

Product Data Sheet

Product Name: Ouabain Octahydrate

Cat. No.: GC10579

Chemical Properties

Cas. No. 11018-89-6

Chemical Name 3-[(1R,3S,5S,8R,9S,10R,11R,13R,14S,17R)-1,5,11,14-tetrahydroxy-10-(hydroxymethyl)-13-methyl-3-[(2R,3R,4R,5R,6S)-3,4,5-trihydroxy-6-methyloxan-2-yl]oxy-2,3,4,6,7,8,9,11,12,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-17-yl]-2H-furan-5-one

SMILES CC1C(C(C(C(O1)OC2CC(C3(C4C(CCC3(C2)O)C5(CCC(C5(CC4O)C)C6=CC(=O)OC6)O)CO)O)O)O)O

Formula $C_{29}H_{60}O_{20}$

M.Wt 728.77

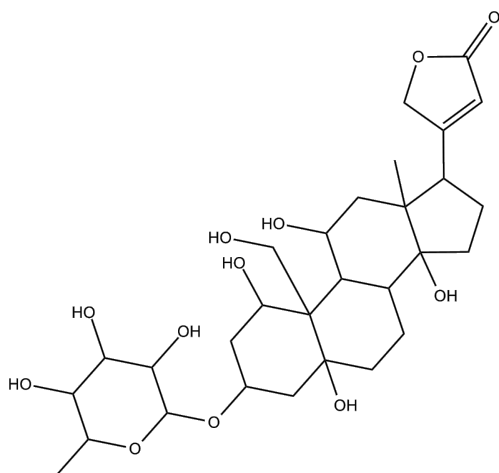
Solubility $\geq 19.5\text{mg/mL}$ in H₂O with ultrasonic and warming

Storage Store at -20°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.

Structure



Protocol

Cell experiment [1]:

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Cell lines	Autosomal dominant polycystic kidney disease (ADPKD) cells, normal human kidney (NHK) cells
Preparation Method	Cultured ADPKD and NHK cells were treated without and with 3nM Ouabain Octahydrate for 24h. Cells were lysed and proteins of interest were identified by immunoblot.
Reaction Conditions	3nM; 24h
Applications	ADPKD cells respond to Ouabain Octahydrate with a decrease in expression of the epithelial marker E-cadherin and increase in the expression of the mesenchymal markers N-cadherin, α smooth muscle actin (α SMA) and collagen-I, and the tight junction protein occludin and claudin-1. Other adhesion molecules, such as ZO-1, β -catenin and vinculin were not significantly modified by Ouabain Octahydrate. These effects of Ouabain Octahydrate were not observed in normal human kidney (NHK) cells.
Animal experiment [2]:	
Animal models	WT, IL-1 $\beta^{-/-}$, NLRP3 $^{-/-}$, Casp1 $^{-/-}$ mice

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Mice were "primed" by intraperitoneal injection of low-dose lipopolysaccharide (LPS, 2mg/kg). 12h after LPS injection, Ouabain Octahydrate (3mg/kg) was injected intraperitoneally; the control group was injected with an equal volume of Preparation Method normal saline. Left ventricular systolic function (%FS, EF), left ventricular end-diastolic diameter (LVEDD) and end-systolic diameter (LVESD) were evaluated by echocardiography. Plasma creatine phosphokinase (CPK, a marker of myocardial injury) and cardiac tissue IL-1 β levels were detected by ELISA.

Dosage form 3mg/kg; i.p.

Applications Ouabain Octahydrate (3mg/kg) significantly reduced left ventricular systolic function (decreased %FS and EF, increased LVESD), increased plasma CPK levels and cardiac IL-1 β protein levels only in LPS-pretreated WT mice. These effects were significantly attenuated in IL-1 β ^{-/-}, NLRP3^{-/-}, or Casp1^{-/-} mice.

References:

- [1] Venugopal J, McDermott J, Sanchez G, et al. Ouabain promotes partial epithelial to mesenchymal transition (EMT) changes in human autosomal dominant polycystic kidney disease (ADPKD) cells[J]. Experimental cell research, 2017, 355(2): 142-152.
- [2] Kobayashi M, Usui-Kawanishi F, Karasawa T, et al. The cardiac glycoside ouabain activates NLRP3 inflammasomes and promotes cardiac inflammation and dysfunction[J]. PloS one, 2017, 12(5): e0176676.

Background

Ouabain Octahydrate is a Na⁺/K⁺-ATPase inhibitor that can be used to study congestive heart failure^[1]. Ouabain Octahydrate can be used to induce cardiac dysfunction or hypertension models in animal models^[2]. Ouabain Octahydrate can exert anti-cancer activity by downregulating intracellular signal transducer and activator of transcription 3 (STAT3)^[3].

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In vitro, Ouabain Octahydrate (3nM) treatment of autosomal dominant polycystic kidney disease (ADPKD) cells for 24h reduced the expression of epithelial cell marker E-cadherin in ADPKD cells, and increased the expression of mesenchymal cell markers N-cadherin, α -smooth muscle actin (α SMA), type I collagen, and tight junction proteins occludin and claudin-1^[4]. Ouabain Octahydrate (25, 50, 100nM) treated Burkitt lymphoma Raji cells for 48h inhibited cell proliferation in a dose-dependent manner, significantly reduced cell viability, and induced cell autophagy^[5].

In vivo, Ouabain Octahydrate (3mg/kg) was intraperitoneally injected into LPS-pretreated WT, IL-1 β ^{-/-}, NLRP3^{-/-}, Casp1^{-/-} mice, which significantly reduced left ventricular systolic function in WT mice, increased plasma CPK levels and cardiac IL-1 β protein levels, induced macrophage infiltration and myocardial damage, but these effects were significantly attenuated in IL-1 β ^{-/-}, NLRP3^{-/-}, and Casp1^{-/-} mice^[6].

References:

- [1] Harich O O, Gavriliuc O I, Ordodi V L, et al. In Vitro Study of the Multimodal Effect of Na⁺/K⁺ ATPase Blocker Ouabain on the Tumor Microenvironment and Malignant Cells[J]. Biomedicines, 2023, 11(8): 2205.
- [2] Ferrari P, Ferrandi M, Valentini G, et al. Targeting Ouabain-and Adducin-dependent mechanisms of hypertension and cardiovascular remodeling as a novel pharmacological approach[J]. Medical Hypotheses, 2007, 68(6): 1307-1314.
- [3] Du J, Jiang L, Chen F, et al. Cardiac glycoside ouabain exerts anticancer activity via downregulation of STAT3[J]. Frontiers in oncology, 2021, 11: 684316.
- [4] Venugopal J, McDermott J, Sanchez G, et al. Ouabain promotes partial epithelial to mesenchymal transition (EMT) changes in human autosomal dominant polycystic kidney disease (ADPKD) cells[J]. Experimental cell research, 2017, 355(2): 142-152.
- [5] Meng L, Wen Y, Zhou M, et al. Ouabain induces apoptosis and autophagy in Burkitt's lymphoma Raji cells[J]. Biomedicine & Pharmacotherapy, 2016, 84: 1841-1848.
- [6] Kobayashi M, Usui-Kawanishi F, Karasawa T, et al. The cardiac glycoside ouabain activates NLRP3 inflammasomes and promotes cardiac inflammation and dysfunction[J]. PloS one, 2017, 12(5): e0176676.

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