

Product data sheet



MedKoo Cat#: 407462 Name: CHIR99021 HCl CAS#: 1797989-42-4 (HCl) Chemical Formula: C ₂₂ H ₁₉ Cl ₃ N ₈ Molecular Weight: 501.8	
Product supplied as: Powder	
Purity (by HPLC): ≥ 98%	
Shipping conditions: Ambient temperature	
Storage conditions: Powder: -20°C 3 years; 4°C 2 years. In solvent: -80°C 3 months; -20°C 2 weeks.	

1. Product description:

CHIR99021, also known as CT99021, is a glycogen synthase kinase 3β (GSK3β) inhibitor that has antiproliferative activity in vitro and in vivo. CHIR-99021 inhibits GSK-3 with IC₅₀ at 7 nM. In a series of carcinoma cell lines, the IC₅₀ of CHIR99021 for proliferation is about 10 μM. CHIR99021 promotes self-renewal of mouse embryonic stem cells by modulation of protein-encoding gene and long intergenic non-coding RNA expression.

2. CoA, QC data, SDS, and handling instruction

SDS and handling instruction, CoA with copies of QC data (NMR, HPLC and MS analytical spectra) can be downloaded from the product web page under “QC And Documents” section. Note: copies of analytical spectra may not be available if the product is being supplied by MedKoo partners. Whether the product was made by MedKoo or provided by its partners, the quality is 100% guaranteed.

3. Solubility data

Solvent	Max Conc. mg/mL	Max Conc. mM
DMSO	80.0	159.43
Ethanol	47.0	93.66
Water	7.14	14.23

4. Stock solution preparation table:

Concentration / Solvent Volume / Mass	1 mg	5 mg	10 mg
1 mM	1.99 mL	9.96 mL	19.93 mL
5 mM	0.40 mL	1.99 mL	3.99 mL
10 mM	0.20 mL	1.00 mL	1.99 mL
50 mM	0.04 mL	0.20 mL	0.40 mL

5. Molarity Calculator, Reconstitution Calculator, Dilution Calculator

Please refer the product web page under section of “Calculator”

6. Recommended literature which reported protocols for in vitro and in vivo study

In vitro study

- Delepine C, Pham VA, Tsang HWS, Sur M. GSK3β inhibitor CHIR 99021 modulates cerebral organoid development through dose-dependent regulation of apoptosis, proliferation, differentiation and migration. *PLoS One*. 2021 May 5;16(5):e0251173. doi: 10.1371/journal.pone.0251173. PMID: 33951093; PMCID: PMC8099055.
- Lee JS, Chae MK, Kikkawa DO, Lee EJ, Yoon JS. Glycogen Synthase Kinase-3β Mediates Proinflammatory Cytokine Secretion and Adipogenesis in Orbital Fibroblasts from Patients with Graves' Orbitopathy. *Invest Ophthalmol Vis Sci*. 2020 Jul 1;61(8):51. doi: 10.1167/iovs.61.8.51. PMID: 32735324; PMCID: PMC7426624.

In vivo study

- Faccidomo S, Holstein SE, Santanam TS, Saunders BL, Swaim KS, Reid GT, O'Neill C, Eastman VR, Hodge CW. Pharmacological inhibition of glycogen synthase kinase 3 increases operant alcohol self-administration in a manner associated with altered pGSK-3β, protein interacting with C kinase and GluA2 protein expression in the reward pathway of male C57BL/6J mice. *Behav Pharmacol*. 2020 Feb;31(1):15-26. doi: 10.1097/FBP.0000000000000501. PMID: 31503067; PMCID: PMC6954298.

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2. Badimon L, Casaní L, Camino-Lopez S, Juan-Babot O, Borrell-Pages M. GSK3 β inhibition and canonical Wnt signaling in mice hearts after myocardial ischemic damage. PLoS One. 2019 Jun 20;14(6):e0218098. doi: 10.1371/journal.pone.0218098. PMID: 31220102; PMCID: PMC6586285.

7. Bioactivity

Biological target:

CHIR-99021 monohydrochloride (CT99021 monohydrochloride) is a potent and selective GSK-3 α/β inhibitor with IC₅₀s of 10 nM and 6.7 nM.

In vitro activity

Organoids treated with low dose of CHIR 99021 (1 μ M) showed increased levels of neural progenitor cell (NPC) markers SOX2 (WB, 1.5-fold increase) and PAX6 (IHC, 1.8-fold increase), and of radial glia marker BLBP (WB, 2.1-fold increase). No change was observed for levels of neuroepithelium marker E-cadherin and neuronal markers TUJ1 and DCX. In contrast, organoids treated with 10 μ M CHIR 99021 showed increased levels of E-cadherin (WB and IHC, 1.8-fold and 92-fold increase) and of intermediate progenitor marker TBR2 (2.9-fold increase), decreased levels of NPC markers SOX2 (WB, 1.9-fold decrease) and PAX6 (IHC, 2-fold decrease), and decreased levels of neuronal marker DCX (IHC, 7.8-fold decrease). This suggests that GSK3 β signaling modulates neuroepithelium differentiation in a dose dependent manner.

Reference: PLoS One. 2021; 16(5): e0251173. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8099055/>

In vivo activity

Phosphorylated GSK3 β (p-GSK3 β , Tyr216) protein levels were higher in ischemic regions of hearts from Lrp5 $^{-/-}$ mice than in those from Wt mice (Fig 1A). Total GSK3 β protein levels were also increased in the myocardium of Lrp5 $^{-/-}$ mice compared to Wt mice. Phosphorylated GSK3 β /Total- GSK3 β ratios to analyze total myocardial content of activated GSK3 β found no differences between genotypes (Fig 1A). CHIR99021 treatment significantly reduced p-GSK3 β protein levels in Lrp5 $^{-/-}$ mice but not in Wt mice. CHIR99021 treatment reduced p-GSK3 β to the same level in both genotypes. Induction of myocardial injury (MI) causes a highly significant increase of p-GSK3 β protein levels in Wt and Lrp5 $^{-/-}$ mice, strongly suggesting that injury affects the canonical Wnt pathway (Fig 1B). Treatment with CHIR99021 before occlusion significantly reduced p-GSK3 β levels in both genotypes (Fig 1C) further demonstrating efficacy of CHIR99021 treatments. Indeed, levels of p-GSK3 β protein were significantly reduced after CHIR99021 treatments in damaged hearts leaving the canonical pathway open for activation and for β -catenin interaction with specific transcription factors.

Reference: PLoS One. 2019; 14(6): e0218098. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6586285/>

Note: The information listed here was extracted from literature. MedKoo has not independently retested and confirmed the accuracy of these methods. Customer should use it just for a reference only.