REPLY EXHIBIT 1

Reply Exhibit 1 – U.S. Patent No. 9,290,754, issued March 22, 2016 (excerpts: first page and claim 18)

Nejmeh v. Theriva Biologics, Inc., No. 3:26-cv-00705-ART-CSD (D. Nev.)

Source: Google Patents, patents.google.com/patent/US9290754B2/en, printed November 7, 2026.

US9290754B2 - Beta-lactamases with improved properties for therapy - Google Patents

Beta-lactamases with improved properties for therapy Download PDF

Info

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US9290754B2 US14/689,877 US201514689877A US9290754B2 US 9290754 B2 US9290754 B2 US 9290754 B2 US9290754 B2 US 9290754B2 US 201514689877 A US201514689877 A US 201514689877A US 9290754 B2 US9290754 B2 US 9290754B2
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Active

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Other versions
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Current Assignee (The listed assignees may be inaccurate. Google has not performed a legal analysis and makes no representation or warranty as to the accuracy of the list.)
Theriva Biologics Inc
Original Assignee
Synthetic Biologics Inc
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2016-08-24 Priority to US15/245,517 priority patent/US9695409B2/en
2017-06-02 Priority to US15/611,881 priority patent/US9783797B1/en
2017-08-10 Priority to US15/674,177 priority patent/US10011824B2/en
2018-05-30 Priority to US15/993,159 priority patent/US10087433B1/en
2018-08-24 Priority to US16/112,283 priority patent/US10336995B2/en
2019-05-16 Priority to US16/414,411 priority patent/US10584326B2/en
2020-01-24 Priority to US16/751,734 priority patent/US10767171B2/en
2020-07-24 Priority to US16/938,318 priority patent/US11236319B2/en
2021-12-08 Priority to US17/545,050 priority patent/US11608494B2/en
2023-02-07 Priority to US18/165,470 priority patent/US20230313166A1/en
2023-02-28 Assigned to THERIVA BIOLOGICS, INC. reassignment THERIVA BIOLOGICS, INC. CHANGE OF NAME (SEE DOCUMENT FOR DETAILS). Assignors: SYNTHETIC BIOLOGICS, INC.
Status Active legal-status Critical Current
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Links

- Micro-Organisms Or Cultivation Processes Thereof (AREA)
- Pharmaceuticals Containing Other Organic And Inorganic Compounds (AREA)
- Peptides Or Proteins (AREA)

Abstract

This invention relates to, in part, compositions of beta-lactamases and methods of using these enzymes in, for example, gastrointestinal tract (GI tract) disorders such as *C. difficile* infection (CDI).

[Description section omitted from this excerpt.]

Claims (19)

What is claimed is:
1. A beta-lactamase comprising an amino acid sequence having at least 90% sequence identity with SEQ ID NO:1 and having A232G, A237S, A238G, S240D, and D276N mutations according to Ambler classification.
2. The beta-lactamase of claim 1, wherein the beta-lactamase hydrolyzes one or more of penicillins and cephalosporins.
3. The beta-lactamase of claim 2, wherein the penicillin is ampicillin.
4. The beta-lactamase of claim 2, wherein the cephalosporin is selected from ceftriaxone, cefotaxime, cefozolin, cefoperazone, cefepime, cefuroxime, and ceftazidime.
5. The beta-lactamase of claim 1, wherein the beta-lactamase has improved catalytic efficiency against cephalosporins as compared to SEQ ID NO:1.
6. The beta-lactamase of claim 5, wherein the beta-lactamase has about a 10 fold to about a 1000 fold improved catalytic efficiency against a cephalosporin as compared to SEQ ID NO:1.
7. The beta-lactamase of claim 6, wherein the cephalosporin is selected from ceftriaxone, cefotaxime, cefozolin, cefoperazone, cefepime, cefuroxime, and ceftazidime.
8. The beta-lactamase of claim 1, wherein the beta-lactamase has improved catalytic efficiency against a cephalosporin as compared to P3A.
9. The beta-lactamase of claim 8, wherein the cephalosporin is selected from cefotaxime, cefepime, and ceftriaxone.
10. The beta-lactamase of claim 1, wherein the beta-lactamase is active in the GI tract.
11. The beta-lactamase of claim 10, wherein the beta-lactamase is stable in the small intestine, optionally selected from one or more of the duodenum, jejunum, and ileum.
12. A polynucleotide comprising a polynucleotide sequence encoding the beta-lactamase of claim 1.
13. A host cell comprising the polynucleotide of claim 12.
14. A pharmaceutical composition, comprising the beta-lactamase of claim 1 and a pharmaceutically acceptable carrier or excipient.
15. The pharmaceutical composition of claim 14, wherein the composition is formulated for oral administration, optionally selected from a tablet, multi-particulate sprinkle, and a multi-particulate capsule.
16. A method for preventing an antibiotic-induced adverse effect in the GI tract, comprising administering an effective amount of a beta-lactamase to a patient in need thereof,
wherein the beta-lactamase comprises an amino acid sequence having at least 90% sequence identity with SEQ ID NO:1 and having A232G, A237S, A238G, S240D, and D276N mutations according to Ambler classification.
17. The method of claim 16, wherein the subject is being administered or will be administered an antibiotic.
18. A method for treating or preventing an antibiotic induced *C. difficile* infection (CDI) and/or a *C. difficile*-associated disease, comprising administering an effective amount of a beta-lactamase to a patient in need thereof, wherein the beta-lactamase comprises an amino acid sequence having at least 90% sequence identity with SEQ ID NO:1 and having A232G, A237S, A238G, S240D, and D276N mutations according to Ambler classification.
19. The method of claim 18, wherein the subject is being administered or will be administered an antibiotic.
US14/689,877 2014-04-17 2015-04-17 Beta-lactamases with improved properties for therapy Active US9290754B2 (en)

Priority Applications (14)

Application Number	Priority Date	Filing Date	Title
US14/689,877 US9290754B2 (en)	2014-04-17	2015-04-17	Beta-lactamases with improved properties for therapy
US15/019,474 US9376673B1 (en)	2014-04-17	2016-02-09	Beta-lactamases with improved properties for therapy
US15/160,669 US9404103B1 (en)	2014-04-17	2016-05-20	Beta-lactamases with improved properties for therapy
US15/200,508 US9464280B1 (en)	2014-04-17	2016-07-01	Beta-lactamases with improved properties for therapy
US15/245,517 US9695409B2 (en)	2014-04-17	2016-08-24	Beta-lactamases with improved properties for therapy
US15/611,881 US9783797B1 (en)	2014-04-17	2017-06-02	Beta-lactamases with improved properties for therapy
US15/674,177 US10011824B2 (en)	2014-04-17	2017-08-10	Beta-lactamases with improved properties for therapy
US15/993,159 US10087433B1 (en)	2014-04-17	2018-05-30	Beta-lactamases with improved properties for therapy
US16/112,283 US10336995B2 (en)	2014-04-17	2018-08-24	Beta-lactamases with improved properties for therapy
US16/414,411 US10584326B2 (en)	2014-04-17	2019-05-16	Beta-lactamases with improved properties for therapy
US16/751,734 US10767171B2 (en)	2014-04-17	2020-01-24	Beta-lactamases with improved properties for therapy
US16/938,318 US11236319B2 (en)	2014-04-17	2020-07-24	Beta-lactamases with improved properties for therapy
US17/545,050 US11608494B2 (en)	2014-04-17	2021-12-08	Beta-lactamases with improved properties for therapy
US18/165,470 US20230313166A1 (en)	2014-04-17	2023-02-07	Beta-lactamases with improved properties for therapy

Applications Claiming Priority (3)

Application Number	Priority Date	Filing Date	Title
US201461980844P	2014-04-17	2014-04-17	
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