

Product Data Sheet

Product Name: Xanthine

Cat. No.: GC33846

Chemical Properties

Cas. No. 69-89-6

SMILES O=C(N1)NC2=C(N=CN2)C1=O

Formula C5H4N4O2 M.Wt 152.11

Solubility 5 mg/mL in Water (ultrasonic and warming and adjust pH to 10 with 1M NaOH and heat to 60°C) ; 8 mg/mL in 1M NaOH (ultrasonic and adjust pH to 11 with NaOH)

Storage Store at 2-8°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.

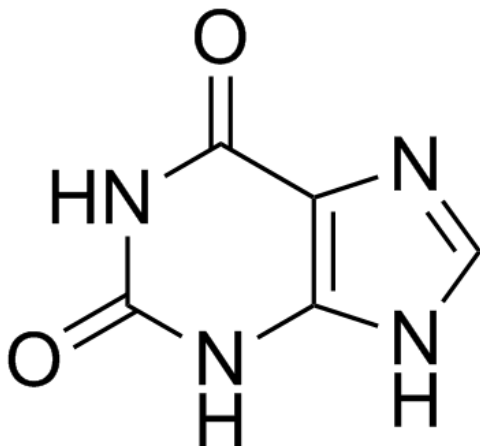
Caution: Product has not been fully validated for medical applications. For research use only.

Tel: (909) 407-4943 Fax: (626) 353-8530 E-mail: tech@glpbio.com

Address: 10292 Central Ave. #205, Montclair, CA, USA

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Structure



Protocol

Cell experiment [1]:

Cell lines Human umbilical vein endothelial cells (HUVECs)

HUVECs were cultured in M199 medium supplemented with 20% FBS, 2mM L-Preparation Method glutamine, 100U/mL penicillin, and 100µg/mL streptomycin at 37°C, 5% CO₂. Cells were treated with Xanthine (3-100µM) for 15 minutes.

Reaction
Conditions 3-100µM; 15min

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Applications Xanthine, through Xanthine oxidase-derived hydrogen peroxide, activated the platelet-activating factor (PAF) pathway, leading to enhanced neutrophil adhesion to endothelial cells. This effect was associated with upregulation of endothelial P-selectin and intercellular adhesion molecule-1 (ICAM-1) expression. The adhesion process was dependent on cell surface Xanthine oxidase and could be inhibited by catalase, Xanthine oxidase inhibitors, or PAF receptor antagonists.

Animal experiment [2]:

Animal models C57BL/6 mice

Preparation Method Mice were intraperitoneally administered Xanthine (500mg/kg) every three days. Behavioral tests (open field test, elevated plus maze test, and object location test) were conducted during the treatment period. Hippocampal tissues were collected after transcardial perfusion for transcriptomic analysis.

Dosage form 500mg/kg; i.p.; every three days for 20 days.

Applications Xanthine administration induced hippocampus-dependent spatial memory deficits in the object location test and a tendency toward anxiety-like behavior in the elevated plus maze test.

References:

- [1] Ichikawa H, Wolf RE, Aw TY, et al. Exogenous xanthine promotes neutrophil adherence to cultured endothelial cells. *Am J Physiol.* 1997 Aug;273(2 Pt 1):G342-7.
- [2] Kambe J, Miyata S, Li C, et al. Xanthine-induced deficits in hippocampal behavior and abnormal expression of hemoglobin genes. *Behav Brain Res.* 2023 Jul 9;449:114476.

Background

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Xanthine is a naturally occurring purine base widely found in plants such as tea and cocoa, and Xanthine serves as a key intermediate in the purine metabolic pathway within living organisms^[1-2]. Xanthine is primarily generated from guanine through deamination catalyzed by guanine deaminase or from hypoxanthine via oxidation catalyzed by Xanthine oxidoreductase (XOR), and is further metabolized to uric acid^[3-4].

In vitro, treatment of 8-day-old Sprague-Dawley rat cerebellar granule neurons with Xanthine (100µM) combined with Xanthine oxidase (0.02U/ml) for 1 or 6 hours, Xanthine significantly reduced cell viability and induced atrophy of cell bodies and synaptic morphology^[5]. Treatment of human umbilical vein endothelial cells (HUVECs) with Xanthine (3-100µM) for 15 minutes, Xanthine activated the platelet-activating factor pathway via Xanthine oxidase-derived hydrogen peroxide, leading to enhanced neutrophil-endothelial adhesion^[6].

In vivo, intraperitoneal administration of Xanthine (500mg/kg) to C57BL/6J mice (every three days for 20 days), Xanthine induced hippocampus-dependent spatial memory deficits and a tendency toward anxiety-like behavior, while upregulating the expression of hemoglobin genes (such as Hba-a1 and HBA2) in hippocampal neurons, resulting in cognitive and behavioral abnormalities^[7].

References:

- [1] POMALES R, ELION GB, HITCHINGS GH. XANTHINE AS A PRECURSOR OF NUCLEIC ACID PURINES IN THE MOUSE. *Biochim Biophys Acta*. 1965 Mar 15;95:505-6.
- [2] Kanemitsu H, Tamura A, Kirino T, et al. Xanthine and uric acid levels in rat brain following focal ischemia. *J Neurochem*. 1988 Dec;51(6):1882-5.
- [3] Zhang A, Ai L. Xanthine negatively regulates c-MYC through the PI3K/AKT signaling pathway and inhibits the proliferation, invasion, and migration of breast cancer cells. *Asia Pac J Clin Oncol*. 2025 Feb;21(1):3-11.
- [4] Fan KQ, Li YY, Wang HL, et al. Stress-Induced Metabolic Disorder in Peripheral CD4+ T Cells Leads to Anxiety-like Behavior. *Cell*. 2019 Oct 31;179(4):864-879.e19.
- [5] Fatokun AA, Stone TW, Smith RA. Hydrogen peroxide mediates damage by xanthine and xanthine oxidase in cerebellar granule neuronal cultures. *Neurosci Lett*. 2007 Apr 6;416(1):34-8.
- [6] Ichikawa H, Wolf RE, Aw TY, et al. Exogenous xanthine promotes neutrophil adherence to cultured endothelial cells. *Am J Physiol*. 1997 Aug;273(2 Pt 1):G342-7.
- [7] Kambe J, Miyata S, Li C, et al. Xanthine-induced deficits in hippocampal behavior and abnormal

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