D-α-Hydroxyglutaric acid disodium

Cat. No.: HY-100542

CAS No.: 103404-90-6

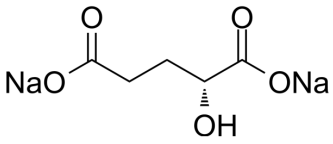
Molecular Formula: $C_5H_6Na_2O_5$

Molecular Weight: 192.08

Target: Reactive Oxygen Species; ATP Synthase; mTOR; Endogenous Metabolite

Pathway: Immunology/Inflammation; Metabolic Enzyme/Protease; NF-κB; Membrane Transporter/Ion Channel; PI3K/Akt/mTOR

Storage: 4°C, sealed storage, away from moisture
* In solvent : -80°C, 6 months; -20°C, 1 month (sealed storage, away from moisture)



SOLVENT & SOLUBILITY

In Vitro

H_2O : 75 mg/mL (390.46 mM; Need ultrasonic)

Preparing Stock Solutions

Solvent / Mass / Concentration	1 mg	5 mg	10 mg
1 mM	5.2062 mL	26.0308 mL	52.0616 mL
5 mM	1.0412 mL	5.2062 mL	10.4123 mL
10 mM	0.5206 mL	2.6031 mL	5.2062 mL

Please refer to the solubility information to select the appropriate solvent.

In Vivo

1. Add each solvent one by one: PBS
Solubility: 100 mg/mL (520.62 mM); Clear solution; Need ultrasonic and warming and heat to 60°C

BIOLOGICAL ACTIVITY

Description

D-α-Hydroxyglutaric acid disodium (Disodium (R)-2-hydroxyglutarate) is the principal metabolite accumulating in neurometabolic disease D-2-hydroxyglutaric aciduria. D-α-Hydroxyglutaric acid disodium is a weak competitive antagonist of α-ketoglutarate (α-KG) and inhibits multiple α-KG-dependent dioxygenases with a K_i of 10.87 mM. D-α-Hydroxyglutaric acid disodium increases reactive oxygen species (ROS) production. D-α-Hydroxyglutaric acid disodium binds and inhibits ATP synthase and inhibits mTOR signaling[1][2][3][4][5].

IC_{50} & Target

Human Endogenous Metabolite

In Vitro

D-α-Hydroxyglutaric acid ((R)-2-hydroxyglutarate) accumulates in human cancers carrying neomorphic mutations in the isocitrate dehydrogenase (IDH) 1 and 2 genes[1][2].
A partial inhibition of KDM7A toward both H3K9me2 and H3K27me2 peptides is observed in the presence of 50 mM D-2-HG and 100 μM α-ketoglutarate (α-KG). Addition of 300 μM α-KG is capable of reversing the inhibition of Caenorhabditis elegans KDM7A (CeKDM7A) by 50 mM D-2-HG, indicating that D-2-HG is a weak competitive inhibitor against α-KG toward the

	CeKDM7A demethylase[1]. D-α-Hydroxyglutaric acid is a weak inhibitor of TET hydroxylases. In the presence of 0.1 mM of α-KG, addition of 10 mM D-α-Hydroxyglutaric acid results in a partial (33%) inhibition of TET2 and addition of 50 mM D-α-Hydroxyglutaric acid results in more inhibition (83%) of TET2. D-α-Hydroxyglutaric acid exhibits a less pronounced inhibitory effect toward TET1[1]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.
In Vivo	D-α-Hydroxyglutaric acid strongly inhibits glucose utilization, CO_2 production and the respiratory chain in rat cerebral cortex and human skeletal muscle, as well as in submitochondrial particles from bovine heart, suggesting an impairment of the aerobic metabolism[5]. D-α-Hydroxyglutaric acid has also been proposed as an endogenous excitotoxic organic acid because it significantly decreased cell viability in neuronal cultures from chick embryo telencephalons and from neonatal rat hippocampus through stimulation of specific NMDA glutamate receptors[5]. D-α-Hydroxyglutaric acid (0.01-1 mM) significantly increases chemiluminescence and thiobarbituric acid-reactive substances (TBA-RS) and decreased total antioxidant reactivity (TAR) values in the cortical supernatants in 30-day-old-rats[5]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

PROTOCOL

Cell Assay [2]	U87 cells, HCT 116 IDH1(R132H/+) cells, and HEK 293 cells are seeded in 12-well plates and after overnight incubation are treated with indicated concentrations of each compound (e.g., 400 and 800 μM D-α-Hydroxyglutaric acid). After harvesting, cells are stained with Acridine Orange (AO) and DAPI. Cell number and viability are measured based on AO and DAPI fluorescence measured by NC3000[2]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

CUSTOMER VALIDATION

- Biosensors (Basel). 2022 Jan 25;12(2):66.

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REFERENCES

[1]. Xu W, et al. Oncometabolite 2-hydroxyglutarate is a competitive inhibitor of α-ketoglutarate-dependent dioxygenases. Cancer Cell. 2011 Jan 18;19(1):17-30.

[2]. Fu X, et al. 2-Hydroxyglutarate Inhibits ATP Synthase and mTOR Signaling. Cell Metab. 2015 Sep 1;22(3):508-15.

[3]. Martijn Kranendijk, et al. Progress in understanding 2-hydroxyglutaric acidurias. J Inherit Metab Dis. 2012 Jul;35(4):571-87.

[4]. Martin Böttcher, et al. D-2-hydroxyglutarate interferes with HIF-1α stability skewing T-cell metabolism towards oxidative phosphorylation and impairing Th17 polarization. Oncoimmunology. 2018 Mar 26;7(7):e1445454.

[5]. Alexandra Latini , et al. D-2-hydroxyglutaric acid induces oxidative stress in cerebral cortex of young rats. Eur J Neurosci. 2003 May;17(10):2017-22.

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

Tel: 609-228-6898 Fax: 609-228-5909 E-mail: tech@MedChemExpress.com
Address: 1 Deer Park Dr, Suite Q, Monmouth Junction, NJ 08852, USA