C_{1-6} alkyl, carboxy C_{1-6} alkyl, hydroxy C_{1-6} alkyl, amino C_{1-6} alkyl, halogenated C_{1-6} alkyl, C_{1-6} alkoxy, halogenated C_{1-6} alkoxy, C_{1-6} alkoxy C_{1-6} alkyl, C_{1-6} alkyl amino, bis-(C_{1-6} alkyl) amino, bis-(C_{1-6} alkyl) amino C_{1-6} alkyl, C_{1-6} alkyl carbonyl, C_{1-6}alkyl carboxyl, C_{1-6} alkoxy carbonyl, carbamoyl, carbamoyl C_{1-6} alkyl, C_{1-6} alkyl carbamoyl, bis-(C_{1-6} alkyl) carbamoyl, amino sulfonyl, amino sulfonyl C_{1-6} alkyl, C_{1-6} alkyl amino sulfonyl, bis-(C_{1-6} alkyl) amino sulfonyl, C_{1-6} alkyl sulfonyl amino, C_{1-6} alkyl sulfonyl, C_{1-6} alkyl carbonyl amino or guanidino,~~

~~(3) C_{3-8} cycloalkyl, aryl or heterocyclic which is optionally substituted by one to three X^2;~~

~~X^2 is independently selected from halogen, carboxyl, hydroxyl, amino, cyano, nitro,~~

~~C_{1-6} alkyl, carboxy C_{1-6} alkyl, hydroxy C_{1-6} alkyl, amino C_{1-6} alkyl, halogenated C_{1-6} alkyl, C_{1-6} alkoxy, halogenated C_{1-6} alkoxy, C_{1-6} alkoxy C_{1-6} alkyl, C_{1-6} alkyl amino, bis-(C_{1-6} alkyl) amino, bis-(C_{1-6} alkyl) amino C_{1-6} alkyl, C_{1-6} alkyl carbonyl, C_{1-6}alkyl carboxyl, C_{1-6} alkoxy carbonyl, carbamoyl, carbamoyl C_{1-6} alkyl, C_{1-6} alkyl carbamoyl, bis-(C_{1-6} alkyl) carbamoyl, amino sulfonyl, amino sulfonyl C_{1-6} alkyl, C_{1-6} alkyl amino sulfonyl, bis-(C_{1-6} alkyl) amino sulfonyl, C_{1-6} alkyl sulfonyl amino, C_{1-6} alkyl sulfonyl, C_{1-6} alkyl amino carbonyl or guanidino.~~

~~(4) -CO-Y,~~

~~Y is C_{1-6} alkyl which is optionally substituted by one to three Y^1, or C_{3-8} cycloalkyl, aryl or heterocyclic which is optionally substituted by one to three Y^2,~~

~~Y^1 represents the above defined X^1 and Y^2 represents the above defined X^2;~~

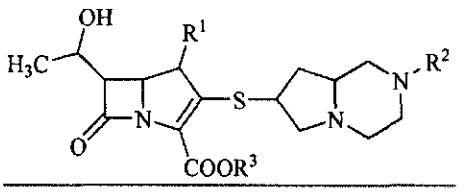
~~(5) $-S(O)_m-Z$, m is 1 or 2,~~

~~Z is amino, C_{1-6} alkyl amino, bis-(C_{1-6} alkyl)amino, or C_{1-6} alkyl which is optionally substituted by one to three Y^1, or C_{3-8} cycloalkyl, aryl or heterocyclic which is optionally substituted by one to three Y^2;~~

~~Y^1 represents the above defined X^1 and Y^2 represents the above defined X^2; and~~

~~R^3 is hydrogen or the carboxyl protecting group.~~

~~2~~1. A compound ~~claimed in claim 1~~ of formula (I), or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer:



(I)

Wherein

R^1 is C_{1-4} alkyl;

R^2 is

~~(1) hydrogen,~~

(~~2~~1) C_{1-4} alkyl, which is optionally substituted by one to three X^1,

X^1 is independently selected from ~~halogen,~~ carboxyl, hydroxyl, amino, C_{1-4} alkoxy, halogenated C_{1-4} alkoxy, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl)amine, C_{1-4} alkyl carbonyl, carbamoyl, amino sulfonyl, guanidino, C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl or 3-7 membered heterocyclic,

C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl or 3-7 membered heterocyclic of

the said X^1 can be further substituted by the following substituents: halogen, C_{1-4} alkyl, halogenated C_{1-4} alkyl, C_{1-4} alkoxy, halogenated C_{1-4} alkoxy, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, C_{1-4} alkyl carbonyl, carbamoyl, carbamoyl C_{1-4} alkyl, amino sulfonyl, amino sulfonyl C_{1-4} alkyl, or guanidino,

(~~3~~2) C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl or 3-7 membered heterocyclic which is optionally substituted by one to three X^2,

X^2 is independently selected from halogen, amino, C_{1-4} alkyl, halogenated C_{1-4} alkyl, C_{1-4} alkoxy, halogenated C_{1-4} alkoxy, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, bis-(C_{1-4} alkyl) amino C_{1-6} alkyl, C_{1-4} alkyl carbonyl, carbamoyl, carbamoyl C_{1-4} alkyl, amino sulfonyl, amino sulfonyl C_{1-4} alkyl, or guanidino,

(~~4~~3) -CO-Y,

Y is C_{1-4} alkyl which is optionally substituted by one to three Y^1, or C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl or 3-7 membered heterocyclic which is optionally substituted by one to three Y^2,

Y^1 represents the above defined X^1 and Y^2 represents the above defined X^2,

(~~5~~4) -$S(O)_m$-Z, m is 1 or 2,

Z is amino, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl)amino, or C_{1-4} alkyl which is optionally substituted by one to three Y^1, or C_{3-6} cycloalkyl, phenyl, 5-6 membered heteroaryl or 3-7 membered heterocyclic which is optionally substituted by one to three Y^2,

Y^1 represents the above defined X^1 and Y^2 represents the above defined X^2; and

R^3 is hydrogen.

~~3~~2. A compound claimed in claim ~~2~~1, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer:

Wherein

R^1 is methyl;

R^2 is

~~(1) hydrogen,~~

(~~2~~1) C_{1-4} alkyl, which is optionally substituted by one to three X^1,

X^1 is independently selected from ~~halogen,~~ carboxyl, hydroxyl, amino, C_{1-4} alkoxy, halogenated C_{1-4} alkoxy, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl)amine, carbamoyl, amino sulfonyl, phenyl, pyridyl, piperidinyl, piperazinyl or morpholinyl,

The phenyl, pyridyl, piperidinyl, piperazinyl or morpholinyl of the said X^1 can be further substituted by the following substituents: halogen, C_{1-4} alkyl, halogenated C_{1-4}

alkyl, C_{1-4} alkoxy, halogenated C_{1-4} alkoxy, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, C_{1-4} alkyl carbonyl, carbamoyl, carbamoyl C_{1-4} alkyl, or amino sulfonyl,

(~~3~~2) phenyl, pyridyl, piperidinyl, piperazinyl, morpholinyl, tetrahydrofuranyl, thiazole, 4,5-dihydro-thiazolyl, or cyclopropyl group which is optionally substituted by one to three X^2,

X^2 is independently selected from halogen, C_{1-4} alkyl, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, carbamoyl, carbamoyl C_{1-4} alkyl, amino sulfonyl,

(43) -CO-Y,

Y is C_{1-4} alkyl which is optionally substituted by one to three Y^1, or phenyl, pyridyl, piperidinyl, piperazinyl, morpholinyl, pyrrolidinyl, furanyl, thiazolyl or 4,5-dihydro-thiazolyl which is optionally substituted by one to three Y^2,

Y^1 is independently selected from amino, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, carbamoyl, guanidino, phenyl, pyridyl, piperidinyl, morpholinyl or pyrrolidinyl,

Y^2 is independently selected from halogen, amino, C_{1-4} alkyl, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl) amino, carbamoyl, carbamoyl C_{1-4} alkyl or amino sulfonyl,

(~~5~~4) $-S(O)_m-Z$, m is 1 or 2,

Z is amino, C_{1-4} alkyl amino, bis-(C_{1-4} alkyl)amino, or C_{1-4} alkyl which is optionally substituted by one to three Y^1, or phenyl, pyridyl, piperidinyl, piperazinyl, morpholinyl or pyrrolidinyl which is optionally substituted by one to three Y^2 ,

Y^1 and Y^2 represents the above defined; and

R^3 is hydrogen.

43. A compound claimed in claim ~~3~~2, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer:

Wherein

R^1 is methyl;

R^2 is

~~(1) hydrogen,~~

(~~2~~1) methyl, ethyl, isopropyl, which is optionally substituted by one to three X^1,

X^1 is independently selected from ~~halogen,~~ hydroxyl, dimethylamine, phenyl or pyridyl,

The phenyl or pyridyl of the said X^1 can be further substituted by the following substituents: halogen, methyl, carbamoyl, carbamoyl methyl, or amino sulfonyl,

(~~3~~2) phenyl, pyridyl, tetrahydrofuranyl, thiazole, 4,5-dihydro-thiazolyl, or cyclopropyl

group which is optionally substituted by one to three X^2,

X^2 is independently selected from halogen, methyl, carbamoyl, amino sulfonyl,

(43) -CO-Y,

Y is methyl, ethyl or isopropyl which is optionally substituted by one to three Y^1, or phenyl, pyridyl, piperidinyl, piperazinyl, pyrrolidinyl which is optionally substituted by one to three Y^2,

Y^1 is independently selected from dimethylamine, carbamoyl, guanidino, phenyl, pyridyl, piperidinyl, morpholinyl or pyrrolidinyl,

Y^2 is independently selected from halogen, methyl, carbamoyl, carbamoyl methyl or amino sulfonyl,

(~~5~~4) -$S(O)_m$-Z, m is 1 or 2,

Z is amino, dimethylamino, dimethylamino methyl, methylpiperazine or morpholine methyl; and

R^3 is hydrogen.

~~5~~4. A compound claimed in claim 43, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer:

Wherein

R^1 is methyl;

R^2 is

~~(1) hydrogen,~~

(21) methyl, ethyl, or isopropyl, which is optionally substituted by one to two X^1,

X^1 is independently selected from ~~hydroxyl,or~~ phenyl,

The said phenyl of X^1 can be further substituted by halogen, methyl, carbamoyl, or amino sulfonyl,

(32) -CO-Y,

Y is methyl, ethyl or isopropyl, which is optionally substituted by one to two Y^1, or phenyl, pyridyl, piperidinyl, which is optionally substituted by one to two Y^2,

Y^1 is independently selected from dimethylamine, guanidino, phenyl, pyridyl, or morpholinyl,

Y^2 is independently selected from halogen, methyl, carbamoyl, or amino sulfonyl,

(43) -$S(O)_m$-Z, m is 1 or 2,

Z is amino, or dimethylamino; and

R^3 is hydrogen.

~~65~~65. A compound claimed in claim ~~54~~54, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer, and the said compound is selected from the followings:

~~(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-3-[(7*S*,8a*S*)-2-methyloctahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,~~

~~(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-3-[(7*S*,8a*S*)-2-Isopropyl-octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,~~

(4*R*,5*S*,6*S*)-3-[(7*S*,8a*S*)-2-benzyloctahydropyrrolo[1,2-*a*]-pyrazin-7-ylthio]-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-3-[(7*S*,8a*S*)-2-acetyloctahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-3-[(7*S*,8a*S*)-2-isobutyryl-octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-3-[(7*S*,8a*S*)-2-benzoyloctahydropyrrolo[1,2-*a*]-pyrazin-7-ylthio]-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-3-[(7*S*,8a*S*)-2-picolinoyloctahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-3-[(7*S*,8a*S*)-2-(4-sulfamoylbenzoyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-3-[(7*S*,8a*S*)-2-sulfamoyloctahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-3-[(7*S*,8a*S*)-2-(4-sulfamoylbenzyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-3-[(7*S*,8a*S*)-2-(2-guanidinoacetyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-6-[(*R*)-1-hydroxyethyl]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-3-((7*S*,8a*S*)-2-(2-(dimethylamino)acetyl)octahydro-pyrrolo[1,2-*a*]pyrazin-7-ylthio)-6-((*R*)-1-hydroxyethyl)-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

(4*R*,5*S*,6*S*)-3-((7*S*,8a*S*)-2-(2-(dimethylamino)propionyl)octa-hydropyrrolo[1,2-*a*]pyrazin-7-ylthio)-6-((*R*)-1-hydroxyethyl)-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2

-carboxylic acid,

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-3-[(7*S*,8a*S*)-2-(2-morpholinoacetyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid,

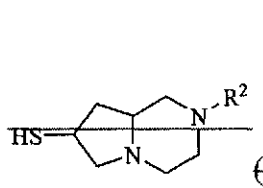
(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-4-methyl-3-[(7*S*,8a*S*)-2-(1-methylpiperidine-4-carbonyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid, and

(4*R*,5*S*,6*S*)-6-[(*R*)-1-hydroxyethyl]-3-[(7*S*,8a*S*)-2-(2-hydroxy-ethyl)octahydropyrrolo[1,2-*a*]pyrazin-7-ylthio]-4-methyl-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid.

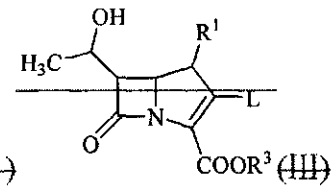
~~7~~6. A pharmaceutical dosage form comprising a compound claimed in claims 1-~~6~~5, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer, characterized in that the said dosage form contains one or more pharmaceutical carriers.

~~8~~7. ~~A method of~~ The use in the manufacture of a medicament for the treatment and/or prevention of infectious diseases comprising a compound claimed in claims 1-~~6~~5, or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer.

~~9. A method of preparation of a compound of formula (I) comprising a nucleophilic substitution reactionin between an intermediate of formula (II) and an intermediate of formula (III)~~



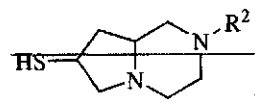
~~(II)~~



~~(III)~~

~~Wherein, R^1,R^2 and R^3 are defined as in claim 1 , and L is a leaving group.~~

~~10. A compound of formula (II), or its pharmaceutically acceptable salts, or its readily hydrolyzed ester, or its solvate, or its stereoisomer:~~



~~(II)~~

~~Wherein, R^2 is defined as in claim 1.~~