

Product Data Sheet

Product Name: Juglone
Cat. No.: GC43933

Chemical Properties

Cas. No. 481-39-0

SMILES O=C1C=CC(C2=CC=CC(O)=C21)=O

Formula $C_{10}H_6O_3$ M.Wt 174.2

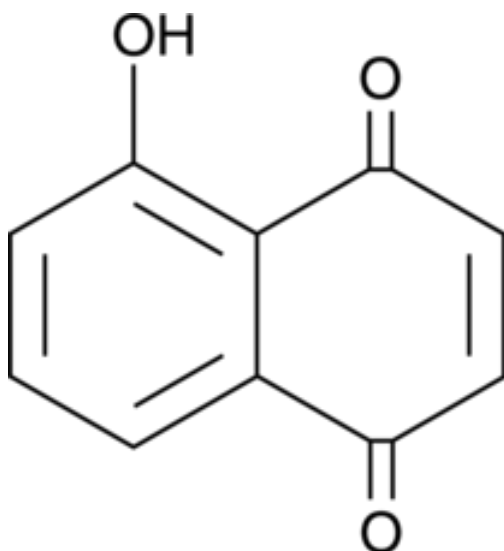
Solubility Ethanol: 10 mg/ml (DMSO can inactivate Juglone's activity) (The solution is unstable, it is recommended to prepare it before use)

Storage 4°C, protect from light ,unstable in solution, ready to use.

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

Cell experiment [1]:

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Cell lines A549 cells

A549 cells were cultured in high-glucose DMEM medium supplemented with 10% fetal bovine serum (FBS), 100U/ml penicillin and 100µg/ml streptomycin, and cultured at 37°C in a humidified environment with 5% CO₂. The solution was changed once a day and digested with 0.25% trypsin every 3 days. A549

Preparation Method cells were seeded in 96-well plates (5×10^3 cells/well) overnight. After adherence, cells were treated with different concentrations of Juglone (1, 2, 4, 8, 16, and 32µM) for 24 hours. Then, 50µL MTT solution was added to each well and incubated for 4 hours. The supernatant was discarded and 100µL DMSO was added to dissolve formazan crystals and the absorbance at 490nm was measured.

Reaction
Conditions 1, 2, 4, 8, 16, and 32µM; 24h

Applications Juglone inhibited cell viability in a concentration-dependent manner within A549 cells.

Animal experiment [2]:

Animal models BALB/c nude mice

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Four-week-old female BALB/c nude mice were cultured and acclimated to the standard environment for one week, and 1×10^7 HepG2 cells were suspended in 100µl cold PBS and injected into the right forelimb socket. When the tumor reached 50mm³ in size, the mice were randomly divided into two groups: the control group and Juglone group (five mice per group). The control group was intraperitoneally injected with 10% DMSO+90% normal saline, and the Juglone group was intraperitoneally injected with 4mg/kg Juglone every other day for 20 days. Mouse body weight and tumor size were measured every 3 days for 4 weeks, and tumor volume was calculated using the following formula: length × width²/2. After treatment, mice were sacrificed, and tumors were removed, weighed, and fixed for immunohistochemical experiments.

Dosage form 4mg/kg every other day for 20 days; i.p.

Applications Juglone treatment resulted in the reduction of tumor volume in mice, partial degeneration and necrosis of tumor cells, and high expression of cleaved caspase-3.

References:

- [1] Zhong J, Hua Y, Zou S, et al. Juglone triggers apoptosis of non-small cell lung cancer through the reactive oxygen species-mediated PI3K/Akt pathway[J]. Plos one, 2024, 19(5): e0299921.
- [2] Wang P, Zhang S D, Jiao J, et al. ROS-mediated p53 activation by juglone enhances apoptosis and autophagy in vivo and in vitro[J]. Toxicology and Applied Pharmacology, 2019, 379: 114647.

Background

Juglone, a phenolic compound found in walnuts, inhibits cystathionine γ-synthase (HpCGS), malonyl-CoA:acylcarrier protein transacylase (HpFabD), and β-hydroxyacylACP dehydratase (HpFabZ) with IC₅₀ values of 7.0±0.7, 20±1, and 30±4µM, respectively^[1]. Juglone contains an intramolecular hydrogen bond between hydroxyl and keto groups and is active in donating the hydrogen-atom, which combats oxidative stress^[2]. Juglone, a potent urease inactivator, produces irreversible inhibition by covalent modification of protein thiol, which is widely used in antibacterial and antifungal

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research^[3].

In vitro, Juglone treatment for 24h inhibited cell viability of BxPC-3 cells and PANC-1 cells with IC₅₀ values of 21.05 and 21.25μM, respectively^[4]. Juglone treatment for 24 hours inhibited the viability of A549 cells with an IC₅₀ value of 9.47μM, arrested the cell cycle and induced apoptosis^[5]. Treatment of human fibroblasts with 5μM Juglone for 30min rapidly induced DNA damage, which triggered a stress response leading to H2AX phosphorylation^[6].

In vivo, Intraperitoneal injection of Juglone (4mg/kg) to mice every other day for 20 days significantly inhibited the growth of transplanted tumors, resulting in partial degeneration and necrosis of tumor cells^[7]. Intraperitoneal injection of Juglone (1mg/kg) every 3 days for 40 days delayed the growth of glioma in mice and prolonged the survival time of glioma-bearing mice^[8].

References:

- [1] Kong YunHua K Y H, Zhang Liang Z L, Yang ZhengYi Y Z Y, et al. Natural product juglone targets three key enzymes from Helicobacter pylori: inhibition assay with crystal structure characterization[J]. 2008.
- [2] Ahmad T, Suzuki Y J. Juglone in oxidative stress and cell signaling[J]. Antioxidants, 2019, 8(4): 91.
- [3] Islam A K M M, Widhalm J R. Agricultural uses of juglone: Opportunities and challenges[J]. Agronomy, 2020, 10(10): 1500.
- [4] Avcı E, Arıkoğlu H, Kaya D E. Investigation of juglone effects on metastasis and angiogenesis in pancreatic cancer cells[J]. Gene, 2016, 588(1): 74-78.
- [5] Zhong J, Hua Y, Zou S, et al. Juglone triggers apoptosis of non-small cell lung cancer through the reactive oxygen species-mediated PI3K/Akt pathway[J]. Plos one, 2024, 19(5): e0299921.
- [6] Paulsen M T, Ljungman M. The natural toxin juglone causes degradation of p53 and induces rapid H2AX phosphorylation and cell death in human fibroblasts[J]. Toxicology and applied pharmacology, 2005, 209(1): 1-9.
- [7] Wang P, Zhang S D, Jiao J, et al. ROS-mediated p53 activation by juglone enhances apoptosis and autophagy in vivo and in vitro[J]. Toxicology and Applied Pharmacology, 2019, 379: 114647.
- [8] Wu J, Zhang H, Xu Y, et al. Juglone induces apoptosis of tumor stem-like cells through ROS-p38 pathway in glioblastoma[J]. BMC neurology, 2017, 17(1): 70.

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