

PHARMACOLOGY OF THYROID HORMONE

➤ GENERAL INFORMATION:-

- The thyroid gland is essential to the endocrine system .
- It is located in front of the neck and is responsible for production of thyroid hormone.
- Thyroid gland secrete thyroid hormones such as T_3 (Triiodothyronin), T_4 (Tetraiodothyronin) and Calcitonin.
- The T_3 and T_4 partially composed of iodine.
- Generally T_3 and T_4 are produced by follicular cell of thyroid gland.
- Calcitonin are produced by parafollicular c-cell and responsible for calcium metabolism.
- The hypothalamus and pituitary gland ,which are located in the brain, help control the thyroid gland.
- These hormone play important role in regulation of weight,energy levels,skin, hair, nail growth.

➤ T_3 and T_4 COMPARISON:-

T_3 (Triiodothyronine)	T_4 (Tetraiodothyronine)
A thyroid hormone that affects almost every physiological process in body.	Main hormone produced by thyroid gland.
Known as triiodothyronin.	Known as thyroxin.
Five times potent than T_4 .	Less potent.
Thyroid gland produces less.	Thyroid gland produces more.
Has shorter duration of action.	Has longer duration of action.
Livothyronine is the synthetic form. And half life is about one day.	Levothyroxine is a synthetic form. And half life is about 7 days.

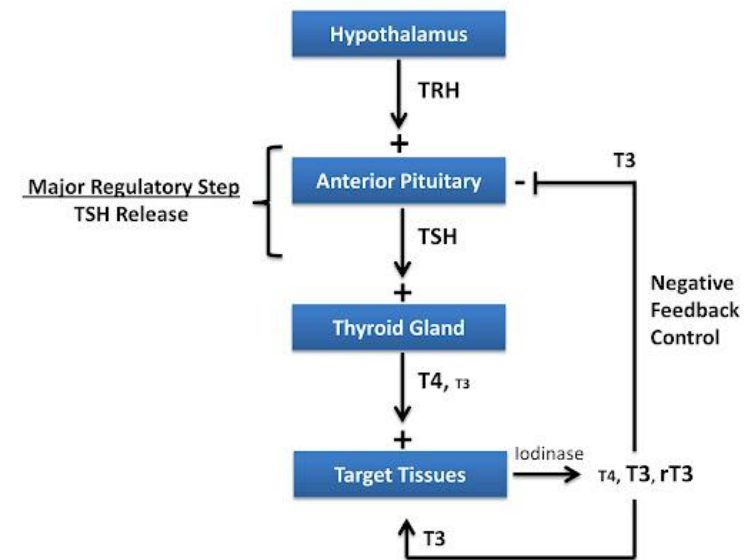
➤ REGULATION OF THYROID HORMONE SECRETION:-

- Hypothalamus act as decater in positive and negative feedback mechanism of thyroid hormone
- The negative feedback by thyroid hormone is directly on pituitary as well as hypothalamus.
- The action of TRH on pituitary and that of TSH on thyroid cell is mediated by enhance by cyclic cimp synthesis.

➤ BIOSYNTHESIS OF THYROID HORMONE:-

Thyroglobulin is a glycoprotein having molecular weight 660kg Dalton containing 10 % sugar

- The thyroid hormone are synthesized and store in thyroid follicle as a part of thyroglobulin molecule



➤ STEPS INVOLVE IN SYNTHESIS OF THYROID HORMONE

A. IODIDE UPTAKE:-

- Is is rate limiting state in thyroid hormone which needs energy
- Follicles have in their basement membrane and iodide tracking mechanism which pump

- destroy iodine in cell through active sodium iodide symportan
- Iodide uptake enhancer TSH , Iodine deficiency, TSH receptor antibody

B. Iodide oxidation to iodine:

- Inside the cell iodide is oxidized by membrane bound paraoxidase enzyme to more active iodine
- Iodine immediately react with tyrosine residue on thyroglobulin to form MIT(monoiodothyronine) orDIT(Diiodothyronine)

C. Coupling:-

- MIT and DIT together form T3.
- $DIT+DIT=T4$.
- Normally high amount of T4is formed.

➤ DISORDERS:-

1) Hyperthyroidism:-

- It occur due to excessive secretion of thyroid hormone.
- The most common hyperthyroidism condition in human is Grave's disease, which is an immune disease in which auto antibodies bind to thyroid stimulating hormone receptor and activates them
- .Grave disease treated using anti thyroid drug.Eg.,propylthiourea, methimazole.

2)Hypothyroidism:-

- It occurs due to thyroid harmone deficiency.
- Symptoms:-Fatigue, Weakness, Hair loss and Reproductive failure.

➤ **ACTION OF THYROID HORMONE:-**

Sr. no.	Drug	M.O.A	Pharmacological action	uses	dose	Adverse effect
1.	Dopamine	Vasodilation and renal blood flow	Treat low blood pressure	Cardiogenic shock	5-10ml	tachyarrhythmia
2.	Mefenamic	Inhibition of cyclooxygenase	Exhibit anti-inflammatory, Analgesic, antipyretic activities	Inflammation and fever	500mg	Heart burn, Upset stomach
3.	Furosemide	Inhibition of sodium potassium 2 chloride co-transporter	By blocking absorption of sodium, chloride	High blood pressure, heart failure, oedema	40mg	Weakness, muscle cramps
4.	Oestrogens	Control gene expression	Development of female secondary sexual characteristics	Menstrual disorder, infertility	0.5mg daily oral	Pelvic muscles, hypertension

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