

THYROID, PARATHYROID

3/10/94, 22 Feb96, 22 Feb 00, 25 Feb 1993, 22 Feb94, 23 Feb 95, 25 Feb 97, 26 Feb 98, 17 Mar 04, 27Feb08, 2Mar09, 1Mar10, 23Feb11

Marieb, p 554-559, MM 1075-, Martini 6th, pp 620-627, 7th: 606-620, 8th: 620-627,

Thyroid: largest pure endocrine gland, lateral lobes with isthmus, high blood flow (p 608) Two hormones: **thyroid hormone**

calcitonin

THYROID HORMONE ACTIONS: thyroxine (T_4 , tissues convert to T_3 , more active) Affects every cell in body except for brain, spleen, testes, uterus and thyroid (p 622)

Stimulates enzymes involved in glucose oxidation = **increase Basal Metabolic Rate (BMR)**

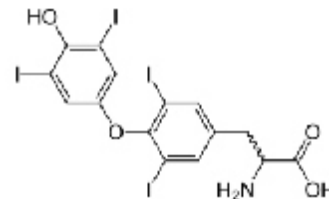
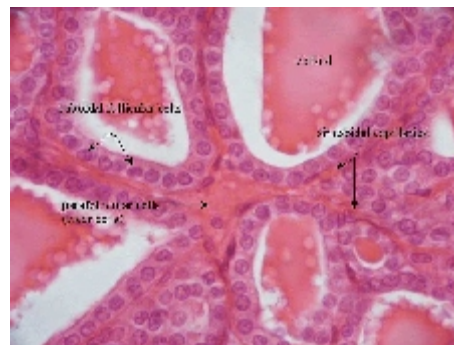
increases O_2 consumption, heat production (**calorigenic** effect)

increases adrenergic receptors in blood vessels

Regulates tissue growth & development, **esp skeletal, nervous and reproductive**

SYNTHESIS: Follicles lined by cuboidal epithelium, make **glycoprotein thyroglobulin, I-rich** (p 621)

1. thyroglobulin is synthesized on rough ER, Golgi packs, dump in to lumen, stored as **colloid**
2. Iodide concentrated fr blood, oxidized to iodine, directed into lumen, attaches to tyrosine in thyroglobulin, making DIT or MIT (diiodotyrosine etc)
3. follicle cells reclaim thyroglobulin by **endocytosis**, cleave it with lysozymes
4. Thyroxine which results diffuses into blood stream



TSH triggers secretion of thyroxine. Colloid is then restocked

90% of thyroid hormone secreted is T_4 . T_3 is **10x more active than T_4** ,

Tissues convert T_4 to T_3 .

cAMP is second messenger, but T_3 can enter, bind to mitochondria and nucleus (increase transcription)

Stimulus for TSH release: increased energy requirements, pregnancy, cold weather.
steroid hormones inhibit TSH release

HYPOTHYROID:

myxedema: low BMR, slow speech, cold intolerance, constipation, thick dry skin, puffy eyes, edema, lethargy, mental sluggish. (**goiter** = hypertrophy, unusable colloid)

cretinism: short disproportionate body, thick neck and tongue,

mentally retarded

HYPERTHYROID:

Grave's Disease: MM: 1075- **exophthalmos, tachycardia**, sweating, wt. loss, nervousness, insomnia

REGULATION OF CALCIUM BLOOD LEVELS:

Ca⁺⁺ functions extremely important:

- 1) bone formation
- 2) coagulation of blood
- 3) maintain cell permeability
- 4) neuromuscular irritability (lack causes tetany)

Two hormones regulate blood calcium

(homeostasis of calcium on p 626):

CALCITONIN:

(32 AA) synth in **parafollicular cells**, released due to high Ca^{++} in blood.

- 1) Inhibits bone resorption (inhibits osteoclasts)
- 2) Stimulates cellular uptake of Ca^{++} , incorporation into bone.

PARATHYROID: (discovery: thyroidectomy led to tetany)

parathormone: most important blood Ca^{++} regulator.

Low blood Ca^{++} triggers its release. Inhibited by hypercalcemia. (xs parathormone = kidney stones)

Effects:

- 1) activates **osteoclasts**
- 2) enhance resorption of Ca^{++} in kidneys
- 3) increase absorption of Ca^{++} in intestines (activates calcitriol)

