Trigonelline

Cat. No.: HY-N0414

CAS No.: 535-83-1

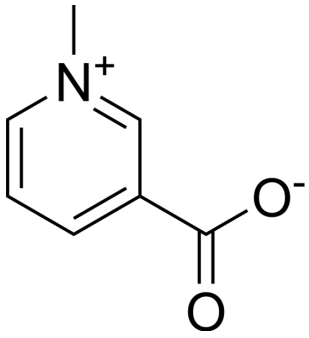
Molecular Formula: $C_7H_7NO_2$

Molecular Weight: 137.14

Target: Endogenous Metabolite; Ferroptosis; Apoptosis; HIV; Bacterial; Fungal

Pathway: Metabolic Enzyme/Protease; Apoptosis; Anti-infection

Storage: 4°C, protect from light
* In solvent : -80°C, 6 months; -20°C, 1 month (protect from light)



SOLVENT & SOLUBILITY

In Vitro

H_2O : ≥ 100 mg/mL (729.18 mM)
DMSO : 7.14 mg/mL (52.06 mM; Need ultrasonic)
* "≥" means soluble, but saturation unknown.

Preparing Stock Solutions	Mass / Solvent / Concentration	1 mg	5 mg	10 mg
	1 mM	7.2918 mL	36.4591 mL	72.9182 mL
	5 mM	1.4584 mL	7.2918 mL	14.5836 mL
	10 mM	0.7292 mL	3.6459 mL	7.2918 mL

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

In Vivo

1. Add each solvent one by one: 10% DMSO >> 40% PEG300 >> 5% Tween-80 >> 45% saline
   Solubility: ≥ 0.71 mg/mL (5.18 mM); Clear solution
2. Add each solvent one by one: 10% DMSO >> 90% (20% SBE-β-CD in saline)
   Solubility: ≥ 0.71 mg/mL (5.18 mM); Clear solution
3. Add each solvent one by one: 10% DMSO >> 90% corn oil
   Solubility: ≥ 0.71 mg/mL (5.18 mM); Clear solution

BIOLOGICAL ACTIVITY

Description

Trigonelline is an alkaloid with potential antidiabetic activity that can be isolated from Trigonella foenum-graecum L or Leonurus artemisia. Trigonelline is a potent Nrf2 inhibitor that blocks Nrf2-dependent proteasome activity, thereby enhancing apoptosis in pancreatic cancer cells. Trigonelline also has anti-HSV-1, antibacterial, and antifungal activity and induces ferroptosis.

IC_{50} & Target

Human Endogenous Metabolite

In Vitro	Trigonelline (TG) significantly rescues the morphology of the H9c2 cells. Treatment of cells with Trigonelline attenuates H_2O_2 induced cell deaths and improves the antioxidant activity. In addition, Trigonelline regulates the apoptotic gene caspase-3, caspase-9 and anti-apoptotic gene Bcl-2, Bcl-XL during H_2O_2 induced oxidative stress in H9c2 cells. For evident, flow cytometer results also confirms that Trigonelline significantly reduces the H_2O_2 induced necrosis and apoptosis in H9c2 cells [1]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.
In Vivo	Trigonelline decreases bone mineralization and tends to worsen bone mechanical properties in streptozotocin-induced diabetic rats. In nicotinamide/streptozotocin-treated rats, Trigonelline significantly increases bone mineral density (BMD) and tends to improve cancellous bone strength. Trigonelline differentially affects the skeletal system of rats with streptozotocin-induced metabolic disorders, intensifying the osteoporotic changes in streptozotocin-treated rats and favorably affecting bones in the non-hyperglycemic (nicotinamide/streptozotocin-treated) rats[2]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

PROTOCOL

Cell Assay	The H9c2 cells are seeded in the 96 well at a density of 1×10^5 cells/well. The cells are treated with different concentrations of Trigonelline (TG) (25 to 150 μM) and hydrogen peroxide (25 to 125 μM). It is incubated at 37°C in 5% CO_2 incubator for 24 h and 6 h respectively and then the culture is treated with the water soluble tetrazolium (WST) reagent incubated for 2 h to 4 h. The living cells absorb the WST then it is converted into an orange colour product. Then, the intensity of colour is measured at 450 nm using spectra count ELISA reader. For cardio protective activity, the cells are seeded and separated into six groups control, H_2O_2 alone, the rest of groups' initially exposed to different concentration (25 to 125 μM) of Trigonelline for 48 hours. Then, 100 μM of H_2O_2 is added and incubated for 4 hours, after, read the absorbance at 450 nm for cell viability assay[1]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.
Animal Administration [2]	Three-month-old female Wistar rats are used in this study. The animals are divided into five groups (n=10): Control rats, Streptozotocin-treated control rats, Streptozotocin-treated rats receiving Trigonelline (50 mg/kg p.o. daily), Nicotinamide/streptozotocin-treated control rats, and Nicotinamide/streptozotocin-treated rats receiving Trigonelline (50 mg/kg p.o. daily). Administration of Trigonelline starts two weeks after streptozotocin and lasts four weeks. Trigonelline is administered once daily by a stomach tube. All control rats receive tap water (the vehicle) at the same volume of 2 mL/kg p.o. The four-week period of Trigonelline administration is long enough to demonstrate skeletal effects of Trigonelline and other compounds of plant origin in rats. The rats are fasted overnight after the last Trigonelline or vehicle administration. The next day, the blood glucose level is measured and the rats are anesthetized with ketamine and xylazine, and then sacrificed by cardiac exsanguination[2]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

CUSTOMER VALIDATION

- Adv Sci (Weinh). 2023 Dec 25:e2305563.
- J Ginseng Res. 5 July 2022.
- J Agric Food Chem. 2022 Jun 10.

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REFERENCES

[1]. Ilavenil S, et al. Trigonelline protects the cardiocyte from hydrogen peroxide induced apoptosis in H9c2 cells. Asian Pac J Trop Med. 2015 Apr;8(4):263-8.

[2]. Joanna Folwarczna, et al. Effects of Trigonelline, an Alkaloid Present in Coffee, on Diabetes-Induced Disorders in the Rat Skeletal System. Nutrients. 2016 Mar; 8(3): 133.

[3]. A Arlt, et al. Inhibition of the Nrf2 transcription factor by the alkaloid trigonelline renders pancreatic cancer cells more susceptible to apoptosis through decreased proteasomal gene expression and proteasome activity. Oncogene. 2013 Oct;32(40):4825-35.

[4]. Ozçelik B, et al. Cytotoxicity, antiviral and antimicrobial activities of alkaloids, flavonoids, and phenolic acids. Pharm Biol. 2011 Apr;49(4):396-402.

[5]. Su Y, et al. Ferroptosis, a novel pharmacological mechanism of anti-cancer drugs. Cancer Lett. 2020 Jul 28;483:127-136.

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