

THYROID GLAND

- Thyroid gland has two combined lobes resembling a butterfly.
- The gland is in a position that is located on the trachea and larynx on the front part of the neck and surrounds them.
- Thyroid gland has T3 and T4 secretions.
- Thyroid hormones regulate the heart rate, blood pressure and body temperature.
- It also regulates the rate of growth and metabolic reactions in the body.
- It helps the growth and development of children from the fetal period.
- T3 and T4 are synthesized from iodine and tyrosine

Comparison of thyroid hormones

	T3	T4
Potency	More potent than T4	10 fold more secreted than T3
Effect rate	Fast effects (2-3 hours)	Slow effects (2-3 days)
Half life	3 days	7 days
Storage	Less storage	More storage
Inactivation	Fastly inactivated	Slowly inactivated

ENDOCRINE SYSTEM

THYROID FUNCTION TESTS:

Thyroid hormones: T3, T4, TSH,

Laboratory values:

Total T4: 60-150 nmol/L, sT4: 9.0-26.0 pmol/L

Total T3: 1.0-2.9 nmol/L, sT3: 3.0-9.0 pmol/L

In plasma:

The free (sT3, sT4) -active form

TBG (Thyroxine Binding Globulin)

TBG level is important; Drugs such as Salicylates and Fenio increase the level of sTx in the plasma because they bind to the same protein.

Hypothyroidism:

- Incidence: 2-15%
- It's more common in females.
- The incidence increases with age.

Symptoms:

Weakness tenderness, dry skin, loose muscle, weight gain, high cholesterol, constipation, bradycardia, angina, depression, slowing reflexes, anemia, weakening of academic performance

Myxedema coma: is a loss of brain function as a result of severe, longstanding low level of thyroid hormone in the blood (hypothyroidism). It can be caused by stress, trauma, surgery, infection, drugs (anesthetics, narcotics, hypnotics). And may result with hypothermia and death.

Cretinism: Severe hypothyroidism in newborns

Causes of Hypothyroidism:

- **Endemic iodine deficiency**
- **Autoimmune thyroiditis (Hashimoto's t.)**
- **Thyroiditis (8% in pregnancies, ~ 6 months after hyperthyroidism)**
- **thyroidectomy**
- **I-131 therapy**
- **External irradiation**
- **Congenital hypothyroidism (Incidence 1 / 3500-1 / 4000)**

Laboratory findings:

Primary hypothyroidism

- T3, T4 low, TSH high (> 5 mIU / L)
- Antibody
- Mild proteinuria in urine

Secondary Hypothyroidism

- T3, T4 low
- TSH is low or within normal limits.

Subclinical hypothyroidism: (indicates the degree of primary hypothyroidism)

- T3, T4 normal, TSH high

Optimum TSH value expected in hypothyroidism patients is $0.5 - 2.0$ mIU / L

Hyperthyroidism (Thyrotoxicosis):

Incidence is 0.3-0.6%

Symptoms:

Hot intolerance, tachycardia, weight loss, fatigue, tremor, menstrual disorders, low cholesterol

Causes of thyrotoxicosis:

- Diffuse toxic hyperplasia (Graves disease-autoimmune) thyrotropin receptor antibodies (TRAb) or thyroid stimulating immunoglobulins (TSI) (caused by stress, smoking, longitudinal radiation, drugs, virus)
- Toxic multinodular goiter
- The gland is aged and does not respond to pituitary regulation
- Pituitary or thyroid tumors
- Excess TSH release
- Iodine-containing medicines
- Amiodarone (cardiac agent) 5-deiodinase inh.
- Thyroiditis

Drugs-Thyroid hormone interactions

Corticosteroids, dopaminergics

low T3, T4, TSH

Li, Iodine,

low T3, T4, high TSH

Oestrogen, phenothiazine,,

high T3, T4, normal TSH

**phenytoin, carbamazepine,
Corticosteroids, androgen, NSAEI**

low T3, T4, normal TSH

**Beta blockers, Amiodarone, Thiouracil,
Glucocorticoids, Propranolol**

low T3, high T4 and TSH

Thyrotoxic crisis (in Graves' patients):

Infection, trauma, occurs at birth. Tachycardia, hyperpyrexia, dehydration, heart failure, pulmonary edema and death may occur.

Thyroiditis:

Thyroid inflammation caused by a viral infection or an autoimmune cause. Adenoviruses.

Goiter:

Hyperthyroid (Graves, Toxic multinodular goiter etc) and Hypothyroidism (Hoshimoto or I deficiency)
The thyroid gland grows in patients. Or euthyroid it may be a benign or malignant tumor in patients

SUMMARY

- TSH test is used for primer hypo and hyperthyroidism. 1st and 2nd generation TSH tests are available. Generation 1 TSH tests only detect hypothyroidism, while Genes 2 and 3 can detect hyperthyroidism. If thyroid function is first tested, TSH test is performed.

- TSH secretion has a circadian rhythm (major secretion between 10 am and 4 am). The normal level of serum TSH is 0.4-4.5 mIU / mL in adults. Some researchers suggest reducing the upper limit of this range to 2.5.

- Minimal thyroid insufficiency (subclinical hypothyroidism)
- Every 5 years for people over 35
- As a routine in pregnancy
- Increased risk of thyroid failure found (Familial risk, autoimmune disease, various drugs, ...)
- In children who show retarded growth

- TSH test should be performed.
- If high TSH is detected, free T4 before treatment should be detected.

- Serum TSH may not be a reliable test for secondary hypothyroidism.
- Abnormalities in TSH may not always be due to dysfunction (Drugs etc).