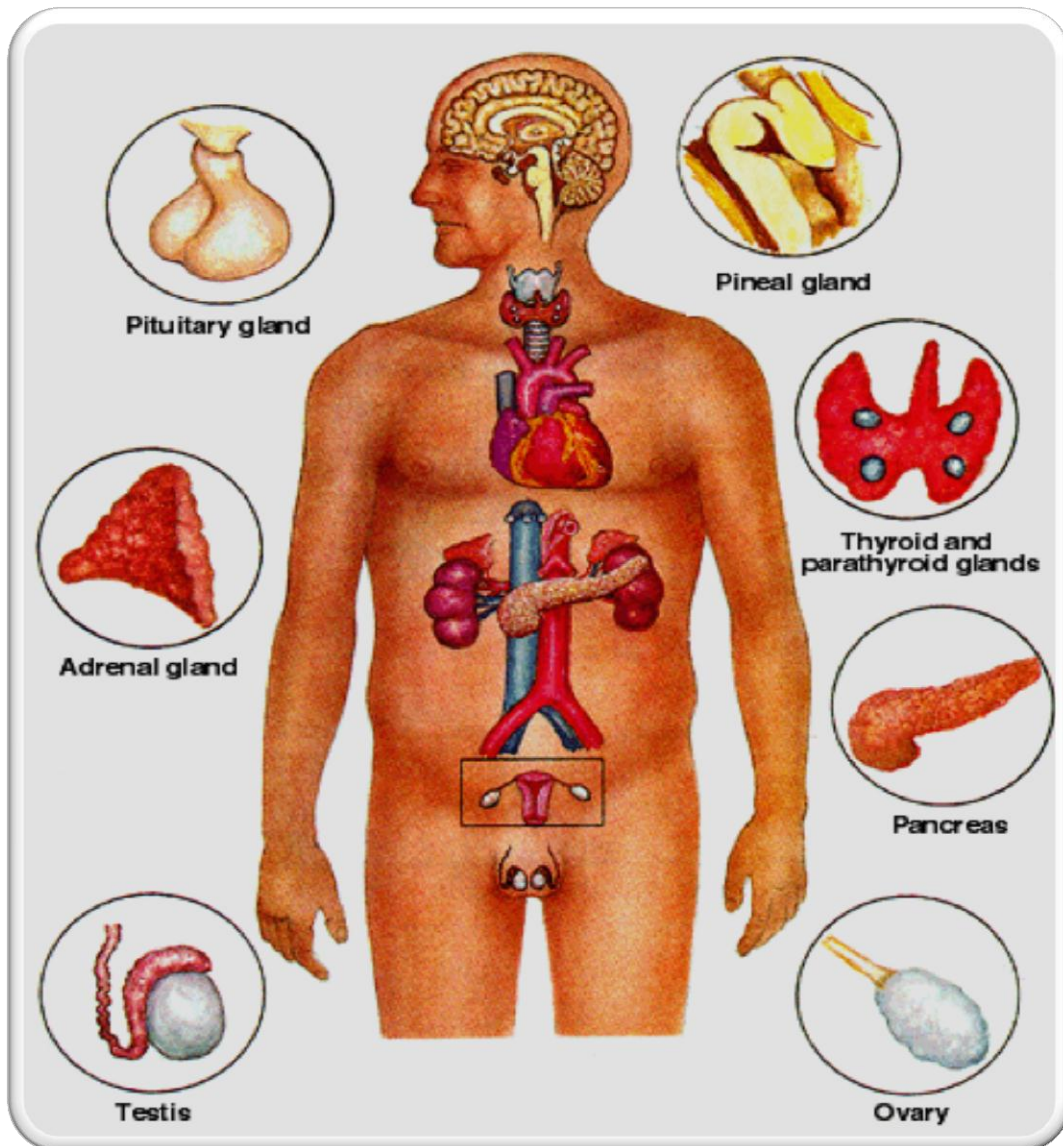


ENDOCRINE BLOCK

PHYSIOLOGY TEAM 431



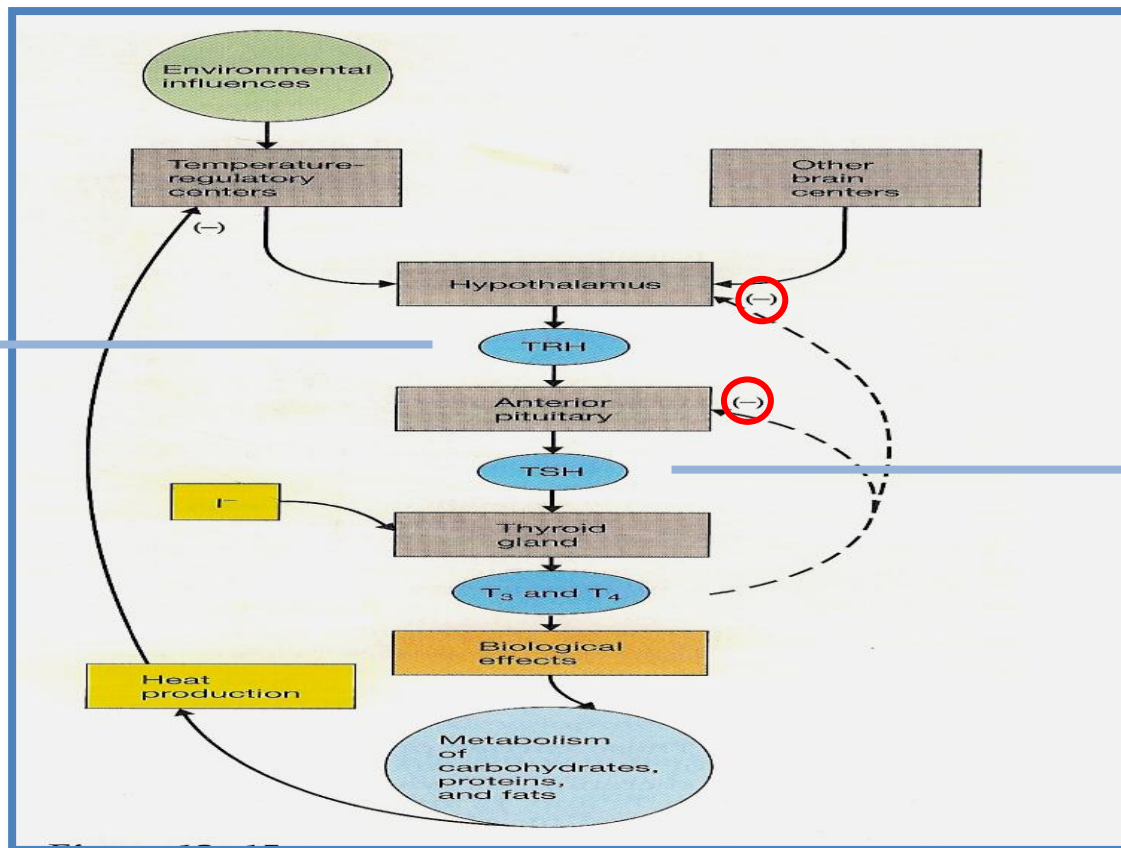
Done by : Sara Alhaddab & Abdullah alanazi

Revised by : Nour Al-Khawajah & Mohammed Asiri

THE THYROID GLAND - 2

REGULATION OF HORMONES SECRETION

It is regulated by the hypothalamic-pituitary axis.



1- Thyrotropin-releasing hormone (TRH):

- Tripeptide in nature.
- Secreted from Paraventricular nuclei of the hypothalamus.
- Act on the thyrotrophs of the anterior pituitary
- Transcription and secretion of TSH.
- Phospholipid second messenger system.

2- Thyroid-stimulating hormone (TSH):

- Glycoprotein in nature.
- Secreted from Anterior pituitary.
- Regulate metabolism, secretion and growth of thyroid gland (trophic effect).

Action of TSH:

- Increase proteolysis of the thyroglobulin
- Increase pump activity
- Increase iodination of tyrosine
- Increase coupling reaction
- Trophic effect

- ✓ TSH secretion started at 11-12 of gestational weeks
- ✓ TSH + receptor → activation of adenylyl cyclase via G_s protein → ↑cAMP → ↑ activation of protein kinase → multiple phosphorylation → secretion and thyroid growth.

Table 9-8 Factors Affecting Thyroid Hormone Secretion

Stimulatory Factors	Inhibitory Factors
TSH	I ⁻ deficiency
Thyroid-stimulating immunoglobulins	Deiodinase deficiency
Increased TBG levels (e.g., pregnancy)	Excessive I ⁻ intake (Wolff-Chaikoff effect)
	Perchlorate; thiocyanate (inhibit Na ⁺ -I ⁻ cotransport)
	Propylthiouracil (inhibits peroxidase enzyme)
	Decreased TBG levels (e.g., liver disease)

Copyright © 2010 by Saunders, an imprint of Elsevier Inc. All rights reserved.

Hyperthyroidism (Over activity of the thyroid gland)

- **Activity of gland:**
 - ✓ 5 - 10 times increase in secretion
 - ✓ 2 - 3 times increase in size
 - ☒ Women : men ratio (8:1)

6. **G.I tract:**

- Weight loss.
- Diarrhea.

7. **Renal function:**

- ↑ Glomerular filtration rate.

8. **Exophthalmos:**

(The cause is unknown but it is because of swelling of retroocular tissue)

- Anxious staring expression.
- Protrusion of eye balls.

9. **Others:**

- Menstrual cycle disturbance



✓ **Based on the Investigations:**

Serum measurement of T3, T4 and TSH

	T3,T4	TSH
primary hyperthyroidism	high	low
secondary hyperthyroidism	high	high

▪ **Treatment:**

• **Medical therapy:**

- E.g. Propylthiouracil (Antithyroid agent)
- Usually for 12-18 months course
- With 3-4 monthly monitoring

• **Surgery:**

- Subtotal thyroidectomy
- Indication for surgery:
 1. Relapse after medical treatment
 2. Drug intolerance
 3. Cosmetic.(Surgery that modifies or improves the appearance of a physical feature)
 4. Suspected malignancy

Hypothyroidism

- ✓ Under activity of the thyroid gland
- ✓ more in woman (30- 60 years).

Causes:

1. Inherited abnormalities of thyroid hormone synthesis :

- Peroxidase defect
- Iodide trapping defect
- Thyroglobulin defect

2. Endemic Colloid Goiter:

- Table Salt (iodized salt) reduced the incidence
- ↓Iodide → ↓ Hormone formation → ↑ TSH
→ ↑ Thyroglobulin → ↑Size (10-times)

3. Idiopathic Nontoxic Colloid Goiter:

- There is no iodine deficiency.
- It has the symptoms of mild Thyroiditis
- Inflammation → ↑ Cell damage → ↓ Hormone secretion
→ ↑ TSH → ↑ Activity of normal cells → ↑ Size

4. Gland destruction (surgery)

5. Pituitary diseases or tumor

6. Hypothalamus diseases or tumor

Diagnosis

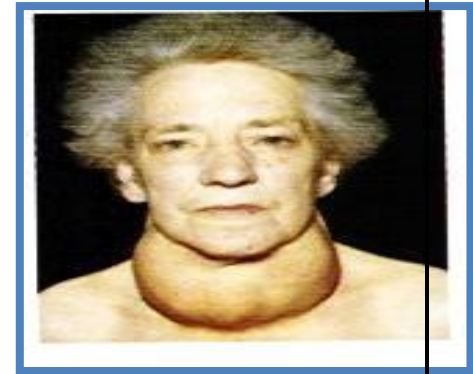
- ✓ Based on the Signs and Symptoms

1. Skin:

- Dry Skin
- Cold Intolerance. (Abnormal sensitivity to a cold environment)

2. Musculoskeletal:

- ↑Muscle Bulk
- ↓In Skeletal Growth
- Muscle Sluggishness
- Slow relaxation after contraction.



3. **Neurological:**

- Slow Movement
- Impaired Memory
- Decrease Mental Capacity

4. **Cardiovascular:**

- ↓Heart rate
- ↓Stroke volume

5. **G.I tract:**

- Constipation
- Increase Weight

6. **Renal function:**

- ↓ Glomerular filtration rate

7. **Myxoedema:**

- An edematous appearance throughout the body

8. **Others:**

- Loss of libido.(Loss of sexual desire)
- Menstrual cycle disturbance

In this condition, for reasons not explained, greatly increased quantities of hyaluronic acid and chondroitin sulfate bound with protein form excessive tissue gel in the interstitial spaces, and this causes the total quantity of interstitial fluid to increase. Because of the gel nature of the excess fluid, it is mainly immobile, and the edema is the nonpitting type



✓ Based on the Investigations

	T3,T4	TSH
primary hypothyroidism	low	High
secondary hypothyroidism	low	low

▪ **Treatment:**

- **L-Thyroxine** (Is a synthetic form of thyroid hormone)
 - Starting dose is 25-50 µg
 - Increase to 200 µg
 - At 2-4 weeks period
 - ☒ The first response seen is the weight loss

Table 9-9 Pathophysiology of Thyroid Hormones

	Hyperthyroidism	Hypothyroidism
Symptoms	<ul style="list-style-type: none"> Increased basal metabolic rate Weight loss Negative nitrogen balance Increased heat production Sweating Increased cardiac output Dyspnea (shortness of breath) Tremor, muscle weakness Exophthalmos Goiter 	<ul style="list-style-type: none"> Decreased basal metabolic rate Weight gain Positive nitrogen balance Decreased heat production Cold sensitivity Decreased cardiac output Hypoventilation Lethargy, mental slowness Drooping eyelids Myxedema Growth retardation Mental retardation (perinatal) Goiter
Causes	<ul style="list-style-type: none"> Graves' disease (increased thyroid-stimulating immunoglobulins) Thyroid neoplasm Excess TSH secretion Exogenous T₃ or T₄ (factitious) 	<ul style="list-style-type: none"> Thyroiditis (autoimmune or Hashimoto's thyroiditis) Surgery for hyperthyroidism I⁻ deficiency Congenital (cretinism) Decreased TRH or TSH
TSH Levels	<ul style="list-style-type: none"> Decreased (feedback inhibition of T₃ on the anterior lobe) Increased (if defect is in anterior pituitary) 	<ul style="list-style-type: none"> Increased (by negative feedback if primary defect is in thyroid gland) Decreased (if defect is in hypothalamus or anterior pituitary)
Treatment	<ul style="list-style-type: none"> Propylthiouracil (inhibits peroxidase enzyme and thyroid hormone synthesis) Thyroidectomy ¹³¹I⁻ (destroys thyroid) β-Adrenergic blocking agents (adjunct therapy) 	<ul style="list-style-type: none"> Thyroid hormone replacement therapy

Cretinism

- Extreme hypothyroidism during infancy and childhood (failure of growth)

- **Causes:**

- 1- Congenital lack of thyroid gland (congenital cretinism)
- 2- Genetic deficiency leading to failure to produce hormone
- 3- Iodine lack in the diet (endemic cretinism)

- **Symptoms:**

- 1- Infant is normal at birth but abnormality appears within weeks
- 2- Protruding tongue
- 3- Dwarf with short limbs
- 4- Mental retardation
- 5- Often umbilical hernia
- 6- Teeth

- **Treatment:**

- Changes are irreversible unless treatment is given early.

