

## Product Data Sheet

Product Name:  $\beta$ -Cyclodextrin (hydrate)

Cat. No.: GC48297

### Chemical Properties

Cas. No. 68168-23-0

SMILES OC[C@@H](O[C@@](O[C@]([C@@H]1O)([H])[C@H](O[C@@](O[C@]([C@@H]2O)([H])[C@H](O[C@@](O[C@]([C@@H]3O)([H])[C@H](O[C@@]4([H])[C@@H]3O)CO)([H])[C@@H]2O)CO)([H])[C@@H]1O)CO)([H])[C@@H]5O)[C@](O[C@](O[C@H](CO)[C@](O[C@](O[C@H](CO)[C@](O4([H])[C@@H]6O)([H])[C@@H]6O)([H])[C@@H]7O)([H])[C@@H]7O)([H])[C@@H]8O)([H])[C@@H]5O

Formula C<sub>42</sub>H<sub>70</sub>O<sub>35</sub>.XH<sub>2</sub>O

M.Wt 1135

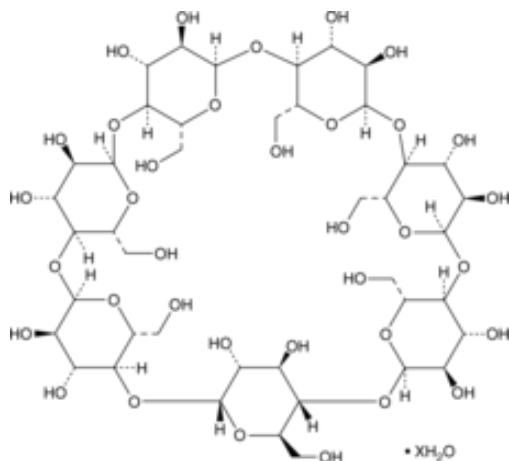
Solubility DMF: 2.5 mg/ml, DMSO: 2.5 mg/ml, DMSO: PBS (pH 7.2) (1:30): 0.03 mg/ml

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

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

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### Cell experiment [1]:

Cell lines                      Human glial cell line (CRL 8621)

Preparation Method                      Cells were cultured in Eagle's Minimal Essential Medium (EMEM) supplemented with 10% heat-inactivated fetal calf serum (FCS) and 100U of penicillin/streptomycin at 37°C in a humidified 5% CO<sub>2</sub> atmosphere. Cells were treated with  $\beta$ -Cyclodextrin at concentrations ranging from 4.69 to 300 $\mu$ g/ml for 24, 48, and 72 hours.

Reaction  
Conditions                      4.69 to 300 $\mu$ g/ml; 24-72h

Applications                      At lower concentrations ( $\leq 18.75\mu$ g/ml),  $\beta$ -Cyclodextrin significantly increased cell proliferation. At higher concentrations ( $\geq 150\mu$ g/ml),  $\beta$ -Cyclodextrin significantly reduced cell survival. The in vitro IC<sub>50</sub> was 115.95 $\mu$ g/ml. A linear dose-dependent cytotoxicity was observed at 24 and 48 hours, while a hermetic-like biphasic dose-response was observed at 72 hours.

### Animal experiment [2]:

Animal models                      Male Wistar rats (390-480g)

Preparation Method                      Rats were permanently cannulated in the jugular vein at least 1 week before the experiments. For intravenous administration,  $\beta$ -Cyclodextrin was dissolved in saline and administered through the cannula. For oral administration, rats were starved for 16 hours prior to the experiment and  $\beta$ -Cyclodextrin dissolved in water was administered through a stomach catheter.

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Dosage form            25-200mg/kg; i.v.; 50-150mg; oral administration; single dose

Applications            After intravenous administration,  $\beta$ -Cyclodextrin showed rapid distribution over extracellular fluids and elimination occurred through glomerular filtration. When a dose of 200mg/kg  $\beta$ -Cyclodextrin was administered, the elimination rate was decreased, probably as a result of nephrotoxicity. Within 24 hours after administration, most of the cyclodextrin dose was recovered unchanged in urine. After oral administration, only insignificant amounts of intact  $\beta$ -Cyclodextrin were absorbed from the gastrointestinal tract.

### References:

- [1] Sofian ZM, Abdullah JM, Rahim AA, et al. Cytotoxicity evaluation of vancomycin and its complex with beta-cyclodextrin on human glial cell line. Pak J Pharm Sci. 2012 Oct;25(4):831-7.
- [2] Frijlink HW, Visser J, Hefting NR, et al. The pharmacokinetics of beta-cyclodextrin and hydroxypropyl-beta-cyclodextrin in the rat. Pharm Res. 1990 Dec;7(12):1248-52.

### Background

$\beta$ -Cyclodextrin (hydrate) is a cyclic oligosaccharide composed of seven glucose units, featuring a hydrophilic outer surface and a hydrophobic inner cavity.  $\beta$ -Cyclodextrin can enhance the solubility and stability of poorly soluble drugs by forming inclusion complexes, while also controlling drug release.  $\beta$ -Cyclodextrin (hydrate) is used in research related to drug delivery systems, the food industry, and cosmetics<sup>[1-4]</sup>.

In vitro,  $\beta$ -Cyclodextrin (1-100 $\mu$ M) in the form of inclusion complexes with Harman was used to treat A2058 melanoma cells for 24 hours.  $\beta$ -Cyclodextrin significantly promoted cytotoxicity, apoptosis, and cell cycle arrest, inhibited cell migration, and enhanced pro-apoptotic effects by increasing caspase-3 activity<sup>[5]</sup>.  $\beta$ -Cyclodextrin (4.69-300 $\mu$ g/ml) was used to treat human glial cell line (CRL 8621) for 24-72 hours. At lower concentrations ( $\leq$ 18.75 $\mu$ g/ml),  $\beta$ -Cyclodextrin significantly increased cell proliferation; at higher concentrations ( $\geq$ 150 $\mu$ g/ml),  $\beta$ -Cyclodextrin significantly reduced cell survival ( $IC_{50}$ =115.95 $\mu$ g/ml)<sup>[6]</sup>.

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In vivo,  $\beta$ -Cyclodextrin (25-675mg/kg/day) was administered through diet to Fischer 344 rats and CD-1 mice (rats for 122-130 weeks, mice for 93-105 weeks).  $\beta$ -Cyclodextrin did not induce treatment-related carcinogenic effects. In mice,  $\beta$ -Cyclodextrin caused large intestine dilation with soft or liquid contents, histologically accompanied by mucosal coverage with mucous secretions containing exfoliated cells, mucosal flattening, and intestinal gland atrophy<sup>[7]</sup>.  $\beta$ -Cyclodextrin (25-200mg/kg) was administered as a single intravenous injection or (50-150mg) as a single oral dose to male Wistar rats.  $\beta$ -Cyclodextrin rapidly distributed into extracellular fluids and was eliminated through glomerular filtration; when challenged with a high dose (200mg/kg), the elimination rate of  $\beta$ -Cyclodextrin in rats decreased<sup>[8]</sup>.

### References:

- [1] Aleem O, Kuchekar B, Pore Y, et al. Effect of beta-cyclodextrin and hydroxypropyl beta-cyclodextrin complexation on physicochemical properties and antimicrobial activity of cefdinir. J Pharm Biomed Anal. 2008 Jul 15;47(3):535-40.
- [2] Shahi M, Falahati D. DFT Study of Interaction between Teriflunomide and  $\beta$ -cyclodextrin. Curr Mol Med. 2025;25(2):187-201.
- [3] Kaboudi N, Asl SG, Nourani N, et al. Solubilization of drugs using beta-cyclodextrin: Experimental data and modeling. Ann Pharm Fr. 2024 Jun;82(4):663-672.
- [4] Chodankar D, Vora A, Kanhed A.  $\beta$ -cyclodextrin and its derivatives: application in wastewater treatment. Environ Sci Pollut Res Int. 2022 Jan;29(2):1585-1604.
- [5] Ferraz CAA, de Oliveira Júnior RG, et al. Complexation with  $\beta$ -cyclodextrin enhances apoptosis-mediated cytotoxic effect of harman in chemoresistant BRAF-mutated melanoma cells. Eur J Pharm Sci. 2020 Jul 1;150:105353.
- [6] Sofian ZM, Abdullah JM, Rahim AA, et al. Cytotoxicity evaluation of vancomycin and its complex with beta-cyclodextrin on human glial cell line. Pak J Pharm Sci. 2012 Oct;25(4):831-7.
- [7] Waner T, Borelli G, Cadel S, et al. Investigation of potential oncogenetic effects of beta-cyclodextrin in the rat and mouse. Arch Toxicol. 1995;69(9):631-9.
- [8] Frijlink HW, Visser J, Hefting NR, et al. The pharmacokinetics of beta-cyclodextrin and hydroxypropyl-beta-cyclodextrin in the rat. Pharm Res. 1990 Dec;7(12):1248-52.

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