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Product Information

3,3′,5-Triiodo-L-thyronine

Catalog Number **T2877**
Storage Temperature –20 °C

CAS RN 6893-02-3
Synonym: T_3

Product Description

Molecular Formula: $C_{15}H_{12}I_3NO_4$
Molecular Weight: 650.97
Extinction coefficient: E^{mM} = 4.09 (295 nm, 40 mM HCl), 49.2 (244 nm), 4.66 (320 nm, 0.1 M NaOH)[1]

The two most important thyroid hormones consist of thyroxine (T_4) and 3,3′,5-triiodo-L-thyronine (T_3). These compounds contain iodine bound to one or more carbons in the complex ring backbone structure of the hormones. During metabolism, T_4 is converted to T_3 via removal of an iodine atom from one of the hormonal rings. Activation of T_4 is catalyzed by two enzymes, iodothyronine-5′-deiodinases type I and type II.[2] T_3 is the biologically active thyroid hormone. The primary hormone synthesized in the thyroid is T_4 and only about 20% of the T_3 that is produced from T_4 is produced in the thyroid gland itself. Most T_3 is produced in the target tissues themselves by conversion of circulating free T_4 that diffuses into the cells or binds to tissue-specific receptors. (There are other pathways of metabolism of thyroid hormones in target tissues not involving iodine removal or addition and these are essential to the functional influence of the thyroid upon those specific tissues.) Most (99.9%) of the T_4 in the circulation is bound to protein. It is only the free T_4 that can be converted to T_3 at the target tissue level. However, as free T_4 is consumed, more T_4 is released from bound protein to replace it, maintaining the low circulating levels at a relatively constant value.

T_3 has been shown to cause accelerated rates of oxygen consumption and heat production in various body tissues excluding the spleen, brain, and sex glands.[3] It also stimulates metabolic breakdown of glucose, fats, and proteins by stimulating the increase in levels of various metabolic enzymes, including liver glucose 6-phosphatase, hexokinase, and mitochondrial enzymes for oxidative phosphorylation. It is vital for central nervous system maturation in fetuses and is required for normal body growth in children. It also maintains alertness and normal body reflexes.

T_3 asserts its influence on function at the cytological or nuclear level, accordingly. One mechanism of action involves binding of the hormone to its receptor, followed by translocation of the complex into the nucleus where it binds to its DNA recognition sequence. It appears the regulation of the pathways above also occurs through binding of T_3 to its receptor. When high levels of T_3/receptor complexes exist, binding of additional T_3 molecules to its receptor induces rapid degradation of the receptor via a ubiquitin-proteasome degradation pathway, indicating T_3 modulates its own function by regulating its receptor level.[4]

This product is synthetically derived.

Precautions and Disclaimer

This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

Preparation Instructions

This product is soluble in 4 M NH_4OH in methanol (5 mg/ml). It is also soluble in NaOH. For use in cell culture, a 20 µg/ml stock solution can be prepared in the following manner: add 1.0 ml of 1.0 N NaOH to 1 mg, gently swirl to dissolve the powder and add 49 ml of sterile medium. The general working range is 0.02–50 ng/ml.[5]

Storage/Stability

Solutions are stable for 30 days at 2–8 °C. Stock solutions should be frozen in working aliquots. Avoid repeated freeze-thaw cycles. Dilute solutions will tend to absorb to glass.[1]

References

1. Data for Biochemical Research, 3rd ed., Dawson, R.M.C. et al., Oxford University Press (New York, NY:1986), p. 29.
2. Köhrle, J., The deiodinase family: selenoenzymes regulating thyroid hormone availability and action. Cellular and Molecular Life Sciences, **57(13-14)**, 1853-1863 (2000).
3. Molecular Cell Biology, Darnell, J. et al., Scientific American Books (New York, NY:1986), pp. 702-703.
4. Dace, A. et al., Hormone binding induces rapid proteasome-mediated degradation of thyroid hormone receptors. Proc. Natl. Acad. Sci. USA, **97(16)**, 8985-8990 (2000).
5. Bottenstein, J. et al., The growth of cells in serum-free hormone-supplemented media. Methods Enzymol., **58**, 94-109 (1979).

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