L-Thyroxine

Cat. No.: HY-18341

CAS No.: 51-48-9

Molecular Formula: $C_{15}H_{11}I_4NO_4$

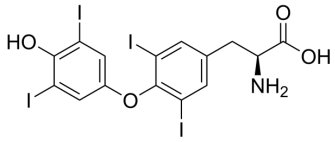
Molecular Weight: 776.87

Target: Thyroid Hormone Receptor; Endogenous Metabolite

Pathway: Vitamin D Related/Nuclear Receptor; Metabolic Enzyme/Protease

Storage:

Powder	-20°C	3 years
	4°C	2 years
In solvent	-80°C	6 months
	-20°C	1 month



SOLVENT & SOLUBILITY

In Vitro

DMSO : 250 mg/mL (321.80 mM; Need ultrasonic)

1M NaOH : 5 mg/mL (6.44 mM; ultrasonic and warming and adjust pH to 11 with NaOH and heat to 60°C)

H_2O : < 0.1 mg/mL (ultrasonic;warming;heat to 60°C) (insoluble)

Preparing Stock Solutions

Solvent / Mass / Concentration	1 mg	5 mg	10 mg
1 mM	1.2872 mL	6.4361 mL	12.8722 mL
5 mM	0.2574 mL	1.2872 mL	2.5744 mL
10 mM	0.1287 mL	0.6436 mL	1.2872 mL

Please refer to the solubility information to select the appropriate solvent.

In Vivo

1. Add each solvent one by one: 10% DMSO >> 40% PEG300 >> 5% Tween-80 >> 45% saline
   Solubility: ≥ 2.08 mg/mL (2.68 mM); Clear solution
2. Add each solvent one by one: 10% DMSO >> 90% (20% SBE-β-CD in saline)
   Solubility: ≥ 2.08 mg/mL (2.68 mM); Clear solution
3. Add each solvent one by one: 10% DMSO >> 90% corn oil
   Solubility: ≥ 2.08 mg/mL (2.68 mM); Clear solution

BIOLOGICAL ACTIVITY

Description

L-Thyroxine (Levothyroxine; T4) is a synthetic hormone for the research of hypothyroidism. DIO enzymes convert biologically active thyroid hormone (Triiodothyronine,T3) from L-Thyroxine (T4)[1].

IC_{50} & Target

Human Endogenous Metabolite

In Vivo	Deiodinases (DIOs), which catalyse the conversion of thyroxine (pro-hormone) to the active thyroid hormone, are associated with thyroid stimulating hormone (TSH) levels. DIO1 and DIO2 catalyze activation of thyroid hormone secretion in contrast to DIO3 playing role inactivation of the secretion. Activities of DIO1 and DIO2 play pivotal role in the negative feedback regulation of pituitary TSH secretion[1]. L-Thyroxine (T4) and Triiodothyronine (T3) hormones are known to modulate the expression of ionic channels, pumps and regulatory contractile proteins. Moreover, thyroid hormones have been shown to influence calcium homeostasis and flux responsible for excitation and contractility, with L-Thyroxine and Triiodothyronine modulating its pharmacological control and secretion. In rats fed 12 weeks with the iodine-free diet, a significant decrease in the levels of both Triiodothyronine and L-Thyroxine is observed when compared to the control group fed with standard diet ($p<0.001$). In the group treated with low doses of L-Thyroxine, an increase in L-Thyroxine levels is observed ($p=0.02$) while Triiodothyronine levels remain virtually similar to the control group ($p=0.19$). Rats treated with high doses of L-Thyroxine display a significant increase in both Triiodothyronine and L-Thyroxine circulating concentrations compared to the non-treated hypothyroid group ($p<0.001$ and $p=0.004$, respectively) and a significant increase in L-Thyroxine levels when compared to the control values ($p=0.03$)[2]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

PROTOCOL

Animal Administration [2]	Rats[2] Sprague-Dawley female rats (N=22) are used. Non-pregnant rats are divided into four groups: 1) control, 2) hypothyroidism, 3) hypothyroidism treated with low doses of L-Thyroxine (20 μg/kg/day) and 4) with high doses of L-Thyroxine (100 μg/kg/day). Control rats (group 1) are fed with standard diet, while the intervention rats are fed with iodine-free diet for 12 weeks to induce hypothyroidism (groups 2-4) which is continued for four more weeks to allow screening of hypothyroid status and L-Thyroxine-treatment. Food and water (iodine-free diet) are available ad libitum. The hypothyroid group treated with low (group 3) or high doses of L-Thyroxine (group 4) are injected intraperitoneally every 24 h with respectively 20 μg/kg/day and 100 μg/kg/day. Blood samples are collected for thyroid function screening at week 12 and 16 following the initiation of either the control or iodine-free diet. Hysterectomy is performed under general anesthesia (isoflurane 2%) at the end of the treatment and the two uterine horns are placed in physiological Krebs' solution until isometric tension measurements within no more than 1 h. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

CUSTOMER VALIDATION

- Nat Immunol. 2024 Mar 18.
- Cell Rep Med. 2023 May 24;101061.
- J Drug Deliv Sci Technol. 2023 Sep 28, 105008.
- Sci Rep. 2022 Jul 4;12(1):11259.
- Mol Brain. 2021 Jan 27;14(1):25.

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REFERENCES

[1]. Arici M, et al. Association between genetic polymorphism and levothyroxine bioavailability in hypothyroid patients. Endocr J. 2018 Mar 28;65(3):317-323.

[2]. Corriveau S, et al. Levothyroxine treatment generates an abnormal uterine contractility patterns in an in vitro animalmodel. J Clin Transl Endocrinol. 2015 Sep 9;2(4):144-149.

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

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