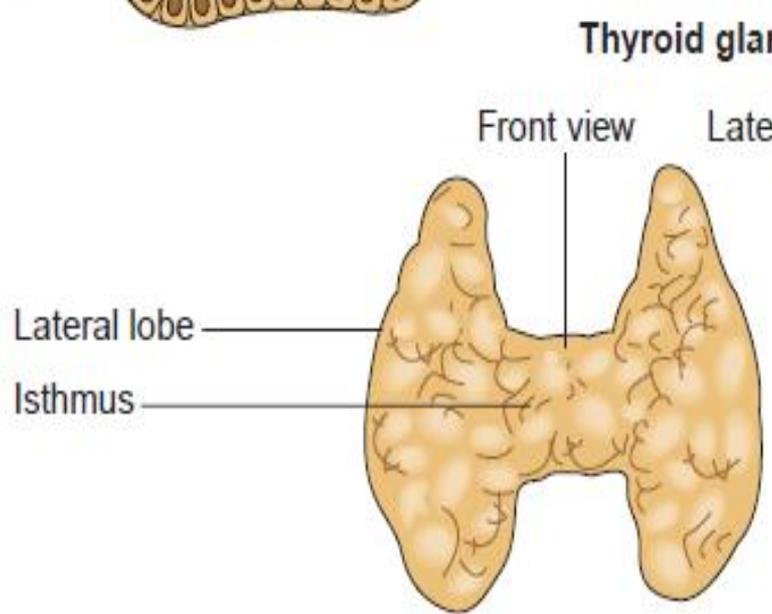
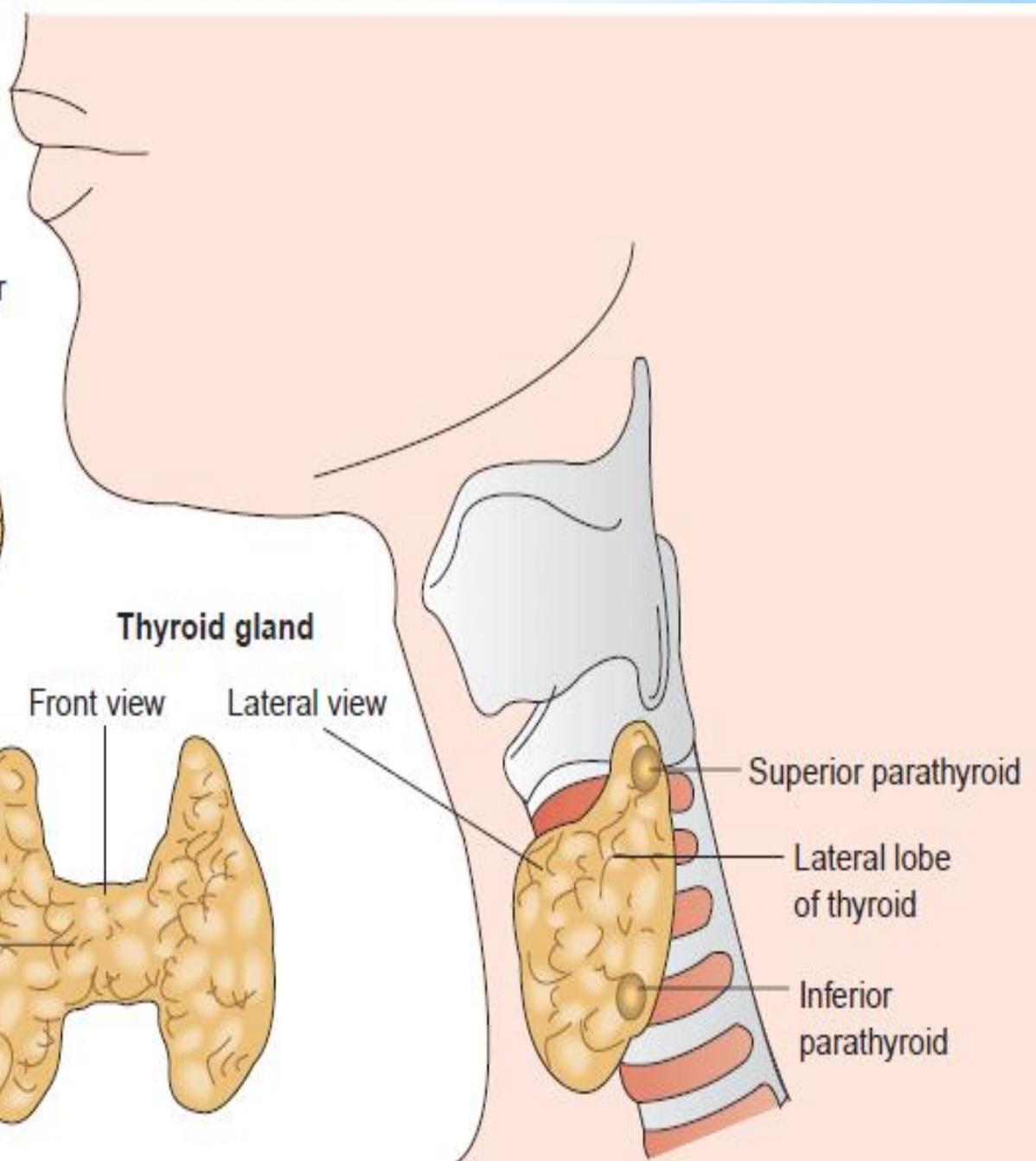
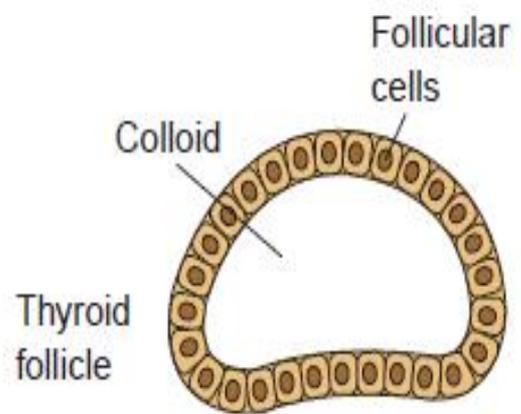


# \*Thyroid disease

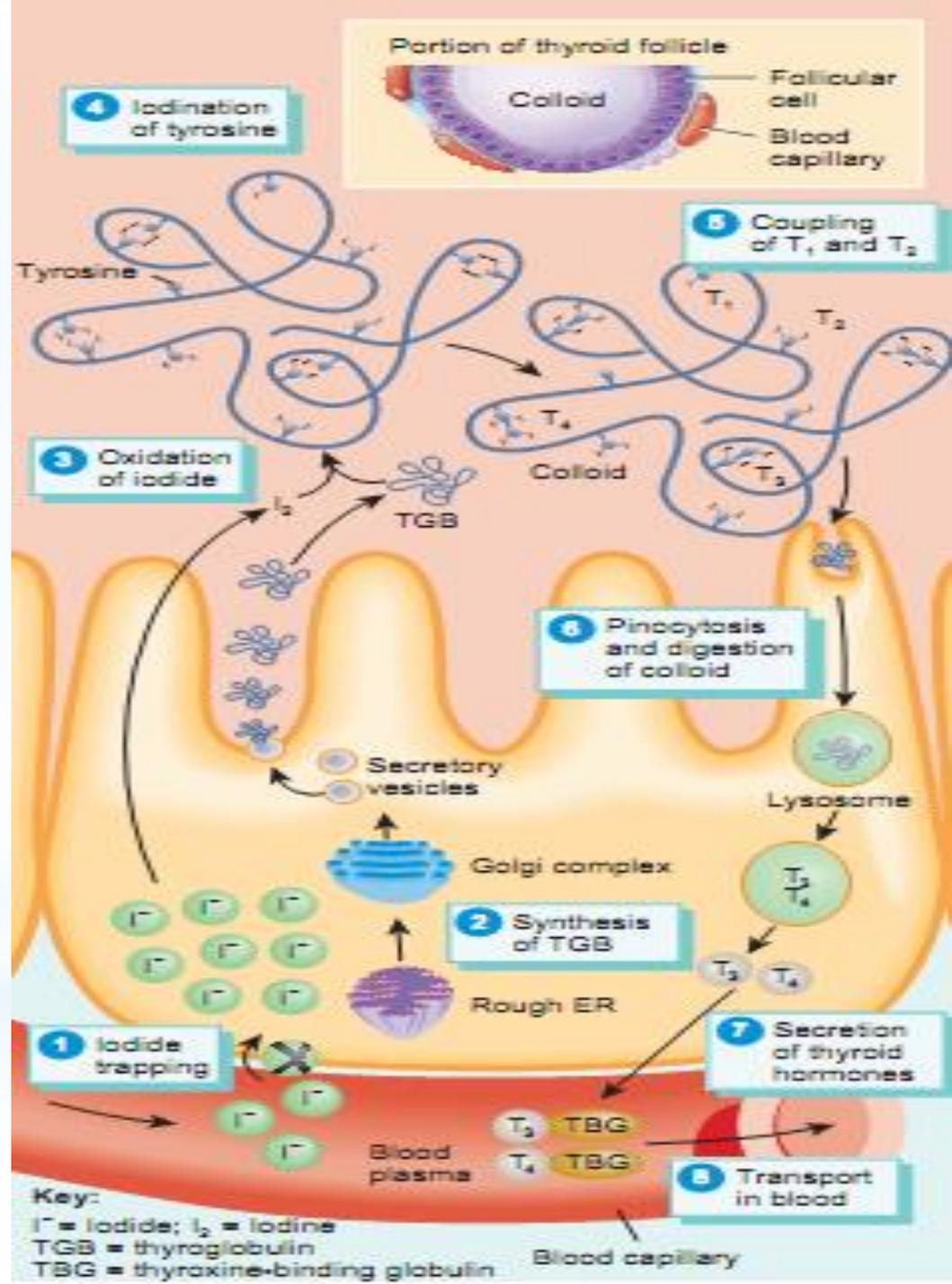


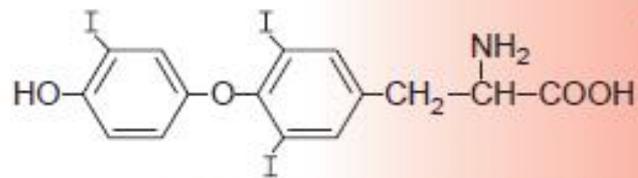
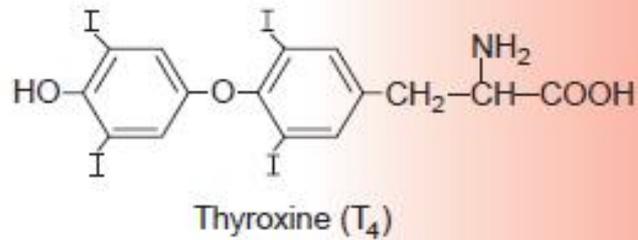
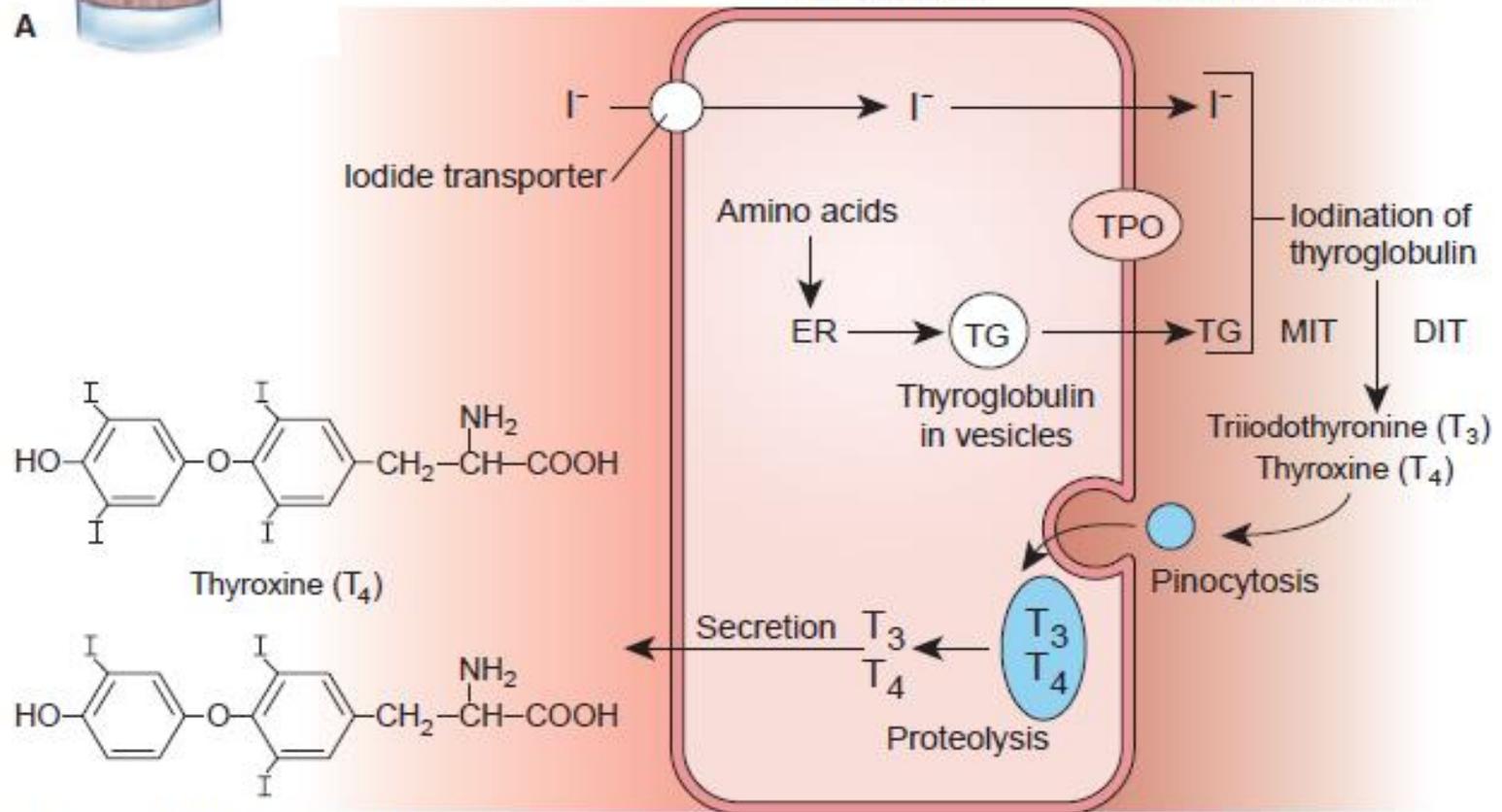
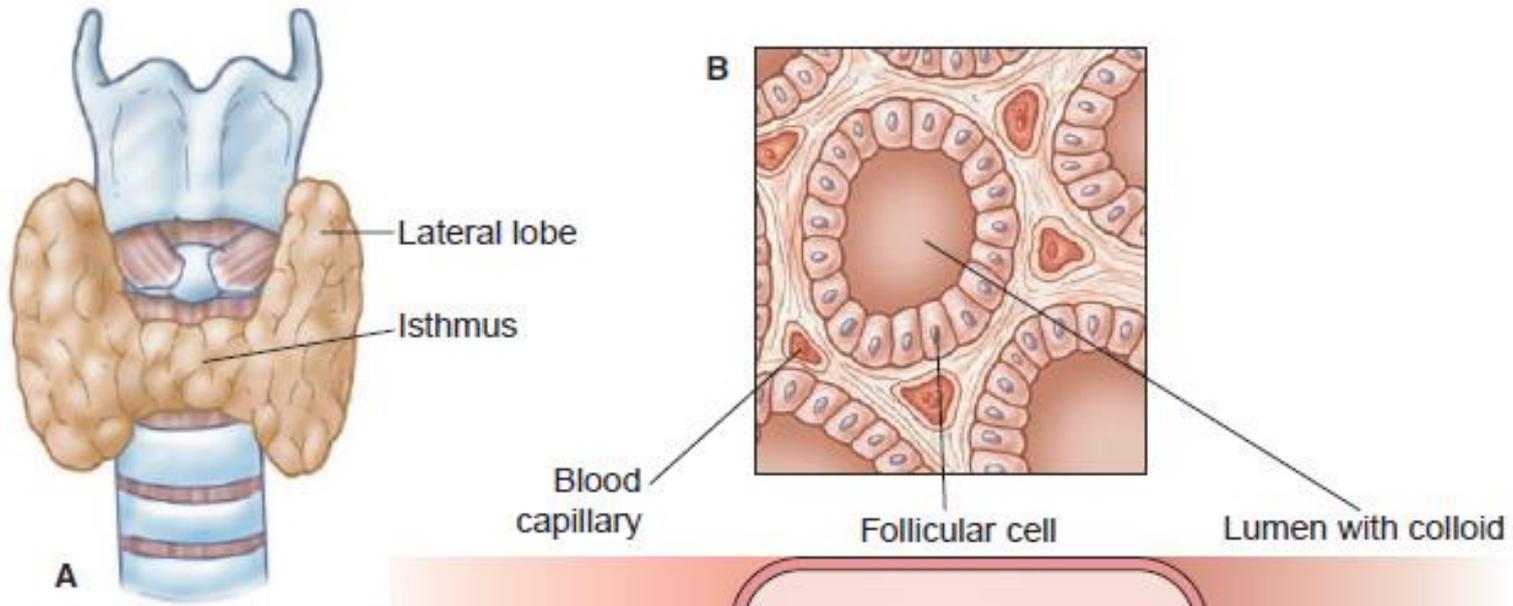
# **Thyroid disease: Under active or overactive of thyroid gland**

- \*Hypothyroidism
- \*Hyperthyroidism

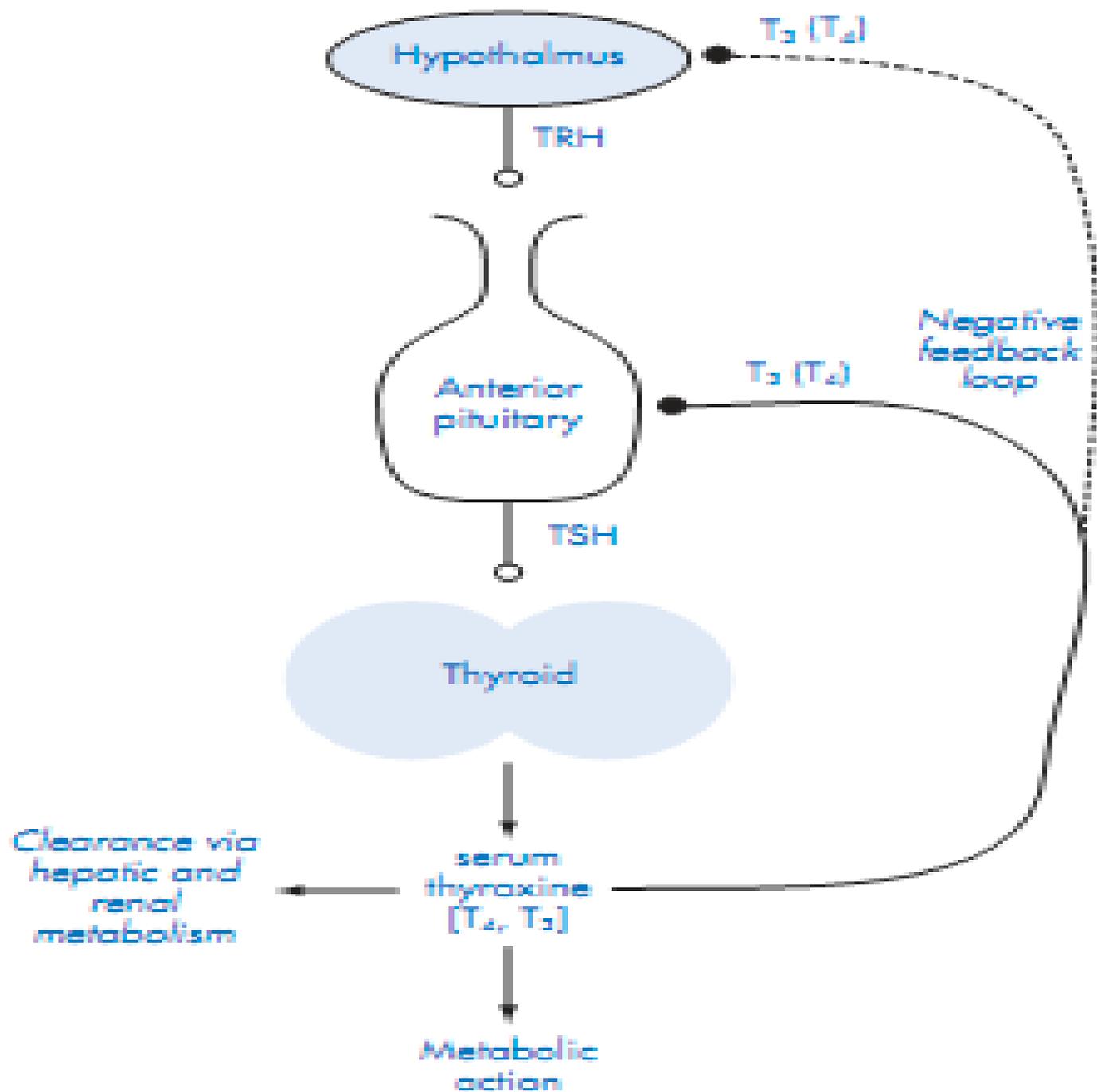
# Physiology of thyroid hormone

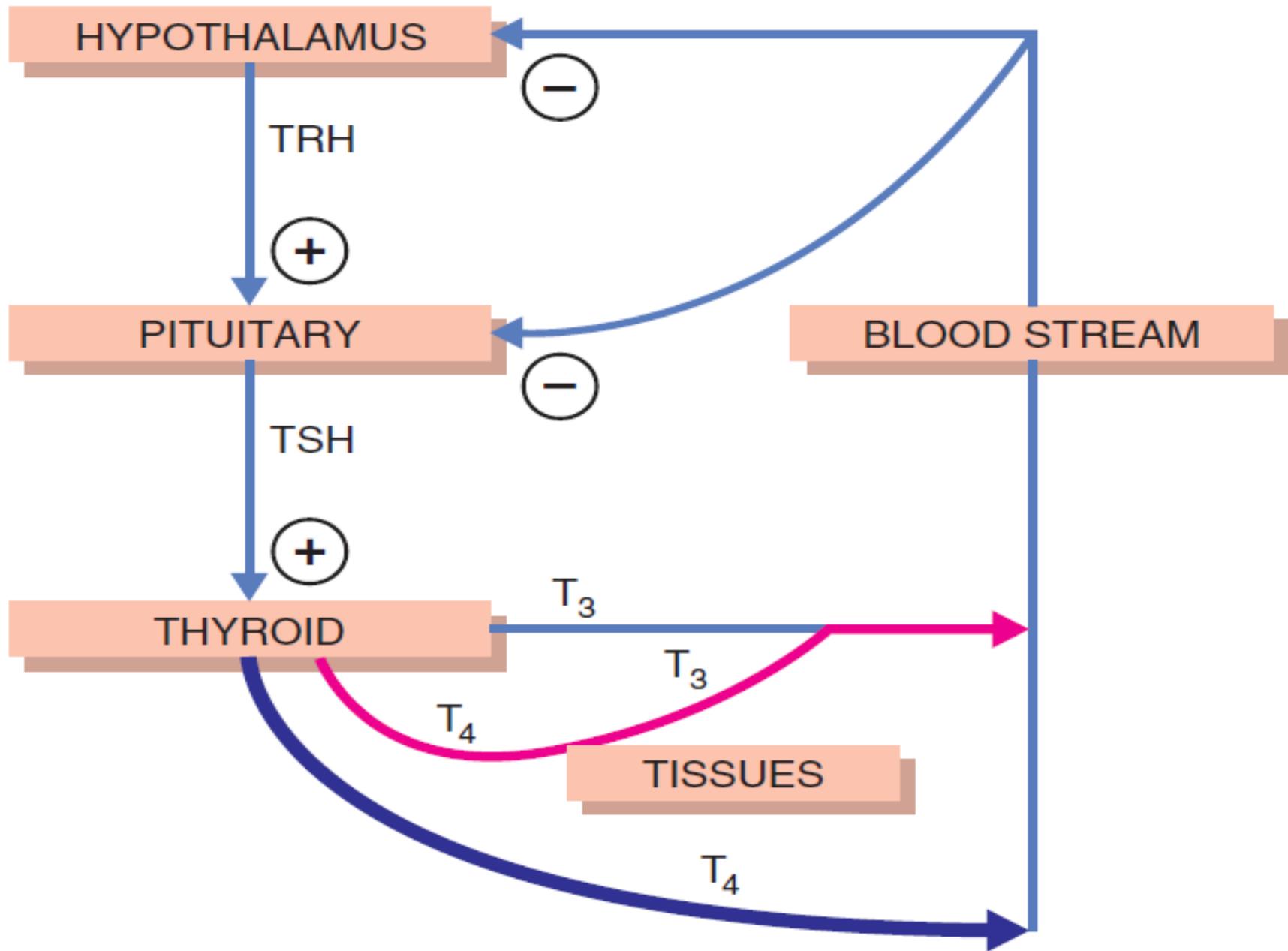
- ✓ Iodide trapping
- ✓ Oxidation of iodide
- ✓ Synthesis of thyroglobulin
- ✓ Iodination of tyrosine.
- ✓ Coupling of T<sub>1</sub> and T<sub>2</sub>
- ✓ Pinocytosis and digestion of colloid
- ✓ Secretion of thyroid hormones.
- ✓ transport in the blood





**C** Triiodothyronine (T<sub>3</sub>)





## **Actions of thyroid hormone**

- ✓ Metabolism and growth
- ✓ Cardiovascular
- ✓ CNS
- ✓ Reproductive system
- ✓ Body temperature

# Hypothyroidism

## Definition

\*Hypothyroidism is defined as the clinical and biochemical syndrome resulting from decreased thyroid hormone production.

## Epidemiology

\*Hypothyroidism occurs in 1.5% to 2% of women and 0.2% of men, and its incidence increases with age

# \* Causes

- \* Hypothyroidism has several causes, including
- \* Hashimoto's disease (Autoimmune thyroid disease )
- \* Thyroiditis, or inflammation of the thyroid gland
- \* Congenital hypothyroidism, or hypothyroidism that is present at birth
- \* Surgical removal of part or all of the thyroid gland (Thyroidectomy)

- \* Radiation treatment of the thyroid
- \* Some medications (Certain goitrogenic agents, such as lithium Carbonate and Antithyroid drugs propylthiouracil and methimazole)

\*Large amounts of iodine

\*Administration of iodide-containing radiographic contrast

\*Media cardiac antiarrhythmic class III drug amiodarone, which contains 75 mg of iodine per 200-mg tablet

\*Iodide-containing cough syrups

## \* Congenital

- \* Acquired hypothyroidism can result from destruction or dysfunction of the thyroid gland (i.e., **primary hypothyroidism**),
- \* **Secondary disorder** caused by impaired pituitary function
- \* **Tertiary disorder** caused by a hypothalamic dysfunction.

\* **Types**

# Primary Hypothyroidism

## Autoimmune

- \* Hashimoto's thyroiditis

## Iatrogenic

- \*  $^{131}\text{I}$  therapy
- \* Thyroidectomy

## Drug-induced

- \* Iodine deficiency
- \* Iodine excess
- \* Lithium
- \* Amiodarone
- \* Antithyroid drugs

## **Secondary Hypothyroidism**

### **Hypothalamic dysfunction**

- \*Neoplasms
- \*Infiltrative disease
- \*Radiation

### **Pituitary dysfunction**

- \*Neoplasms
- \*Pituitary surgery
- \*Postpartum pituitary necrosis
- \*Idiopathic hypopituitarism
- \*Radiation

\***Hashimoto thyroiditis**, an autoimmune disorder in which the thyroid gland may be totally destroyed by an immunologic process

\*Present with either goitrous thyroid gland enlargement and mild hypothyroidism

\*Thyroid gland atrophy and more severe thyroid hormone deficiency

A goiter is an abnormal enlargement of the thyroid gland

**ic Autoimmune  
Thyroiditis**

\* Specific defects in suppressor T-lymphocyte directed against normally occurring antigens on the thyroid membrane.

\* Once these T lymphocytes interact with thyroid membrane antigen, B lymphocytes are stimulated to produce thyroid antibodies

\* **Pathophysiology**

- \* These antibodies are capable of fixing complement and inducing cytotoxic changes in thyroid cells.
- \* Antibodies that stimulating **thyroid growth** through interaction with the TSH receptor can be found particularly in goitrous hypothyroidism
- \* Antibodies that inhibit the **trophic effects** of TSH are present in the atrophic type

\*Thyroiditis is an inflammation of the thyroid gland, usually caused by an autoimmune attack (in postpartum thyroiditis or silent thyroiditis) or by a viral infection.

\*The transient hyperthyroid state is caused by leakage of preformed thyroid hormone from damaged cells of the gland

\***Thyroiditis**

- \* once all of the stored hormone has been released, the thyroid becomes underactive
- \* **Subacute thyroiditis** (autoimmune) : This condition involves painful inflammation and enlargement of the thyroid.
- \* **Postpartum thyroiditis** (autoimmune) : About 8 percent of women who have been pregnant develop postpartum thyroiditis within a few months of giving birth.

\* Iatrogenic (induced by therapy) hypothyroidism follows exposure to excessive amounts of radiation (radioiodine or external radiation) or surgery.

\* Hypothyroidism occurs within 3 months to a year after  $^{131}\text{I}$  therapy in most patients treated for Graves' disease.

## \* Iatrogenic Hypothyroidism

\* External radiation therapy to the region of the thyroid using doses of greater than 2,500 cGy for therapy of neck carcinoma also causes hypothyroidism.

\* Total thyroidectomy causes hypothyroidism within 1 month.

- \* A few babies are born without a thyroid or with a partly formed thyroid
- \* A few babies have part or all of their thyroid in the wrong place (ectopic thyroid).
- \* In some babies, the thyroid cells or their enzymes don't work right

## \* Congenital Hypothyroidism

\*Pituitary insufficiency can be caused by destruction of thyrotrophs by either **functioning or non functioning pituitary tumors**, **surgical therapy**, **external pituitary radiation**, **postpartum pituitary necrosis** (trauma, and infiltrative processes of the pituitary such as metastatic tumors, tuberculosis, histiocytosis, and autoimmune mechanisms

\***Pituitary Disease**

\*Hypothalamic Hypothyroidism TRH deficiency also causes a **rare form** of central hypothyroidism. In both adults and children it can occur as a result of cranial irradiation, trauma, infiltrative diseases, or neoplastic diseases.

## \*Hypothalamic Hypothyroidism

\*Myxedema implies the presence of a **nonpitting mucus type of edema** caused by an accumulation of a hydrophilic mucopolysaccharide substance in the connective tissues throughout the body

\***Myxedema**

\* Myxedematous coma is a rare life-threatening, end-stage expression of hypothyroidism.

\* It is characterized by coma, hypothermia, cardiovascular collapse, hypoventilation, and severe metabolic disorders that include hyponatremia, hypoglycemia, and lactic acidosis.

\* **Myxedema Coma**

The pathophysiology of myxedema coma involves three major aspects:

- (1) Carbon dioxide retention and hypoxia,
- (2) Fluid and electrolyte imbalance, and
- (3) Hypothermia

## \* Pathophysiology of myxedema

# \*Hyperthyroidism

- \* Thyrotoxicosis results when tissues are exposed to excessive levels of T4, T3, or both.
- \* The most common cause of hyperthyroidism is Graves disease, which is accompanied by ophthalmopathy (or dermopathy) and diffuse goiter

## \* Thyrotoxicosis

## *Primary*

- \* Graves disease
- \* Multinodular goiter
- \* Adenoma and carcinoma (tumors)
- \* Iodine-induced hyperthyroidism

## *Secondary*

- \* TSH-secreting pituitary adenoma (rare)\*

\*Types

\* Graves' disease includes hyperthyroidism, diffuse thyroid enlargement, and exophthalmos, and less commonly pretibial myxedema and thyroid acropachy

\* **Pathogenesis.** *Graves disease is an autoimmune disorder* in which a variety of antibodies may be present in the serum, including antibodies to the TSH(main) receptor, thyroid peroxisomes, and thyroglobulin.

\* **Graves Disease**



Pretibial myxedema, Exophthalmus, Thyroid acropachy

- \* *Multinodular goiters reflect impaired synthesis of thyroid hormone, most often caused by dietary iodine deficiency*
- \* Impairment of thyroid hormone synthesis leads to a compensatory rise in the serum TSH level, which, in turn, causes hypertrophy and hyperplasia of thyroid follicular cells and, ultimately, gross enlargement of the thyroid gland.
- \* *Mutations in proteins of the TSH-signaling pathway*

## \* **Multinodular goiter**

\*Follicular carcinoma

\*Thyroid adenoma

\*Tumors

\*Thyroiditis is an inflammation of the thyroid that causes stored thyroid hormone to leak out of the thyroid gland. At first, the leakage raises hormone levels in the blood, leading to hyperthyroidism that lasts for 1 or 2 months. Most people then develop hypothyroidism

\*Subacute thyroiditis

\*Postpartum thyroiditis.

\*Silent thyroiditis

\*Thyroiditis

\* Consuming large amounts of iodine may cause the thyroid to make excess thyroid hormone

\* **Consuming Too Much Iodine**

\*Thyroid storm is a life-threatening medical emergency characterized by decompensated thyrotoxicosis, high fever (often  $>39.4^{\circ}\text{C}$  [ $103^{\circ}\text{F}$ ]), tachycardia, tachypnea, dehydration, delirium, coma, nausea, vomiting, and diarrhea.

\*Thyroid Storm

**LEVEL OF ORGANIZATION****HYPOTHYROIDISM****HYPERTHYROIDISM**

Basal metabolic rate	Decreased	Increased
Sensitivity to catecholamines	Decreased	Increased
General features	Myxedematous features	Exophthalmos (in Graves disease)
	Deep voice	Lid lag
	Impaired growth (child)	Accelerated growth (child)
Blood cholesterol levels	Increased	Decreased
General behavior	Mental retardation (infant)	Restlessness, irritability, anxiety
	Mental and physical sluggishness	Hyperkinesia
	Somnolence	Wakefulness
Cardiovascular function	Decreased cardiac output	Increased cardiac output
	Bradycardia	Tachycardia and palpitations
Gastrointestinal function	Constipation	Diarrhea
	Decreased appetite	Increased appetite
Respiratory function	Hypoventilation	Dyspnea
Muscle tone and reflexes	Decreased	Increased, with tremor and twitching
Temperature tolerance	Cold intolerance	Heat intolerance
Skin and hair	Decreased sweating	Increased sweating
	Coarse and dry skin and hair	Thin and silky skin and hair
Weight	Gain	Loss

## **Diagnosis**

### **Normal**

T.T4: 4.5–10.9 mcg/dL

FT4: 0.8–2.7 ng/dL

TT3: 60–181 ng/Dl

TSH: 0.5–4.7 mIU/L

## **Primary hypothyroidism**

- \*Elevated serum TSH and low free T3 and T4

## **Secondary hypothyroidism**

- \*TSH levels will be within or below the reference range
- \*Free and/or total T4 and T3 serum concentrations will be low.

- \***Subclinical hypothyroidism** (serum TSH  $>4.5$  mIU/L; and T4 normal)

- \***“Clinically significant” hypothyroidism** (TSH  $>4.5$  mIU/L; and T4  $<4.5$  mcg/dL).



\*Thank you