THYROID GLAND

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Largest endocrine gland situated in front of the larynx, bilobed connected by a bridge of tissue called thyroid isthmus.

Histology

Thyroid is made up of multiple follicles lined by cuboidal epithelial cells.

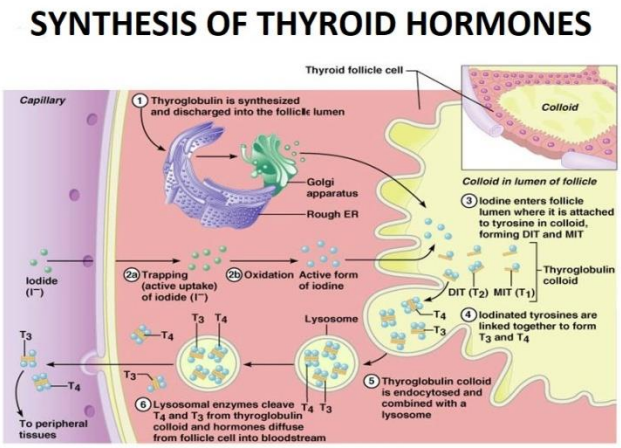
Thyroid gland is composed of a large number of closed **follicles.** These follicles are lined with cuboidal epithelial cells, which are called **follicular cells.** Follicular cavity is filled with a colloidal substance known as **thyroglobulin,** which is secreted by the follicular cells.

Thyroid hormones

- Thyroxine (T4)-Follicular cells
- Tri-iodo-thyronine(T3)-Follicular cells
- Calcitonin-Para follicular cells

Synthesis of thyroid hormones occurs in five stages:

1. Thyroglobulin synthesis
2. Iodide trapping
3. Oxidation of iodide
4. Transport of iodine into follicular cavity
5. Iodination of tyrosine
6. Coupling reactions



(Picturecourtesy:http://www.biosciencenotes.com/synthesis-of-thyroid-hormones/)

Actions of thyroid hormones

- **Calorigenic action**

  T3 and T4 increase the O2 consumption of almost all metabolically active tissues except adult brain,testis,spleen,lymph node,ovary,uterus and ant.pituitary.T3 is more effective than T4

- **On metabolism**

  On protein metabolism-anabolism of protein

  Thyroxine stimulates almost all processes involved in the metabolism of carbohydrate

  Thyroxine decreases the fat storage by mobilizing it from adipose tissues and fat depot

- **On cardiovascular system**

T4 increases heart rate and force of myocardial contraction.Increase in cardiac output increase the systolic Bp

- T4 increases body temperature and produce vasodialatation thus decrease peripheral resistance diastolic Bp
- On bone marrow metabolism
- T4 deficiency leads to anemia and excess causes erythropoesis
- **On vitamin:**Increase the demand for co-enzymes and vitamins from which they are formed.hepatic conversion of beta carotene to vit-A and retinine
- **On lactation:**maintenance of galactopoesis
- **Gonadal development** ,development of secondary sexual character

Serum thyroid hormone and TSH Level

Total T3 = 0.12 μg/dL

Total T4 =3-8 μg/dL

Serum TSH= 0.2-5microlU/ml

Applied Physiology

Goiter

Enlargement of thyroid gland is called goiter

Goitrogenic agents:

- Iodide deficiency.(normal intake-100-200microgm)
- Excess iodide
- Vegetables of brassicae family

Goiter in Hyperthyroidism – Toxic Goiter

Toxic goiter is the enlargement of thyroid gland with increased secretion of thyroid hormones, caused by thyroid tumor.

Goiter in Hypothyroidism – Non-toxic Goiter

Non-toxic goiter is the enlargement of thyroid gland without increase in hormone secretion. It is also called hypothyroid goiter (Fig. 67.6).

Based on the cause, the non-toxic hypothyroid goiter is classified into two types.

1. Endemic colloid goiter-due to deficiency of iodine
2. Idiopathic non-toxic goiter-unknown cause

Hypothyroidism

Due to reduced T3 and T4

It is of two types:Myxoedema and cretinism

Myxoedema: Hypothyroidism in adults

Features of Myxoedema

- Swelling of face
- Bagginess under eyes
- Non-pitting type of edema
- Atherosclerosis

Cretinism

Cretinism is the hypothyroidism in children, characterized by stunted growth

Causes for cretinism

Cretinism occurs due to congenital absence of thyroid gland, genetic disorder or lack of iodine in the diet.

Features of cretinism

- Few weeks after birth, the baby starts developing signs like sluggish movements and croaking sounds while crying. Unless treated immediately, the baby will be mentally retarded permanently.
- Stunted growth with a bloated body
- Protruded abdomen with enlarged protruded tongue
- Failure of sexual development
- Other characteristic features of hypothyroidism

Hyperthyroidism

Increased levels of free T4and T3

Common Cause-Grave's disease- autoimmune disease

Signs and Symptoms of Hyperthyroidism

1. Intolerance to heat as the body produces lot of heat due to increased basal metabolic rate caused by excess of thyroxine
2. Increased sweating due to vasodilatation
3. Decreased body weight due to fat mobilization
4. Diarrhea due to increased motility of GI tract
5. Muscular weakness because of excess protein,catabolism
6. Nervousness, extreme fatigue, inability to sleep, mild tremor in the hands and psychoneurotic symptoms such as hyperexcitability, extreme anxiety or worry. All these symptoms are due to the excess stimulation of neurons in the central nervous system
7. Toxic goiter
8. Oligomenorrhea or amenorrhea
9. Exophthalmos,lid lag
10. Polycythemia
11. Tachycardia and atrial fibrillation
12. Systolic hypertension
13. Cardiac failure.