

Product Data Sheet

Product Name: Imipenem

Cat. No.: GP11075

Chemical Properties

Cas. No. 64221-86-9

Chemical Name (5R,6S)-3-[2-(aminomethylideneamino)ethylsulfanyl]-6-[(1R)-1-hydroxyethyl]-7-oxo-1-azabicyclo[3.2.0]hept-2-ene-2-carboxylic acid

SMILES C[C@](O)([H])[C@](C1=O)([H])[C@@](N21)([H])CC(SCCNC=N)=C2C(O)=O

Formula $C_{12}H_{17}N_3O_4S$ M.Wt 299.35

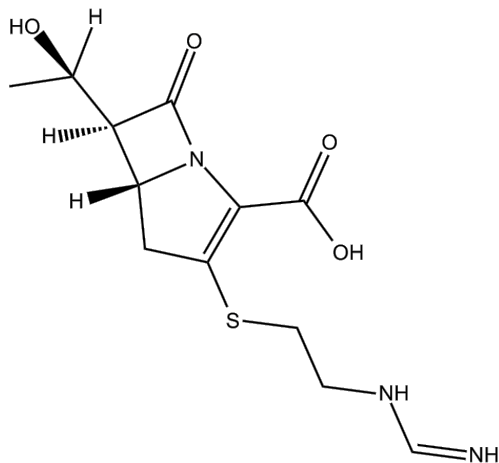
Solubility Water: 63 mg/mL; DMSO: 1 mg/mL (3.15 mM; DMSO moisture absorption will reduce compound solubility, please use newly opened DMSO); Ethanol: Insoluble

Storage Store at -20°C

General tips For obtaining a higher solubility, please warm the tube at 37 °C and shake it in the ultrasonic bath for a while. Stock solution can be stored below -20°C for several months.

Shipping Condition Evaluation sample solution: ship with blue ice. All other available size: ship with RT, or blue ice upon request.

Structure



Protocol

Caution: Product has not been fully validated for medical applications. For research use only.

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MIC experiment [1]:

Preparation Method Susceptibilities of *Y. pestis* strains were determined by the broth microdilution method according to CLSI M45-A2

Reaction Conditions 0.04-2mg/L; 35°C

Applications The MICs for the *Y. pestis* strains with Imipenem ranged from a low of 0.12mg/liter to a high of 1.0mg/liter.

Cell experiment[2]:

Cell experiment THP-1 cells

Preparation Method THP-1 cells were seeded into 24-well plates, differentiated for 24h and infected with *M. abscessus* CIP104536. Imipenem (8 and 32mg/L) or amoxicillin alone or in combination with relebactam (16mg/L) or avibactam (16mg/L) were added to each well. Rifabutin was also studied in combination with imipenem (8mg/L), Imipenem/relebactam or Imipenem/avibactam. Imipenem was added every 24h.

Reaction Conditions 8 and 32mg/L; 24h

Applications Combination of relebactam with β -lactams led to >128- and 2-fold decreases in the MICs of amoxicillin and Imipenem (from 8 to 4mg/L). *M. abscessus* was not killed by the Imipenem/relebactam combination. In contrast, relebactam increased the intracellular activity of Imipenem, leading to 88% killing.

Animal experiment [3]:

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Animal models Female C57BL/6 mice (6-8 weeks old, 20-25g body weight)

Preparation Method Mice were randomly divided into four groups: the sham-operated mice as the control group, CLP-induced sepsis mice, CLP-induced sepsis mice treated with the low dose of Imipenem (25mg/kg), CLP-induced sepsis mice treated with the high dose of Imipenem (125mg/kg). Imipenem was injected one hour after sepsis induction, repeating the injection every 24h up to 72h.

Dosage form 25 or 125mg/kg; s.c; repeating the injection every 24h up to 72h

Applications Sepsis mice treated with a high dose (125mg/kg) of Imipenem showed a significant reduction in bacterial load, while increased liver enzymes, endotoxin level, and inflammatory cytokine production in plasma and liver. Significant reduction in the liver enzymes, bacterial load, endotoxin levels, and inflammatory cytokine levels was observed in the mice treated with a low dose (25mg/kg) of Imipenem. Liver tissue pathology of mice indicated little tissue destruction in the sepsis mice treated with 25mg/kg of Imipenem compared to other groups. Mice receiving 25mg/kg of Imipenem had better survival rate.

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References:

- [1] Heine HS, Louie A, et.al. Evaluation of imipenem for prophylaxis and therapy of *Yersinia pestis* delivered by aerosol in a mouse model of pneumonic plague. *Antimicrob Agents Chemother*. 2014 Jun;58(6):3276-84. doi: 10.1128/AAC.02420-14. Epub 2014 Mar 31. PMID: 24687492; PMCID: PMC4068467.
- [2] Le Run E, Atze H, et.al. Impact of relebactam-mediated inhibition of *Mycobacterium abscessus* BlaMab β -lactamase on the in vitro and intracellular efficacy of imipenem. *J Antimicrob Chemother*. 2020 Feb 1;75(2):379-383. doi: 10.1093/jac/dkz433. PMID: 31637424.
- [3] Khosrojerdi A, Soudi S, et.al. Imipenem alters systemic and liver inflammatory responses in CLP-induced sepsis mice in a dose-dependent manner. *Int Immunopharmacol*. 2021 Apr;93:107421. doi: 10.1016/j.intimp.2021.107421. Epub 2021 Feb 4. PMID: 33548581.

Background

Imipenem is a semisynthetic thienamycin. Imipenem is one of the broad-spectrum antibiotics that has a bactericidal action against multiple gram-negative, gram-positive, aerobic, and anaerobic bacteria by binding to penicillin-binding protein 2 (PBP2) and interacting with bacterial cell wall synthesis^[2-5]. Imipenem exerts a bactericidal effects by disrupting cell wall synthesis.

In vitro, the MICs of imipenem against the *Y. pestis* strains ranged from 0.12 to 1.0mg/L^[6].

In vivo, Imipenem (4g/70kg/day; i.p.; 7 days) decreased peritoneal cell counts and phagocytic activity, but increased IL-1 production and NK cell activity in BALB/c mice^[3]. Imipenem (125mg/kg; s.c.; every 24h for 72h) significantly reduced bacterial load, but increased liver enzymes, endotoxin levels, and inflammatory cytokine production in the plasma and liver of septic mice^[1]. Imipenem (25mg/kg; s.c.; every 24h for 72h) significantly reduced liver enzymes, bacterial load, endotoxin levels, and inflammatory cytokine levels in septic mice^[1].

References:

- [1] Khosrojerdi A, Soudi S, et.al. Imipenem alters systemic and liver inflammatory responses in CLP-

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[2] Acar JF, Goldstein FW, et.al. Activity of imipenem on aerobic bacteria. J Antimicrob Chemother. 1983 Dec;12 Suppl D:37-45. doi: 10.1093/jac/12.suppl_d.37. PMID: 6421793.

[3] Ortega E, de Pablo MA, et.al. Modification of natural immunity in mice by imipenem/cilastatin. J Antibiot (Tokyo). 1997 Jun;50(6):502-8. doi: 10.7164/antibiotics.50.502. PMID: 9268007.

[4] Ortega E, de Pablo MA, et.al. Modification of acquired immunity in mice by imipenem/cilastatin. J Antimicrob Chemother. 1999 Oct;44(4):561-4. doi: 10.1093/jac/44.4.561. PMID: 10588322.

[5] LiverTox: Clinical and Research Information on Drug-Induced Liver Injury [Internet]. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases; 2012-. Imipenem-Cilastatin. 2017 Jan 17. PMID: 31644018.

[6] Heine HS, Louie A, et.al. Evaluation of imipenem for prophylaxis and therapy of Yersinia pestis delivered by aerosol in a mouse model of pneumonic plague. Antimicrob Agents Chemother. 2014 Jun;58(6):3276-84. doi: 10.1128/AAC.02420-14. Epub 2014 Mar 31. PMID: 24687492; PMCID: PMC4068467.

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