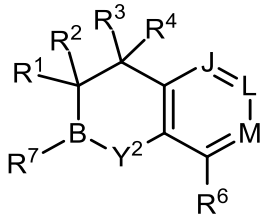
[0008] Treatment of strains producing any of these carbapenemases with carbapenems can be associated with poor outcomes.

[0009] Another mechanism of β-lactamase mediated resistance to carbapenems involves combination of permeability or efflux mechanisms combined with hyper production of beta-lactamases. One example is the loss of a porin combined in hyperproduction of ampC beta-lactamase results in resistance to imipenem in *Pseudomonas aeruginosa.* Efflux pump over expression combined with hyperproduction of the ampC β-lactamase can also result in resistance to a carbapenem such as meropenem.

[0010] Thus, there is a need for improved β-lactamase inhibitors (BLIs).

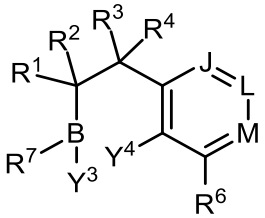
SUMMARY

[0010a] In one aspect, the present disclosure refers to a compound having the structure of the Formula Ic or IIc, or a pharmaceutically acceptable salt thereof:



Ic

,



IIc

wherein

R^2 and R^3 together with the atoms to which they are attached form a fused ring or ring system selected from the group consisting of C_{3-7} cycloalkyl and 3-10 membered heterocyclyl, each optionally substituted with one or more R^5, and

each of $R^1$and R^4 is independently selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10} alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido,

$-SR^c$, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, and $-NR^fS(O)_2NR^fOR^d$; or

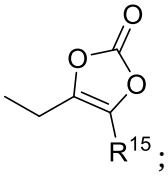
R^5 is $-Y^5-(CH_2)_t-G$;

t is an integer of 0 or 1;

G is selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10}alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, $-SR^c$, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, and $-NR^fS(O)_2NR^fOR^d$;

each J, L, M is independently CR^{12} or N (nitrogen);

R^6 is selected from the group consisting of -C(O)OR, and a carboxylic acid isostere;

R is selected from the group consisting of H, C_{1-9} alkyl, $-CR^{10}R^{11}OC(O)C_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)C_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)$(3 to 7 membered heterocyclyl), $-CR^{10}R^{11}OC(O)C_{2-8}$alkoxyalkyl, $-CR^{10}R^{11}OC(O)OC_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)OC_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)O$(3 to 7 membered heterocyclyl), $-CR^{10}R^{11}OC(O)OC_{2-8}$alkoxyalkyl, $-CR^{10}R^{11}OC(O)C_{6-10}$aryl, $-CR^{10}R^{11}OC(O)OC_{6-10}$aryl, $-CR^{10}R^{11}C(O)NR^{13}R^{14}$, $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)NR^{13}R^{14}$, $-CR^{10}R^{11}OC(O)O(CH_2)_{2-3}OC(O)C_{1-4}$ alkyl, $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)OC_{1-4}$ alkyl, $-CR^{10}R^{11}OC(O)(CH_2)_{1-3}OC(O)C_{1-4}$ alkyl, and  ;

R^7 is selected from the group consisting of –OH and optionally substituted C_{1-6} alkoxy;

each R^{10} and R^{11} is independently selected from the group consisting of H, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl;

R^{12} is selected from the group consisting of hydrogen, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10}alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, sulfhydryl, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, $-NR^fS(O)_2NR^fOR^d$, and $-(CH_2)_p-Y^6-(CH_2)_qK$;

each R^{13} and R^{14} is independently selected from the group consisting of H, optionally substituted C_{1-6}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl;

R^{15} is optionally substituted C_{1-6} alkyl;

Y^2 is -O- or -S- ;

Y^3 is -OHor -SH;

Y^4 is selected from the group consisting of -OH, and optionally substituted C_{1-6} alkoxy;

Y^5 is absent;

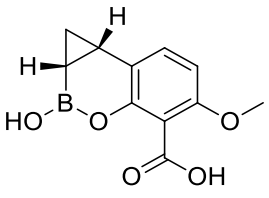
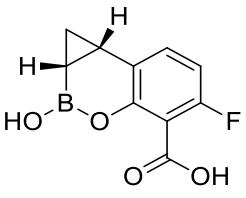
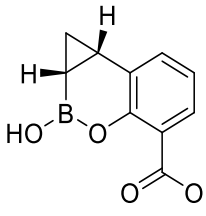
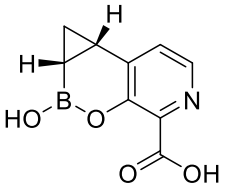
Y^6 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^f-$;

K is selected from the group consisting of C-amido; N-amido; S-sulfonamido; N-sulfonamido; $-NR^fC(O)NR^fR^g$; $-NR^fS(O)_2NR^fR^g$; $-C(=NR^e)R^c$; $-C(=NR^e)NR^fR^g$; $-NR^fCR^c(=NR^e)$; $-NR^fC(=NR^e)NR^fR^g$; C_{1-4} alkyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{6-10} aryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{3-7}

carbocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; 5-10 membered heteroaryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; and 3-10 membered heterocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido;

each R^c, R^d, R^e, R^f, and R^g are independently selected from the group consisting of H, halogen, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; and

each p and q is independently 0 or 1.

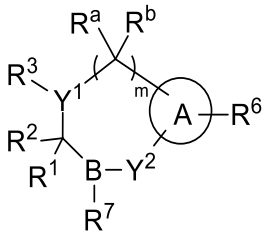
[0010b] In another aspect, the present disclosure refers to a compound selected from the group consisting of  ,  ,  , and  , and pharmaceutically acceptable salts thereof.

[0010c] In another aspect, the present disclosure refers to a pharmaceutical composition comprising a therapeutically effective amount of a compound as described herein, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable excipient.

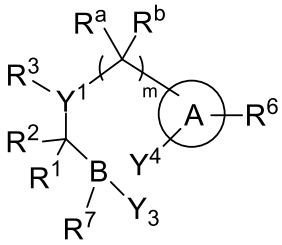
[0010d] In another aspect, the present disclosure refers to use of a compound as described herein, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for treating a bacterial infection caused by β-lactam antibacterial agent-resistant *enterobacteriaceae*.

[0010e] In yet another aspect, the present disclosure refers to the compound as described herein, or a pharmaceutically acceptable salt thereof, for use in therapy.

[0011] Some examples described herein relate to compounds having the structure of the Formula I or II, or pharmaceutically acceptable salts thereof:



I



II

wherein

Y^1 is N or CR^4;

m is an integer of 0 or 1;

(a)

R^2 and R^3 together with the atoms to which they are attached form a fused ring or ring system selected from the group consisting of C_{3-7}carbocyclyl, 3-10 membered heterocyclyl, C_{6-10} aryl, and 5-10 membered heteroaryl, each optionally substituted with one or more R^5, and

each of R^1, R^4, R^a, and R^b is independently selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10} alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl,

Y^4 is selected from the group consisting of -OH, optionally substituted C_{1-6} alkoxy, amino, and $-N(OR^8)R^9$; and

Y^5 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^g-$, or Y^5 is absent;

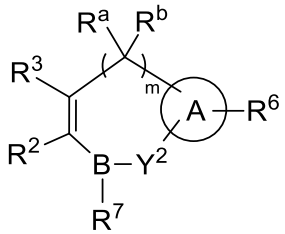
Y^6 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^f-$;

K is selected from the group consisting of C-amido; N-amido; S-sulfonamido; N-sulfonamido; $-NR^fC(O)NR^fR^g$; $-NR^fS(O)_2NR^fR^g$; $-C(=NR^e)R^c$; $-C(=NR^e)NR^fR^g$; $-NR^fCR^c(=NR^e)$; $-NR^fC(=NR^e)NR^fR^g$; C_{1-4} alkyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{6-10} aryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{3-7} carbocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; 5-10 membered heteroaryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; and 3-10 membered heterocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido;

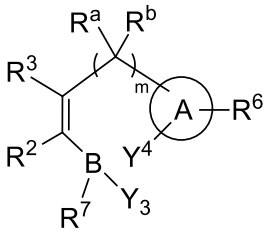
each R^c, R^d, R^e, R^f, and R^g are independently selected from the group consisting of H, halogen, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; and

each p and q is independently 0 or 1.

[0012] Some examples described herein relate to compounds having the structure of the Formula III or IV, or pharmaceutically acceptable salts thereof:



III



IV

wherein

(a)

each of R^2 and R^3 is independently selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy,

each R^{13} and R^{14} is independently selected from the group consisting of H, optionally substituted C_{1-6}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl;

R^{15} is optionally substituted C_{1-6} alkyl;

Y^2 is selected from the group consisting of -O-, -S-, and $-NR^9-$;

Y^3 is selected from the group consisting of -OH, -SH, and $-NHR^9$;

Y^4 is selected from the group consisting of -OH, optionally substituted C_{1-6} alkoxy, amino, and $-N(OR^8)R^9$;

Y^5 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^g-$, or Y^5 is absent;

Y^6 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^f-$;

K is selected from the group consisting of C-amido; N-amido; S-sulfonamido; N-sulfonamido; $-NR^fC(O)NR^fR^g$; $-NR^fS(O)_2NR^fR^g$; $-C(=NR^e)R^c$; $-C(=NR^e)NR^fR^g$; $-NR^fCR^c(=NR^e)$; $-NR^fC(=NR^e)NR^fR^g$; C_{1-4} alkyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{6-10} aryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{3-7} carbocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; 5-10 membered heteroaryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; and 3-10 membered heterocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido;

each R^c, R^d, R^e, R^f, and R^g are independently selected from the group consisting of H, halogen, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; and

each p and q is independently 0 or 1.

[0013] Some further examples described herein relate to compounds having the structure of the Formula V, or pharmaceutically acceptable salts thereof

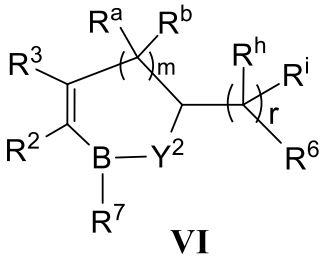
Y^2 is selected from the group consisting of -O-, -S-, and -NR^9-;

Y^5 is selected from the group consisting of -S-, -S(O)-, -$S(O)_2$-, -O-, -CR^fR^g-, and -NR^g-, or Y^5 is absent;

each R^c, R^d, R^e, R^f, and R^g are independently selected from the group consisting of H, halogen, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; and

each R^h and R^i is independently selected from the group consisting of H, halogen, cyano, amino, C-amido, N-amido, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; or R^h and R^i together with the atoms to which they are attached form a spirocyclic ring or ring system selected from the group consisting of C_{3-7} carbocyclyl, 3-10 membered heterocyclyl, C_{6-10} aryl, and 5-10 membered heteroaryl, each optionally substituted with one or more R^5.

[0014] Some examples described herein relate to compounds having the structure of Formula VI, or pharmaceutically acceptable salts thereof:



VI

wherein r is an integer of 0 or 1;

(a)

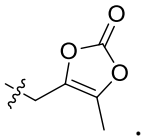
each of R^2 and R^3 is independently selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10}alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, -SR^c, -$C(O)(CH_2)_{0-3}SR^c$, -$C(O)(CH_2)_{1-3}R^d$, -$NR^fC(O)NR^fR^g$, -$NR^fS(O)_2NR^fR^g$, -

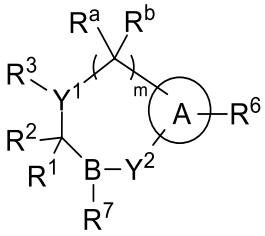
[0015] Some further examples described herein relate to pharmaceutical compositions comprising a therapeutically effective amount of a compound having the structure of Formula I, II, III, IV, V or VI, as described herein, or pharmaceutically acceptable salts thereof, and a pharmaceutically acceptable excipient. In some examples, the pharmaceutical composition may further comprise an additional medicament.

[0016] Some additional examples described herein relate to methods of treating a bacterial infection comprising administering a compound having the structure of Formula I, II, III, IV, V or VI as described herein, or pharmaceutically acceptable salts thereof to a subject in need thereof. In some examples, the method further comprises administering to the subject an additional medicament, for example, the additional medicament may be selected from an antibacterial agent, an antifungal agent, an antiviral agent, an anti-inflammatory agent, or an antiallergic agent.

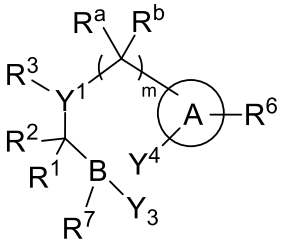
DETAILED DESCRIPTION OF EMBODIMENTS

Compounds of Formula I or II

[0017] In some embodiments, compounds that contain a boronic acid moiety are provided that act as antimicrobial agents and/or as potentiators of antimicrobial agents. Various embodiments of these compounds include compounds having the structures of Formula I or II as described above or pharmaceutically acceptable salts thereof. In some embodiments of the compounds of Formula I or II, R is selected from H, $C_{1\text{-}9}$ alkyl, $-CR^{10}R^{11}OC(O)C_{1\text{-}9}$alkyl, $-CR^{10}R^{11}OC(O)OC_{1\text{-}9}$alkyl, $-CR^{10}R^{11}OC(O)C_{6\text{-}10}$aryl, $-CR^{10}R^{11}OC(O)OC_{6\text{-}10}$aryl and  .



I

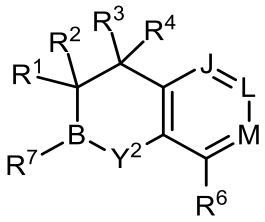


II

[0018] In some embodiments, the compounds of Formula I or II are also represented by the structure of Formula Ia or IIa, or pharmaceutically acceptable salts thereof:

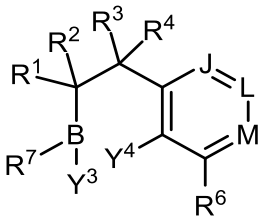
What is claimed is:

1. A compound having the structure of the Formula Ic or IIc, or a pharmaceutically acceptable salt thereof:



Ic

,



IIc

wherein

R^2 and R^3 together with the atoms to which they are attached form a fused ring or ring system selected from the group consisting of C_{3-7} cycloalkyl and 3-10 membered heterocyclyl, each optionally substituted with one or more R^5, and

each of $R^1$and R^4 is independently selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10} alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, -SR^c, -$C(O)(CH_2)_{0-3}SR^c$, -$C(O)(CH_2)_{1-3}R^d$, -$NR^fC(O)NR^fR^g$, -$NR^fS(O)_2NR^fR^g$, -$C(=NR^e)R^c$, -$C(=NR^e)NR^fR^g$, -$NR^fCR^c(=NR^e)$, -$NR^fC(=NR^e)NR^fR^g$, -$S(O)(CH_2)_{1-3}R^c$, and -$NR^fS(O)_2NR^fOR^d$; or

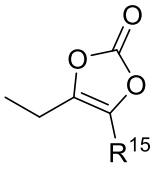
R^5 is -Y^5-$(CH_2)_t$-G;

t is an integer of 0 or 1;

G is selected from the group consisting of H, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10}alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, $-SR^c$, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, and $-NR^fS(O)_2NR^fOR^d$;

each J, L, M is independently CR^{12} or N (nitrogen);

R^6 is selected from the group consisting of -C(O)OR, and a carboxylic acid isostere;

R is selected from the group consisting of H, C_{1-9} alkyl, $-CR^{10}R^{11}OC(O)C_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)C_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)$(3 to 7 membered heterocyclyl), $-CR^{10}R^{11}OC(O)C_{2-8}$alkoxyalkyl, $-CR^{10}R^{11}OC(O)OC_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)OC_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)O$(3 to 7 membered heterocyclyl), $-CR^{10}R^{11}OC(O)OC_{2-8}$alkoxyalkyl, $-CR^{10}R^{11}OC(O)C_{6-10}$aryl, $-CR^{10}R^{11}OC(O)OC_{6-10}$aryl, $-CR^{10}R^{11}C(O)NR^{13}R^{14}$, $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)NR^{13}R^{14}$, $-CR^{10}R^{11}OC(O)O(CH_2)_{2-3}OC(O)C_{1-4}$ alkyl, $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)OC_{1-4}$ alkyl, $-CR^{10}R^{11}OC(O)(CH_2)_{1-3}OC(O)C_{1-4}$ alkyl, and 

;

R^7 is selected from the group consisting of –OH and optionally substituted C_{1-6} alkoxy;

each R^{10} and R^{11} is independently selected from the group consisting of H, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally

substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl;

R^{12} is selected from the group consisting of hydrogen, amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkoxy, optionally substituted (C_{1-6} alkoxy)C_{1-6} alkyl, optionally substituted C_{2-10}alkenyl, optionally substituted C_{2-10}alkynyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, optionally substituted 5-10 membered heteroaryl, optionally substituted (C_{3-7}carbocyclyl)C_{1-6}alkyl, optionally substituted (3-10 membered heterocyclyl)C_{1-6}alkyl, optionally substituted (C_{6-10}aryl)C_{1-6}alkyl, (C_{6-10}aryl)C_{1-6}alkoxy, optionally substituted (5-10 membered heteroaryl)C_{1-6}alkyl, acyl, C-carboxy, O-carboxy, C-amido, N-amido, S-sulfonamido, N-sulfonamido, sulfhydryl, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, $-NR^fS(O)_2NR^fOR^d$, and $-(CH_2)_p-Y^6-(CH_2)_qK$;

each R^{13} and R^{14} is independently selected from the group consisting of H, optionally substituted C_{1-6}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl;

R^{15} is optionally substituted C_{1-6} alkyl;

Y^2 is -O- or -S- ;

Y^3 is -OHor -SH;

Y^4 is selected from the group consisting of -OH, and optionally substituted C_{1-6} alkoxy;

Y^5 is absent;

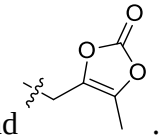
Y^6 is selected from the group consisting of -S-, -S(O)-, $-S(O)_2-$, -O-, $-CR^fR^g-$, and $-NR^f-$;

K is selected from the group consisting of C-amido; N-amido; S-sulfonamido; N-sulfonamido; $-NR^fC(O)NR^fR^g$; $-NR^fS(O)_2NR^fR^g$; $-C(=NR^e)R^c$; $-C(=NR^e)NR^fR^g$; $-NR^fCR^c(=NR^e)$; $-NR^fC(=NR^e)NR^fR^g$; C_{1-4} alkyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkoxy, amino, halogen, C-amido,

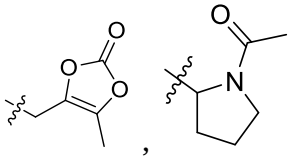
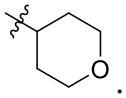
and N-amido; C_{6-10} aryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; C_{3-7} carbocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; 5-10 membered heteroaryl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido; and 3-10 membered heterocyclyl optionally substituted with 0-2 substituents selected from the group consisting of C_{1-4} alkyl, C_{1-4} alkoxy, amino, halogen, C-amido, and N-amido;

each R^c, R^d, R^e, R^f, and R^g are independently selected from the group consisting of H, halogen, optionally substituted C_{1-4}alkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 3-10 membered heterocyclyl, optionally substituted C_{6-10}aryl, and optionally substituted 5-10 membered heteroaryl; and

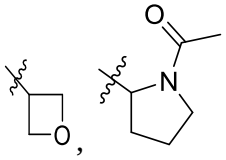
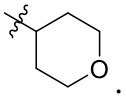
each p and q is independently 0 or 1.

2. The compound of claim 1, wherein R is selected from the group consisting of H, C_{1-9} alkyl, $-CR^{10}R^{11}OC(O)C_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)OC_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)C_{6-10}$aryl, $-CR^{10}R^{11}OC(O)OC_{6-10}$aryl and  .

3. The compound of claim 1, wherein R is $-CR^{10}R^{11}OC(O)C_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)C_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)$(3 to 7 membered heterocyclyl), or $-CR^{10}R^{11}OC(O)C_{2-8}$alkoxyalkyl.

4. The compound of claim 3, wherein the 3 to 7 membered heterocyclyl of R is  , , or  .

5. The compound of claim 1, wherein R is $-CR^{10}R^{11}OC(O)OC_{1-9}$alkyl, $-CR^{10}R^{11}OC(O)OC_{3-7}$carbocyclyl, $-CR^{10}R^{11}OC(O)O$(3 to 7 membered heterocyclyl), or $-CR^{10}R^{11}OC(O)OC_{2-8}$alkoxyalkyl.

6. The compound of claim 5, wherein the 3 to 7 membered heterocyclyl of R is  , , or  .

7. The compound of claim 1, wherein R is $-CR^{10}R^{11}C(O)NR^{13}R^{14}$.

8. The compound of claim 1, wherein R is $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)NR^{13}R^{14}$, $-CR^{10}R^{11}OC(O)O(CH_2)_{2-3}OC(O)C_{1-4}$ alkyl, $-CR^{10}R^{11}OC(O)(CH_2)_{1-3}OC(O)C_{1-4}$ alkyl, or $-CR^{10}R^{11}OC(O)O(CH_2)_{1-3}C(O)OC_{1-4}$ alkyl.

9. The compound of claim 1, wherein each J, L and M is CR^{12}.

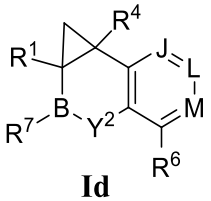
10. The compound of claim 9, wherein each R^{12} is independently hydrogen, halogen, C_{1-6} alkoxy, or C_{1-6} haloalkoxy.

11. The compound of claim 1, wherein at least one of J, L and M is N.

12. The compound of claim 11, wherein M is N.

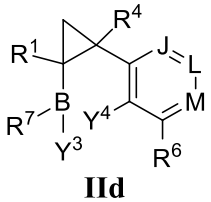
13. The compound of claim 1, wherein R^2 and R^3 together with the atoms to which they are attached form C_{3-7} cycloalkyl optionally substituted with one or more R^5.

14. The compound of claim 13, having the structure of Formula Id or IId, or a pharmaceutically acceptable salt thereof:

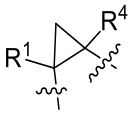


Id

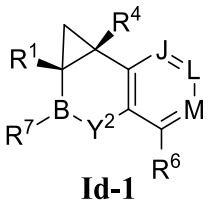
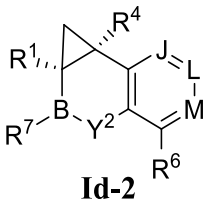
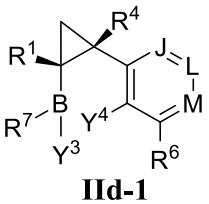
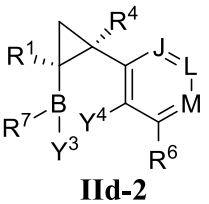
or



IId,

wherein the cyclopropyl moiety  is optionally substituted with one or more R^5.

15. The compound of claim 14, having the structure of Formula Id-1, Id-2, IId-1 or IId-2, or a pharmaceutically acceptable salt thereof:


Id-1, 
Id-2, 
IId-1, or 
IId-2.

16. The compound of claim 15 , wherein each J, L and M is CR^{12}.

17. The compound of claim 16, wherein each R^{12} is independently hydrogen, halogen, C_{1-6} alkoxy, or C_{1-6} haloalkoxy.

18. The compound of claim 17, wherein R^6 is -C(O)OR.

19. The compound of claim 1, wherein R^1 is hydrogen or C_{1-6} hydroxyalkyl.

20. The compound of claim 1, wherein R^4 is hydrogen.

21. The compound of claim 1, wherein R^6 is -C(O)OR.

22. The compound of claim 21, wherein R is H.

23. The compound of claim 1, wherein R^7 is -OH.

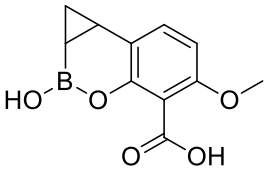
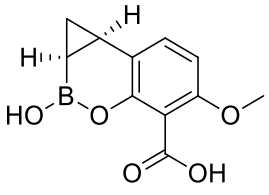
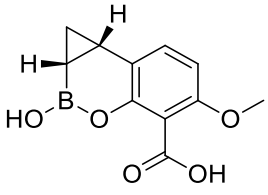
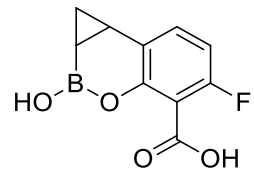
24. The compound of claim 1, wherein Y^2 is -O-.

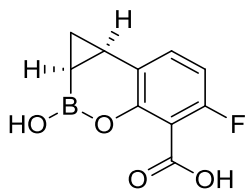
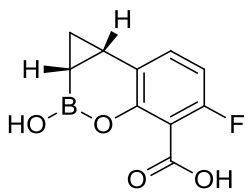
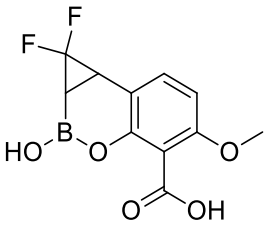
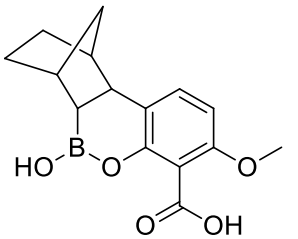
25. The compound of claim 1, wherein Y^3 is -OH.

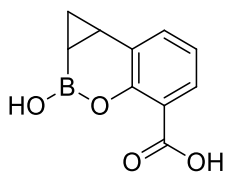
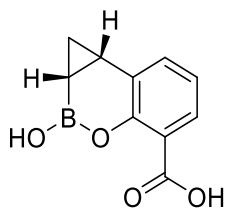
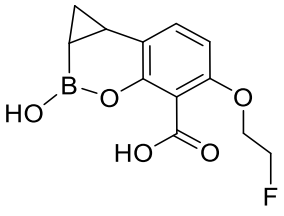
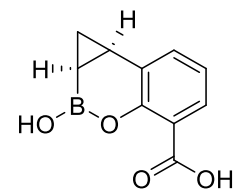
26. The compound of claim 1, wherein Y^4 is -OH.

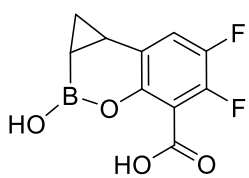
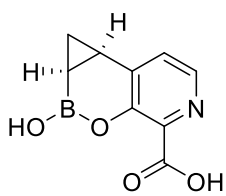
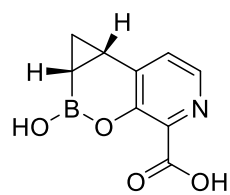
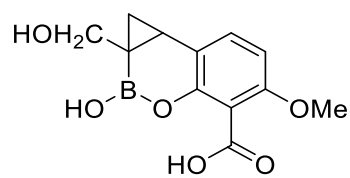
27. The compound of claim 1, wherein t is 0, and R^5 is selected from the group consisting of amino, halogen, cyano, hydroxy, optionally substituted C_{1-6} alkoxy, acyl, C-carboxy, C-amido, N-amido, N-sulfonamido, $-SR^c$, $-C(O)(CH_2)_{0-3}SR^c$, $-C(O)(CH_2)_{1-3}R^d$, $-NR^fC(O)NR^fR^g$, $-NR^fS(O)_2NR^fR^g$, $-C(=NR^e)R^c$, $-C(=NR^e)NR^fR^g$, $-NR^fCR^c(=NR^e)$, $-NR^fC(=NR^e)NR^fR^g$, $-S(O)(CH_2)_{1-3}R^c$, and $-NR^fS(O)_2NR^fOR^d$.

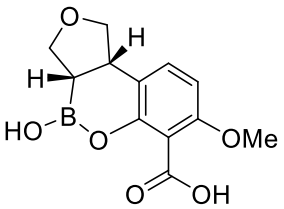
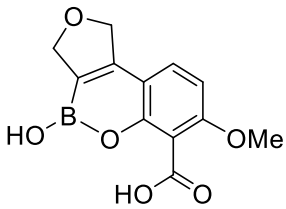
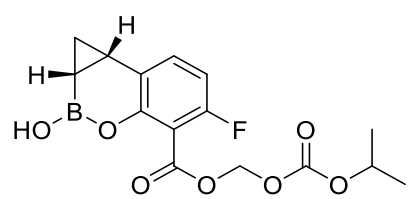
28. The compound of claim 0, selected from the group consisting of

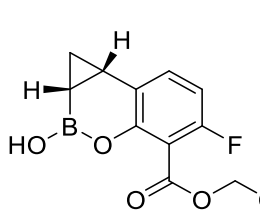
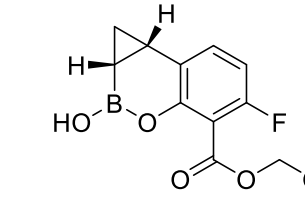
 ,  ,  ,  ,

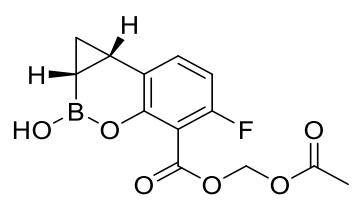
 ,  ,  ,  ,

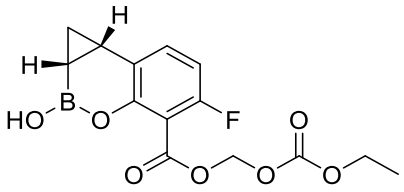
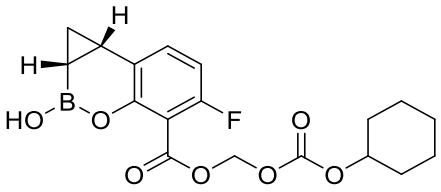
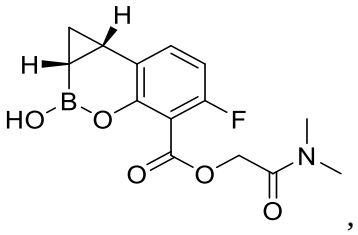
 ,  ,  ,  ,

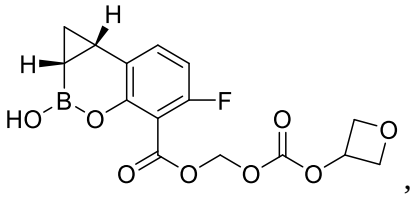
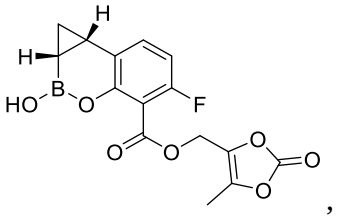
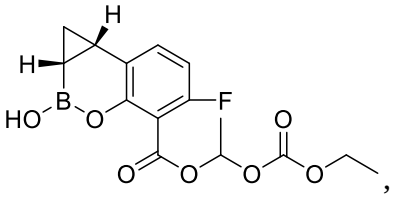
 ,  ,  ,  ,

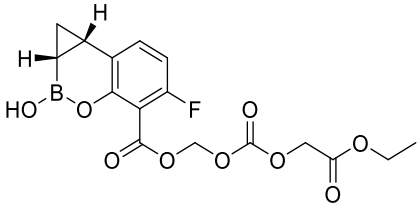
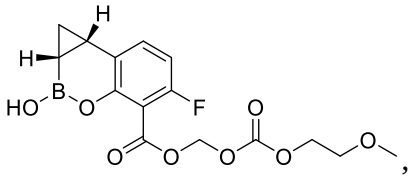
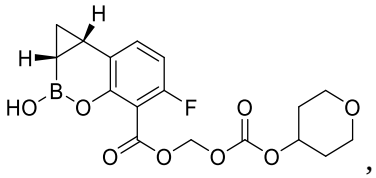
 ,  ,  ,

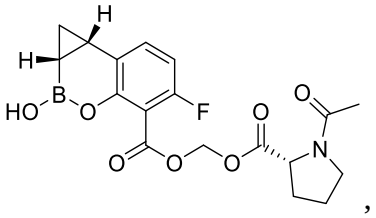
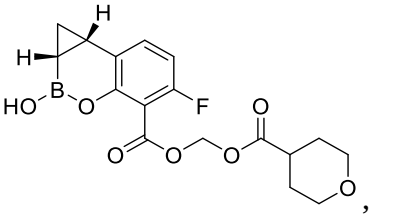
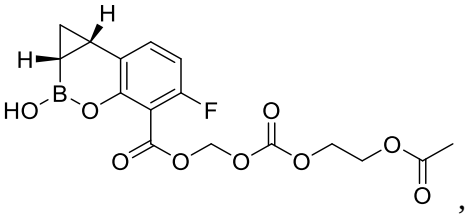
 ,  , ,

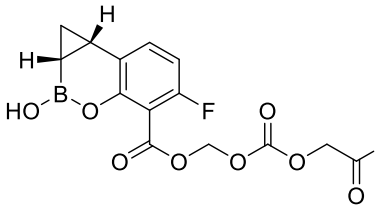
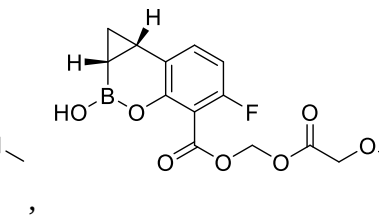
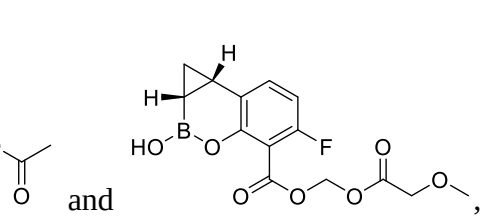
, ,  ,

 ,  ,  ,

 ,  ,  ,

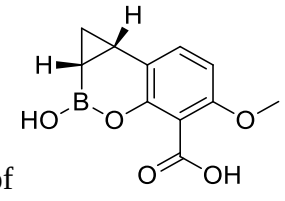
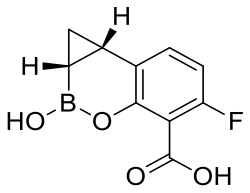
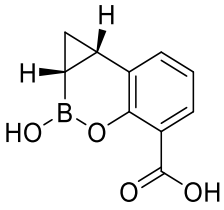
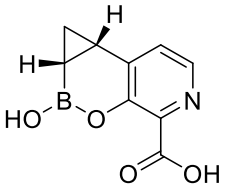
 ,  ,  ,

 ,  ,  ,

 ,  ,  ,

, and ,

and pharmaceutically acceptable salts thereof.

29. A compound selected from the group consisting of  ,  ,  , and  , and pharmaceutically acceptable salts thereof.

30. The compound of claim 28 or 29, wherein the pharmaceutically acceptable salt is a sodium salt.

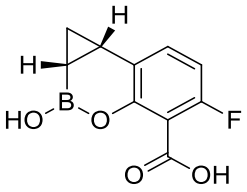
31. A pharmaceutical composition comprising a therapeutically effective amount of a compound of any one of claims 1 to 30, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable excipient.

32. The pharmaceutical composition of claim 31, further comprising an additional medicament.

33. Use of a compound of any one of claims 1 to 30, or a pharmaceutically acceptable salt thereof, in the preparation of a medicament for treating a bacterial infection caused by β-lactam antibacterial agent-resistant *enterobacteriaceae*.

34. The use of claim 33, wherein the medicament further comprises a β-lactam antibacterial agent.

35. The use of claim 33, wherein the pharmaceutically acceptable salt is a sodium salt.

36. The use of claim 34, wherein the compound is  or a pharmaceutically acceptable salt thereof, and the β-lactam antibacterial agent is Meropenem or Ceftibuten.

37. The compound of any one of claims 1 to 30, or a pharmaceutically acceptable salt thereof, for use in therapy.