Product Data Sheet

Product Name: Amikacin hydrate
Cat. No.: GC15685

Chemical Properties

Cas. No.	1257517-67-1		
Chemical Name	(2S)-4-amino-N-[(1R,2S,3S,4R,5S)-5-amino-2-[(2S,3R,4S,5S,6R)-4-amino-3,5-dihydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-4-[(2R,3R,4S,5S,6R)-6-(aminomethyl)-3,4,5-trihydroxyoxan-2-yl]oxy-3-hydroxycyclohexyl]-2-hydroxybutanamide;hydrate		
SMILES	C1C(C(C(C(C1NC(=O)C(CCN)O)OC2C(C(C(C(O2)CO)O)N)O)O)OC3C(C(C(C(O3)CN)O)O)O)N.O		
Formula	$C_{22}H_{43}N_5O_{13}.xH_2O$	M.Wt	585.6
Solubility	100 mg/mL in Water (Need ultrasonic); 100 mg/mL in DMSO(Need ultrasonic);	Storage	Store at -20°C
General tips	For obtaining a higher solubility , please warm the tube at 37 ℃ and shake it in the ultrasonic bath for a while.Stock solution can be stored below -20℃ 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	Amikacin hydrate		

Protocol

Cell experiment [1]:

Cell lines	Equine chondrocytes, synovial cells, bone marrow-derived mesenchymal stem cells (BMD-MSC), and adipose-derived mesenchymal stem cells (AD-MSC).
Preparation Method	Cells were harvested from three donor horses and plated in triplicate wells for 48 hours prior to the addition of Amikacin hydrate(0.003 to 25mg/mL). Cells were maintained in complete DMEM media.
Reaction Conditions	0.003 to 25mg/mL; 12h

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Applications	Amikacin hydrate induced rapid, dose-dependent cytotoxic effects on all cell types, primarily through apoptosis. Amikacin hydrate exposure decreased cellular metabolism and mitochondrial mass, and suppressed cell proliferation.

Animal experiment [2]:

Animal models	Neutropenic ICR Swiss mice
Preparation Method	Mice were intramuscularly inoculated with 10^8cfu/mL of carbapenem-resistant Enterobacteriaceae (CRE) strains, followed by subcutaneous administration of Meropenem (200mg/kg every 8 hours) and Amikacin hydrate (7.5mg/kg every 12 hours) either alone or in combination.
Dosage form	7.5mg/kg; s.c.
Applications	The combination therapy of Meropenem and Amikacin hydrate significantly reduced bacterial density in the thigh muscles and increased survival rates compared to Meropenem monotherapy.

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References:
[1] Pezzanite L, Chow L, Soontararak S, et al. Amikacin hydrate induces rapid dose-dependent apoptotic cell death in equine chondrocytes and synovial cells in vitro. Equine Vet J. 2020 Sep;52(5):715-724.
[2] Hagihara M, Kato H, Yamashita R, et al. In vivo study assessed meropenem and Amikacin hydrate combination therapy against carbapenem-resistant and carbapenemase-producing Enterobacteriaceae strains. J Infect Chemother. 2020 Jan;26(1):1-7.

Background

Amikacin hydrate is an aminoglycoside antibiotic[1]. Amikacin hydrate is used to treat a variety of infections caused by Gram-negative bacteria[2]. Amikacin hydrate can enter bacterial cells and bind to their ribosomes. By interfering with bacterial protein synthesis, it prevents normal bacterial growth and reproduction, thereby exerting its antibacterial effects [3]. Amikacin hydrate is widely used in the treatment of complex urinary tract infections, respiratory infections, and sepsis[4].

In vitro, Amikacin hydrate (0.003 - 25mg/mL) treatment of equine joint cells (including chondrocytes, synovial cells, adipose-derived and bone marrow-derived mesenchymal stem cells) induces rapid cell death within 1 hour in a dose-dependent manner. Moreover, the cytotoxicity of Amikacin hydrate is not mitigated by the presence of synovial fluid[5]. Amikacin hydrate (32mg/L) alone or in combination with 2mg/L Colistin can effectively kill bacteria within biofilms of mature *Pseudomonas aeruginosa* (PAO1 and CRPAO1) treatment for 24 hours[6].

In vivo, Amikacin hydrate (15mg/kg) combined with Imipenem (40mg/kg) administered intraperitoneally every 8 hours is used to treat mice infected with drug-resistant *Escherichia coli*. The combination of Amikacin hydrate and Imipenem significantly reduces the bacterial count in the blood of mice[7]. Amikacin hydrate (7.5mg/kg; every 12 hours) combined with Meropenem (200mg/kg; every 8 hours) administered intraperitoneally to mice infected with carbapenem-resistant *Enterobacteriaceae* (CRE). Compared to Meropenem monotherapy, the combination therapy significantly reduces bacterial density in the thigh muscles of mice and increases survival rates[8].

References:
[1] Ramirez MS, Tolmasky ME. Amikacin hydrate: Uses, Resistance, and Prospects for Inhibition. Molecules. 2017 Dec 19;22(12):2267.

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[3] Jenkins A, Thomson AH, Brown NM, et al. Amikacin hydrate use and therapeutic drug monitoring in adults: do dose regimens and drug exposures affect either outcome or adverse events? A systematic review. J Antimicrob Chemother. 2016 Oct;71(10):2754-9.
[4] Kato H, Hamada Y. Amikacin hydrate Therapy in Japanese Pediatric Patients: Narrative Review. Int J Environ Res Public Health. 2022 Feb 10;19(4):1972.
[5] Pezzanite L, Chow L, Soontararak S, et al. Amikacin hydrate induces rapid dose-dependent apoptotic cell death in equine chondrocytes and synovial cells in vitro. Equine Vet J. 2020 Sep;52(5):715-724.
[6] Wang Y, Li C, Wang J, et al. The Efficacy of Colistin Combined with Amikacin hydrate or Levofloxacin against Pseudomonas aeruginosa Biofilm Infection. Microbiol Spectr. 2022 Oct 26;10(5):e0146822.
[7] Farhan SM, El-Baky RMA, Abdalla S, et al. In Vitro and In Vivo Effect of Amikacin hydrate and Imipenem Combinations against Multidrug-Resistant E. coli. Trop Med Infect Dis. 2022 Oct 2;7(10):281.
[8] Hagihara M, Kato H, Yamashita R, et al. In vivo study assessed meropenem and Amikacin hydrate combination therapy against carbapenem-resistant and carbapenemase-producing Enterobacteriaceae strains. J Infect Chemother. 2020 Jan;26(1):1-7.

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