Product Data Sheet

Product Name: Thymosin beta 4 (Thymosin β4)
Cat. No.: GC32448

Chemical Properties

Cas. No.	77591-33-4		
SMILES	Ser-Asp-Lys-Pro-Asp-Met-Ala-Glu-Ile-Glu-Lys-Phe-Asp-Lys-Ser-Lys-Leu-Lys-Lys-Thr-Glu-Thr-Gln-Glu-Lys-Asn-Pro-Leu-Pro-Ser-Lys-Glu-Thr-Ile-Glu-Gln-Glu-Lys-Gln-Ala-Gly-Glu-Ser		
Formula	$C_{212}H_{350}N_{56}O_{78}S$	M.Wt	4963.44
Solubility	Water : 50 mg/mL (10.07 mM; Need ultrasonic)	Storage	Store at -20°C
General tips	For obtaining a higher solubility , please warm the tube at 37 ℃ and shake it in the ultrasonic bath for a while.Stock solution can be stored below -20℃ 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]:

Cell lines	hCMEC/D3 cell line
Preparation Method	Cells were treated with 200μM PrP (106-126) with or without Thymosin β4 and Thymosin β4 siRNA. Cell viability was determined by MTT assay and LDH assay.
Reaction Conditions	0.01, 0.05, 0.1, and 0.5μg/mL

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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Applications	Pretreatment of hCMEC/D3 cells with various concentrations of Thymosin β4 on 200μM PrP (106-126)-treated cells resulted in significantly increased viability in a dose-dependent (0.1, 0.5 μg/ml) manner compared to cells incubated with 200μM PrP (106-126) alone. Analysis of LDH activity in the cell culture supernatants revealed that 0.1 and 0.5μg/ml Thymosin β4 significantly inhibited 200μM PrP (106-126)-induced cytotoxicity in hCMEC/D3 cells

Animal experiment [2]:

Animal models	CD1 adult nulliparous female mice, 2-5 months
Preparation Method	Only 6 of 10 were pregnant. At 10:00 a.m. on day E14 and E17 of gestation mice were weighed and treated with an intraperitoneal injection of Thymosin β4. Three pregnant mice received treatment with Thymosin β4 and three mice were used as a control group. To keep the same conditions of stress, the mice of the control group underwent corresponding intraperitoneal injections of vehicle (PBS). On the day E19 of gestation, caesarean sections were performed.
Dosage form	6mg/kg, intraperitoneal injection

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Applications	Thymosin β4 is capable of accelerating the development of the entire fetus and fetal organs when administered to pregnant mice in the last week of gestation. Regarding the body length at birth, newborns of Thymosin β4-treated animals showed a length always higher than the neonates of non-treated mice. In multiple organs, including heart, kidney, lungs, gut, notochord and cerebral cortex, the degree of differentiation of stem/precursor cells was accelerated by the maternal administration of Thymosin β4, leading to the appearance of a more mature organ architecture

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References:

[1]. Song K, Han HJ, et al. Thymosin beta 4 attenuates PrP(106-126)-induced human brain endothelial cells dysfunction. Eur J Pharmacol. 2020;869:172891.

[2]. Faa G, Piras M, et al. Thymosin beta-4 prenatal administration improves fetal development and halts side effects due to preterm delivery. Eur Rev Med Pharmacol Sci. 2021;25(1):431-437.

Background

Thymosin β4 is a major actin sequestering protein in cells and can interact with G-actin[1,2]. Thymosin β4 is found in many vertebrate tissues and cells and is especially concentrated in macrophages, fibroblasts, neutrophils, and platelets, which have large pools of G-actin[3]. The main physiological role of Thymosin β4 is the regulation of actin polymerization. Thymosin β4 is also involved in angiogenesis, cell survival, cell migration and fetal development[4].

Thymosin β4 plays a crucial role in the regulation of tight junction stability and acts in cytoskeleton rearrangement, which are closely related with BBB permeability[2].

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Thymosin β4 is a novel regulator for primary cilia formation and it affects ciliogenesis by regulating the expression of NPHP3 in HeLa cervical cancer cells[5]. Thymosin β4 regulates HSC activation by influencing the activity of Smoothened and GLI2, suggesting Thymosin β4 as a novel therapeutic target in liver disease[6]. Synthetic Thymosin β4 peptide increases NK cell cytotoxicity mediated by intercellular adhesion molecule^{-1} (ICAM^{-1}) through the secretion of cytolytic granules to target cells, suggests that Thymosin β4 is a key activator of NK cell cytotoxicity[7].

Thymosin β4 enhanced wound healing in a rat full thickness wound model suggest that Thymosin β4 is a potent wound healing factor with multiple activities[1]. Thymosin β4 administration during gestation may act as a powerful fetal growth promoter, by accelerating the development of newborn organs and tissues[4].Recombinant Human Thymosin β4 significantly increased the survival rate of mice infected with MHV-A59 through inhibiting virus replication, balancing the host's immune response, alleviating pathological damage, and promoting repair of the liver[8].

References:

[1]. Malinda KM, Sidhu GS, et al. Thymosin beta4 accelerates wound healing. J Invest Dermatol. 1999;113(3):364-368.
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[3]. Weber A, Nachmias VT, et al, Safer D. Interaction of thymosin beta 4 with muscle and platelet actin: implications for actin sequestration in resting platelets. Biochemistry. 1992;31(27):6179-6185.
[4]. Faa G, Piras M, et al. Thymosin beta-4 prenatal administration improves fetal development and halts side effects due to preterm delivery. Eur Rev Med Pharmacol Sci. 2021;25(1):431-437.
[5]. Lee JW, Kim HS, et al. Thymosin β-4 is a novel regulator for primary cilium formation by nephronophthisis 3 in HeLa human cervical cancer cells. Sci Rep. 2019;9(1):6849. Published 2019 May 2.
[6]. Kim J, Hyun J, et al. Thymosin beta-4 regulates activation of hepatic stellate cells via hedgehog signaling. Sci Rep. 2017;7(1):3815. Published 2017 Jun 19.
[7]. Lee HR, Yoon SY, et al. Thymosin beta 4 enhances NK cell cytotoxicity mediated by ICAM-1. Immunol Lett. 2009;123(1):72-76.

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[8]. Yu R, Mao Y, et al. Recombinant Human Thymosin Beta-4 Protects against Mouse Coronavirus Infection. Mediators Inflamm. 2021;2021:9979032. Published 2021 Apr 21.

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