Thyroid Replacement

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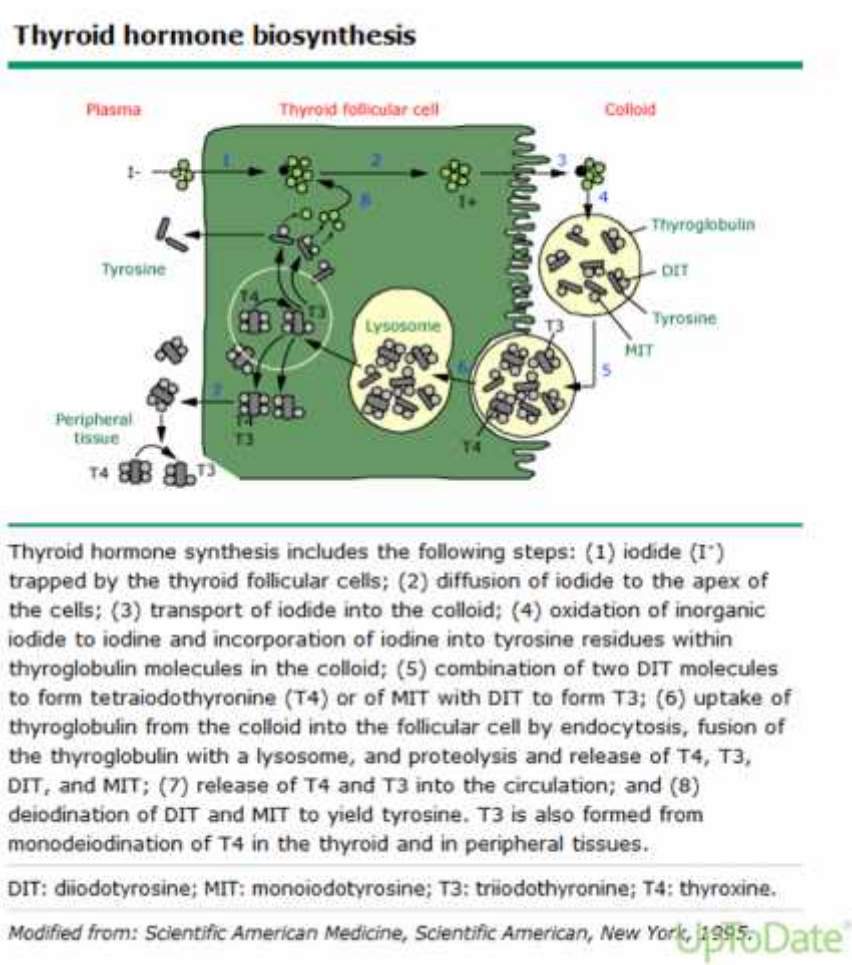
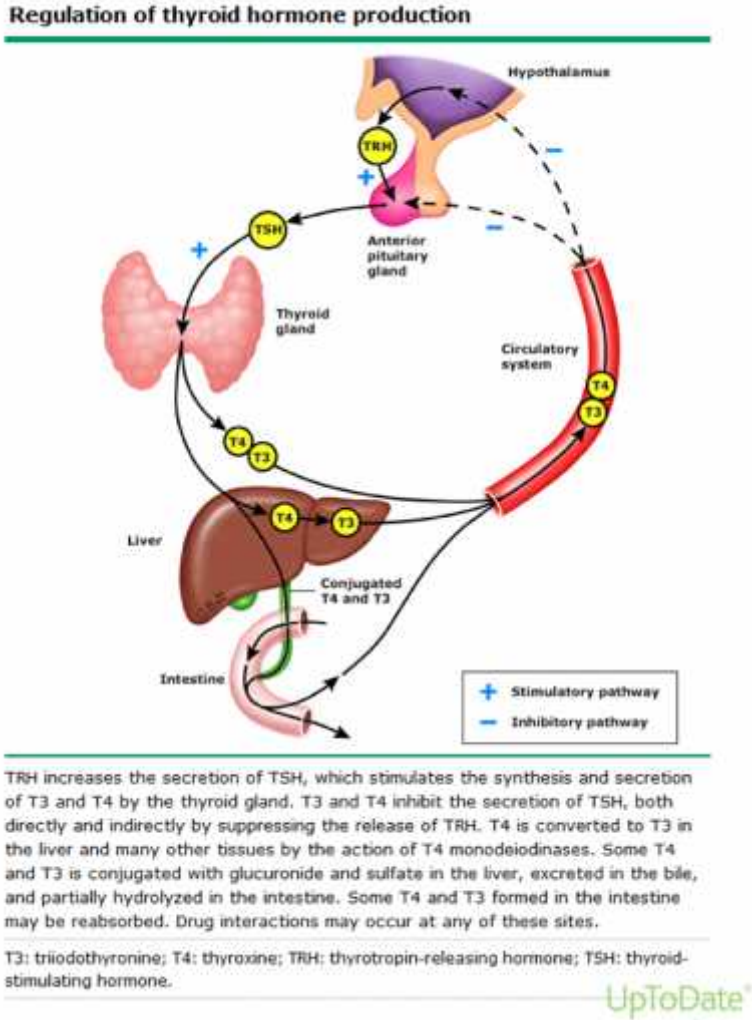
Thyroid Synthesis

- Iodide is transported to thyroid follicles
- Iodide is ionized and organified with thyroglobulin at the apical cells
- T4 is formed by two units of diiodotyrosine
- T3 is formed by 1 unit diiodotyrosine and 1 unit of monoiodotyrosine intrathyroidal
- Extrathyroidal T3 formed by deiodination of T4



Regulation of Thyroid Hormone

- TSH (Thyrotropin) regulates the synthesis and secretion of T4 and T3
- Thyrotropin releasing hormone (TRH) regulates TSH secretion
- Elevation of serum T4 and T3 decreases TSH and TRH



Function of Thyroid Hormone

- Mechanism of action through binding of DNA transcription
- Thyroid hormone essential for bone development and growth
- Regulation of heart rate and rhythm
- Influences activity of other hormones (catecholamine and insulin for example)

Causes of Hypothyroidism

- Primary Hypothyroidism
  - Hashimoto thyroiditis
  - Thyroidectomy/ Radioiodine therapy
  - Iodine deficiency/excess
  - Drugs: lithium, amiodarone
- Secondary/Tertiary Hypothyroidism
  - TSH deficiency
  - TRH deficiency

Clinical Manifestations

- Skin/Hair
  - Dry, coarse
- Eyes
  - Periorbital edema
- Heart
  - Heart failure, rate and rhythm abnormalities
- Neurologic
  - Congenital: mental retardation, impaired motor control
  - Peripheral neuropathy, movement disorders, Alzheimer's disease
  - Hashimoto's Encephalopathy

Thyroid Replacement

- First line: Levothyroxine which is a synthetic T4
- 80% absorption ideally. Should be taken 1 hour before breakfast
- Recommend to repeat TSH levels every 6 weeks to adjust dose
- Other formulations are not recommended since most doses are not regulated

Over Replacement

- Subclinical (Normal T4/T3 but low TSH) and overt hyperthyroidism
- Accelerated bone loss, bone remodeling, and bone density
- Elevated risk of arrhythmias with overcorrection of thyroid hormone
- Additional hyperthyroidism symptoms

Adjustment of Maintenance dose

- Routine TSH yearly after establishment of maintenance dose
- During pregnancy dose may need to increase and return post-partum
- Significant weight gain or conditions that impair thyroid hormone absorption
- Significant weight loss, aging or androgen therapy

References

- Ross, Douglas S. "Thyroid Hormone Synthesis and Physiology." *UpToDate*, edited by Ted W. Post.
- Ross, Douglas S. "Treatment of Hypothyroidsm." *UpToDate*, edited by Ted W. Post.