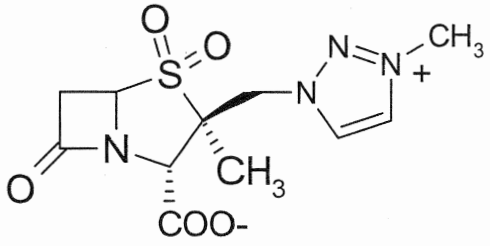
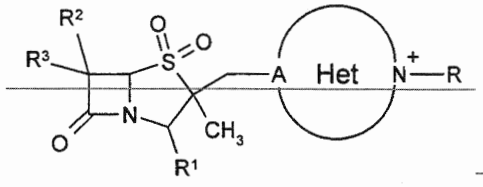
We Claim:

1. Use of a compound of the formula ~~(I),~~



~~Their~~and its derivatives, analogs, tautomeric forms, stereoisomers, polymorphs, solvates, metabolites, prodrugs, hydrates, pharmaceutically acceptable salts and esters, in the manufacture of a medicament for the treatment or prevention of carbapenemase-producing bacterial infection.~~;~~



~~(I)~~

~~wherein~~

~~A = C or N;~~

~~Het represents optionally substituted three- to seven-membered heterocyclic ring;~~

~~R^1 represents carboxylate anion or $COOR^4$ wherein R^4 represents hydrogen, C_1-C_6 alkyl, C_6-C_{10}aryl, C_6-C_{10}arylC_1-C_6alkyl, methoxybenzyl, nitrobenzyl, silyl, diphenylmethyl, proxetil, axetil, cilexetil, pivoxil, hexetil, daloxate or a pharmaceutically acceptable salt;~~

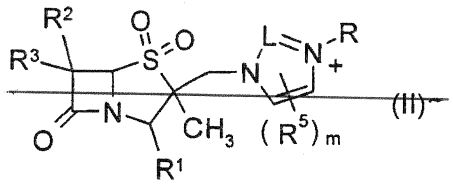
~~R^2 and R^3 independently represent hydrogen, halogen, amino, protected amino or optionally substituted C_1-C_6alkyl, C_2-C_6alkenyl and C_2-C_6alkynyl;~~

~~R represents substituted or unsubstituted C_1-C_6alkyl, C_2-C_6alkenyl, C_6-C_{10}aryl, C_6-C_{10}arylC_1-C_6alkyl, C_3-C_{12}cycloalkyl, oxo, heterocyclyl and heterocyclylalkyl groups;~~

~~when the groups R, R^2 and R^3 are substituted, the substituents which may be one or more are selected from lower alkyl (C_1-C_4alkyl selected from the group consisting of methyl, ethyl, propyl and isopropyl); lower alkoxy (C_1-C_4alkoxy selected from the group consisting of methoxy, ethoxy and propoxy); lower alkylthio (C_1-C_4alkylthio selected from the group consisting of methylthio and ethylthio); lower alkylamino (C_1-C_4alkylamino selected from the group consisting of methylamino, ethylamino and propylamino); cyclo(lower)alkyl (C_5-C_6cycloalkyl selected from the group consisting of cyclopentyl and cyclohexyl); cyclo(lower)alkenyl (C_5-C_6cycloalkenyl selected from the group consisting of cyclohexenyl and cyclohexadienyl); hydroxy; halogen (chloro, bromo, fluoro and iodo); amino;~~

protected amino; cyano; nitro; carbamoyl; -$CONHC_1$-C_4alkyl-COO-C_1-C_4alkyl; carboxy; protected carboxy; -COO-C_1-C_4alkyl; -CO-heterocyclyl; sulfonyl; sulfamoyl; imino; oxo; amino(lower)alkyl selected from the group consisting of aminomethyl, aminoethyl and aminopropyl; halo(lower)alkyl selected from the group consisting of trifluoromethyl (-CF_3), fluoromethyl, fluoroethyl, bromomethyl and difluoromethyl; carboxylic acid and carboxylic acid derivatives selected from the group consisting of hydroxamic acid, ester and amide.

2. The use as claimed in claim 1, wherein the compounds are selected from formula (II),



their tautomeric forms, stereoisomers, polymorphs, solvates, hydrates, pharmaceutically acceptable salts and esters ;

wherein:

L = C or N;

R^+ represents carboxylate anion or $COOR^4$ wherein R^4 represents hydrogen, C_1-C_6alkyl, C_6-C_{10}aryl, C_6-C_{10}arylC_1-C_6alkyl, methoxybenzyl, nitrobenzyl, silyl, diphenylmethyl, proxetil, axetil, cilexetil, pivoxil, hexetil, daloxate or a pharmaceutically acceptable salt;

R^2 and R^3 may be same or different and independently represent hydrogen, halogen, amino, protected amino, optionally substituted C_1-C_6alkyl, C_2-C_6alkenyl and C_2-C_6alkynyl;

R represents substituted or unsubstituted C_1-C_6alkyl, C_2-C_6alkenyl, C_6-C_{10}aryl, C_6-C_{10}aryl C_1-C_6alkyl, C_3-C_{12}cycloalkyl, oxo, heterocyclyl and heterocyclylalkyl;

R^5 is hydrogen, C_1-C_6alkyl, C_1-C_6alkoxy, C_1-C_6alkylthio, C_1-C_6alkylamino, hydroxyl, halogen and trihalomethyl; and

m is 0, 1 or 2.

3. The use as claimed in claim 1 or 2, wherein the compound is selected from:

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-methyl-1*H*-1,2,3-triazol-3-ium;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-ethyl-1*H*-1,2,3-triazol-3-ium;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-n-propyl-1*H*-1,2,3-triazol-3-ium;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-allyl-1*H*-1,2,3-triazol-3-ium;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-(2-amino-2-oxoethyl)-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-(2-t-butoxy-2-oxoethyl)-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-(2-morpholin-4-yl-2-oxoethyl)-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-{2[(2-ethoxy-2-oxoethyl)amino]-2-oxoethyl}-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-{2-[(3-ethoxy-3-oxopropyl)amino]-2-oxoethyl}-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-(2-{[1-(ethoxycarbonyl)-2-hydroxypropyl]amino}-2-oxoethyl)-1*H*-1,2,3-triazol-3-ium and the corresponding acid;

1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-benzyl-1H-1,2,3-triazol-3-ium and the corresponding acid;

~~(2*S*,3*S*,5*R*)-3-Methyl-3-(3-methyl-imidazol-3-ium-1-ylmethyl)-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylate and the corresponding acid; and~~

~~(2*S*,3*S*,5*R*)-3-Methyl-3-(4-methyl-3-methyl-imidazol-3-ium-1-ylmethyl)-4,4,7-trioxo-4-thia-1-aza-bicyclo[3.2.0]heptane-2-carboxylate and the corresponding acid, their derivatives, analogs, tautomeric forms, stereoisomers, polymorphs, solvates, metabolites, prodrugs, hydrates, pharmaceutically acceptable salts and esters.~~

~~4. The use as claimed in claim 1 or 2, wherein the compound is, 1-{[(2*S*,3*S*,5*R*)-2-Carboxy-3-methyl-4,4,7-trioxo-4-thia-1-azabicyclo[3.2.0]hept-3-yl]methyl}-3-methyl-1H-1,2,3-triazol-3-ium and its tautomeric forms, stereoisomers, polymorphs, solvates, hydrates, pharmaceutically acceptable salts and esters.~~

~~5~~2. The use as claimed in claims 1-~~4~~, wherein the bacteria are selected from Gram-negative bacteria.

~~6~~3. The use as claimed in claims 1-4, wherein the carbapenemases are selected from KPC.

~~7~~4. The use as claimed in claim~~s~~ 1-~~4~~, wherein the medicament is a composition comprising;

a. one or more β-lactam antibacterial agents and

b. one or more pharmaceutically acceptable carrier.

~~8. The use as claimed in claims 1-4, wherein the antibacterial agents are β-lactam antibacterial agents.~~

~~9~~5. The use as claimed in claim ~~8~~4, wherein the antibacterial agents are selected from Penicillins, Cephalosporins, Carbacephem, Oxacephem, Carbapenems, Cephamycins, Penems, Monobactams or a combination thereof.

~~10~~6. The use as claimed in claim ~~9~~5, wherein the penicillins are selected from Amdinocillin (Mecillinam), Amoxicillin, Ampicillin, Amylpenicillin, Apalcillin, Aspoxicillin, Azidocillin, Azlocillin, Bacampicillin, Carbenicillin, Carindacillin, Clometocillin, Cloxacillin, Cyclacillin (Ciclacillin), Dicloxacillin, Epicillin, Fenbenicillin, Floxacillin (flucloxacillin), Hetacillin, Lenampicillin, Metampicillin, Methicillin, Mezlocillin, Nafcillin, Oxacillin, Penamecillin, Penethecillin, Penicillin G (Procaine Pencillin), Penicillin N, Penicillin O, Penicillin V (Phenoxymethyl Penicillin), Phenethicillin, Piperacillin, Pivampicillin, Propicillin, Quinacillin, Sulbenicillin, Talampicillin, Temocillin, Ticarcillin, Pivmecillinam, Benzathine Penicillin, Benzyl Penicillin, Co-amoxiclav and Lenampicillin.

~~11~~7. The use as claimed in claim ~~9~~5, wherein the cephalosporins are selected from Cephaloridin, Cephradine, Cefoxitin, Cephacetril, Cefinenoxime, Cephaloglycin, Cefonicid, Cefodizime, Cefpirome, Cefpiramide, Cefozopran, Cefoselis, Ceftuprenam, Cefpimizole, Cefclidin, Cefpodoxime axetil, Cefteram pivoxil, Cefcapene pivoxil, Ceftobiprole, Ceftaroline, Cefoperazone, Cefquinome,

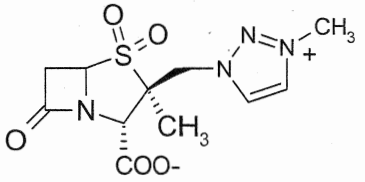
Ceftiofur, Cefovecin, Cefadroxil, Cefalonium, Cefepime, Cefotaxime, Ceftazidime, Cefetamet pivoxil, Cefditoren pivoxil, Cephaloridine, Ceftazidime, Ceftriaxone, Cefbuperazone, Cephalothin, Cephazolin, Cephapirin, Ceftezole, Cefamandole, Cefotiam, Cefotiam hexetil, Cefuroxime, Ceftizoxime, Cefmenoxime, Cefuzonam, Cefsulodin, Cefmetazole, Cefminox, Cephalexin, Cefradine, Cefaclor, Cefadroxil, Cefalonium, Cefprozil, Cefuroxime axetil, Cefixime, Cefpodoxime proxetil, Ceftibuten, CXA-101(FR264205), and Cefdinir.

~~12~~8. The use as claimed in claim ~~9~~5, wherein the carbapenems are selected from Meropenem, Ertapenem, Doripenem, Biapenem, Panipenem, Ritipenem, Tebipenem, Tomopenem, Sulopenem, Razupenem, Imipenem, ME 1036 and SM216601.

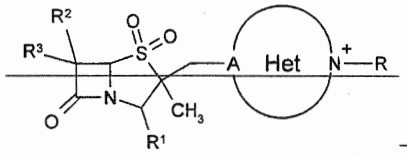
~~13~~9. The use as claimed in claim ~~9~~5, wherein the Monobactams are selected from Aztreonam, Carumonam, Tigemonam, BAL19764 and BAL30072.

~~14~~10. The use as claimed in claim 1, wherein the antibacterial agents are selected from Imipenem, Faropenem, Doripenem, Meropenem, Ertapenem, Aztreonam, Cefepime, Cefotaxime, Ceftazidime, Ceftobiprole, Cefquinome, Ceftiofur, Cefadroxil and Cefalonium.

~~15~~11. Use of ~~the~~a compound of formula ~~(I)~~



~~as~~for the manufacture of an *in vitro* diagnostic reagent for the detection of carbapenemases.~~:~~



~~(I)~~

~~wherein~~

~~A = C or N;~~

~~Het represents optionally substituted three- to seven-membered heterocyclic ring;~~ ~~R^1 represents carboxylate anion or $COOR^4$ wherein R^4 represents hydrogen, C_1-C_6 alkyl, C_6-C_{10}aryl, C_6-C_{10}arylC_1-C_6alkyl, methoxybenzyl, nitrobenzyl, silyl, diphenylmethyl, proxetil, axetil, cilexetil, pivoxil, hexetil, daloxate or a pharmaceutically acceptable salt;~~

~~R^2 and R^3 independently represent hydrogen, halogen, amino, protected amino or optionally substituted C_1-C_6alkyl, C_2-C_6alkenyl and C_2-C_6alkynyl; R represents substituted or unsubstituted C_1-C_6alkyl, C_2-C_6alkenyl, C_6-C_{10}aryl, C_6-C_{10}arylC_1-C_6alkyl, C_3-C_{12}cycloalkyl, oxo, heterocyclyl and heterocyclylalkyl groups;~~

~~when the groups R, R^2 and R^3 are substituted, the substituents which may be one or more are selected from lower alkyl (C_1-C_4alkyl selected from the group consisting of methyl, ethyl, propyl and isopropyl); lower alkoxy (C_1-C_4alkoxy selected from the group consisting of methoxy, ethoxy and propoxy); lower alkylthio (C_1-C_4alkylthio selected from the group consisting of methylthio and ethylthio); lower alkylamino (C_1-C_4alkylamino selected from the group consisting of methylamino, ethylamino and propylamino); cyclo(lower)alkyl (C_5-C_6cycloalkyl selected from the group consisting of cyclopentyl and cyclohexyl); cyclo(lower)alkenyl (C_5-C_6cycloalkenyl selected from the group consisting of cyclohexenyl and cyclohexadienyl); hydroxy; halogen (chloro, bromo, fluoro and iodo); amino; protected amino; cyano; nitro; carbamoyl; -CONHC_1-C_4alkyl-COO-C_1-C_4alkyl; carboxy; protected carboxy; -COO-C_1-C_4alkyl; -CO-heterocyclyl; sulfonyl; sulfamoyl; imino; oxo; amino(lower)alkyl selected from the group consisting of aminomethyl, aminoethyl and aminopropyl; halo(lower)alkyl selected from the group consisting of trifluoromethyl (-CF_3), fluoromethyl, fluoroethyl, bromomethyl and difluoromethyl; carboxylic acid and carboxylic acid derivatives selected from the group consisting of hydroxamic acid, ester and amide.~~

~~16~~12. The use as claimed in claim ~~15~~11 as a diagnostic reagent for the detection of β-lactamases belonging to the families of KPC.

~~17~~13. Use of a compound as claimed in claim 1 ~~or 2~~ in the manufacture of a medicament for the treatment of patients with bacterial infections, preoperative patients, postoperative patients, patients in ICU, patients with nosocomial infections, community acquired infections and non-human animals.

~~18~~14. The use as claimed in claim ~~17~~13, wherein the antibacterial agents are selected from the group consisting of Penicillins, Cephalosporins, Penems, Carbacephem, Carbapenems, Oxacephem, Monobactams, Aminoglycosides, Bacteriocins, Quinolones, Sulfonamides, Macrolides, Tetracyclines, Glycylcyclines, Oxazolidinones, Lipopeptides, Polypeptides, Rifamycins, Chloramphenicol, Polyene antifungals and derivatives thereof.

~~19~~15. The use as claimed in claim 1 wherein the medicament is administered separately to an antibacterial agent.