



המרכז הרפואי לגליל  
רפואה מוקדמת ואנליטי

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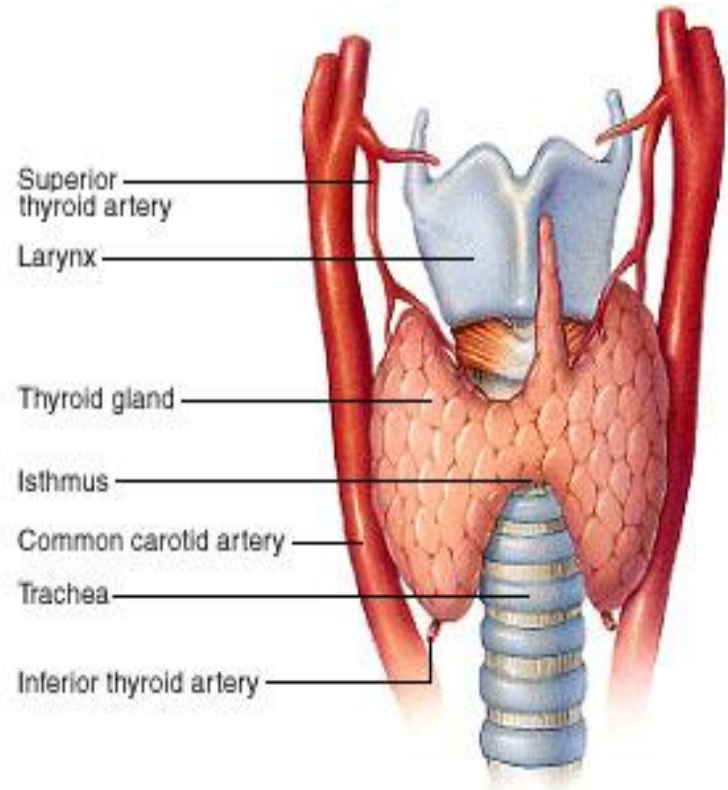
# The diseases of thyroid

Dr. Nodelman Marina

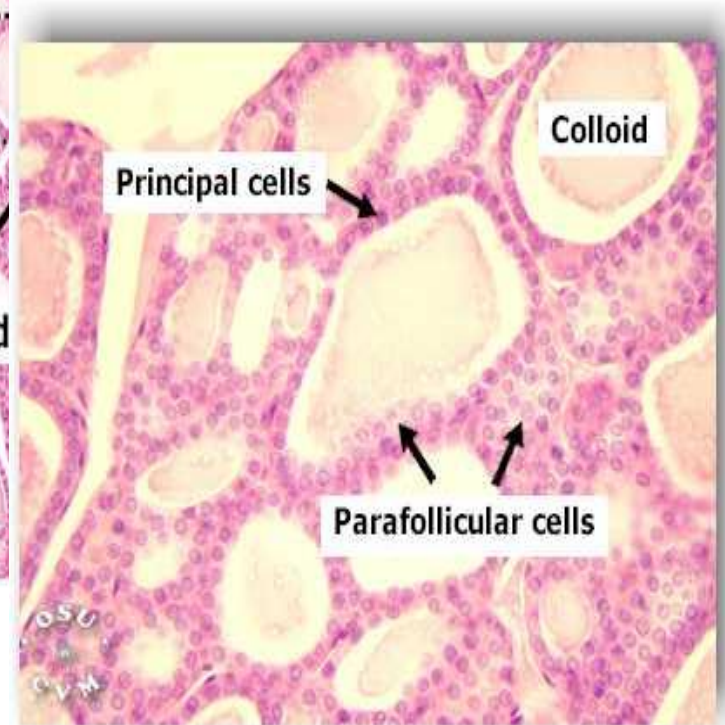
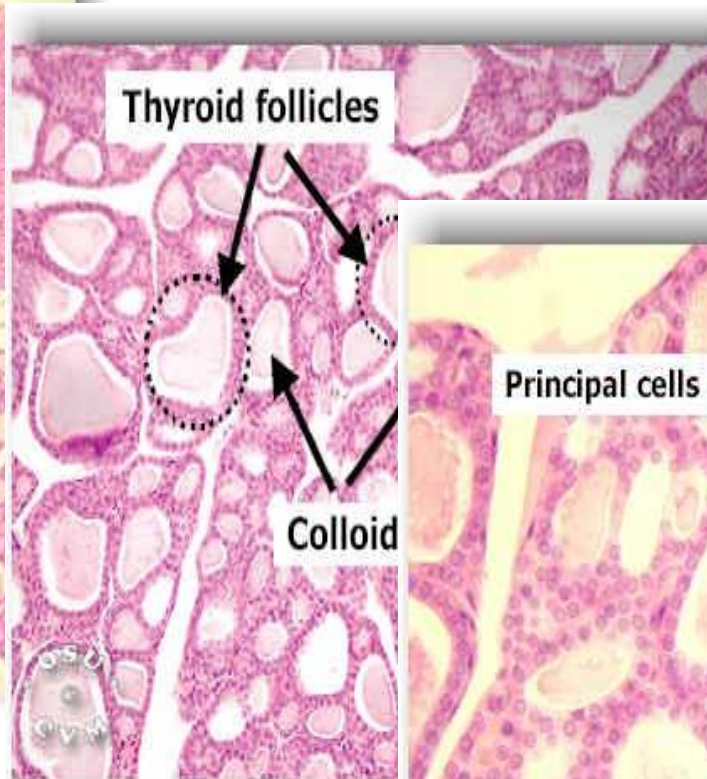
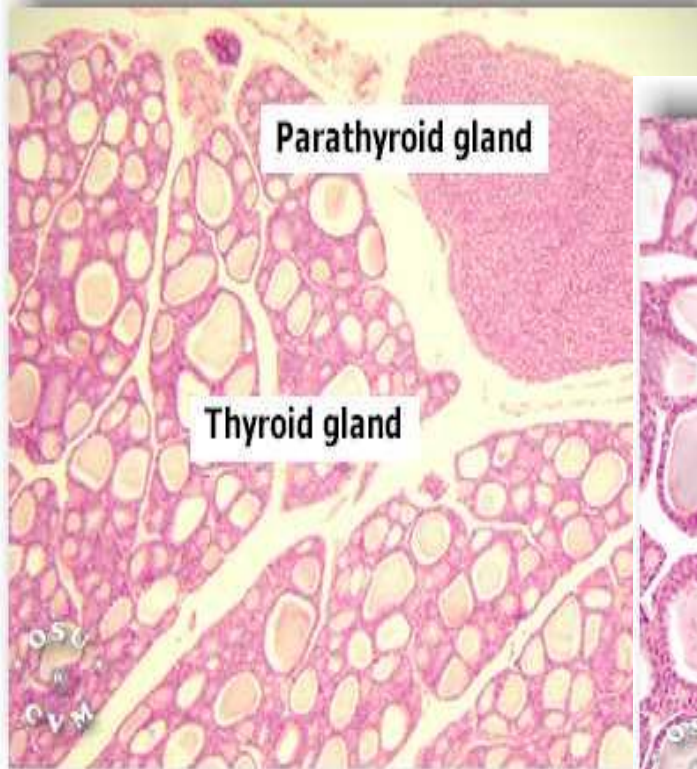
# The anatomy and function

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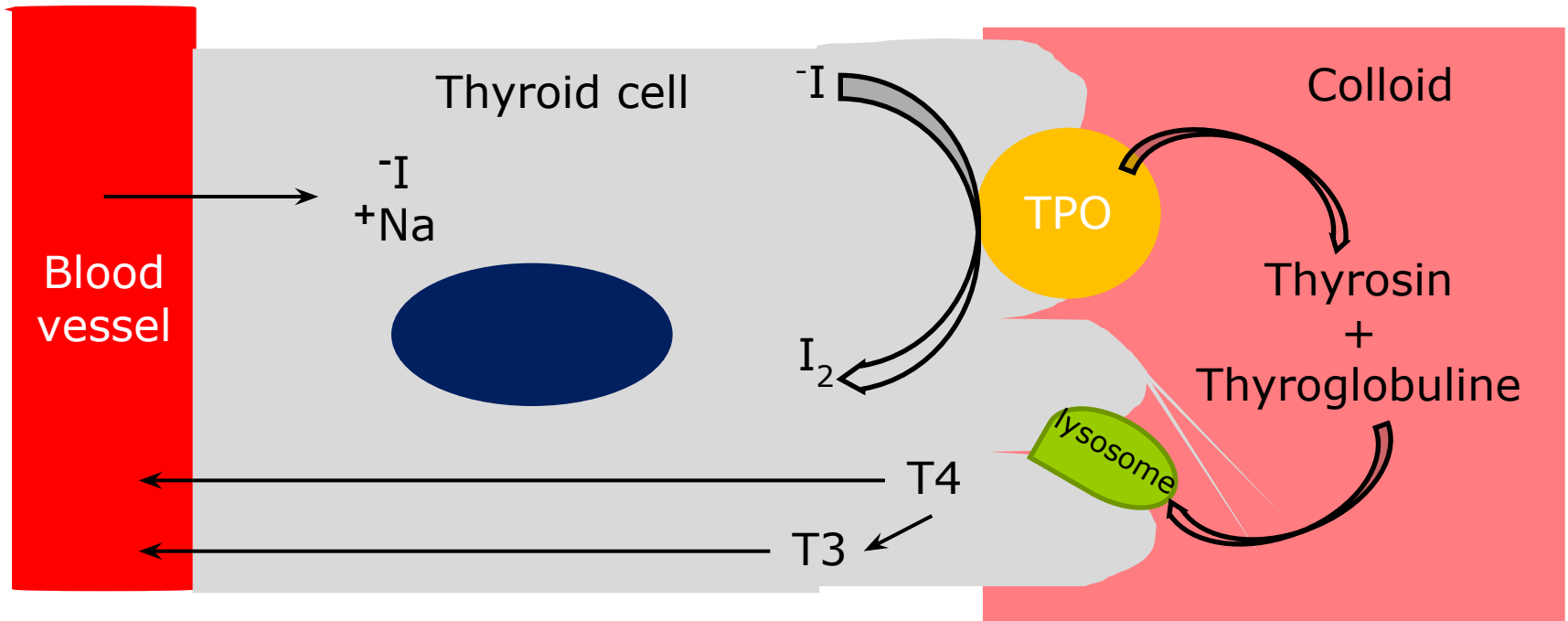
- ❖ In the prenatal period and childhood: cells differentiation and growth
- ❖ In adults: thermoregulation, basal metabolic rate, carbohydrate's and protein's metabolism



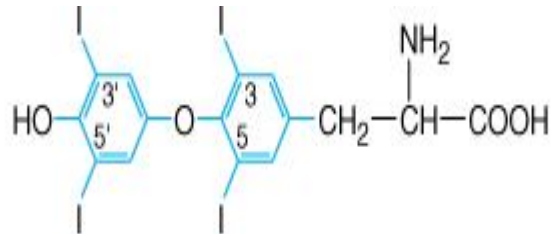
# Thyroid structure



# Synthesis of thyroid hormones



# Thyroid hormones

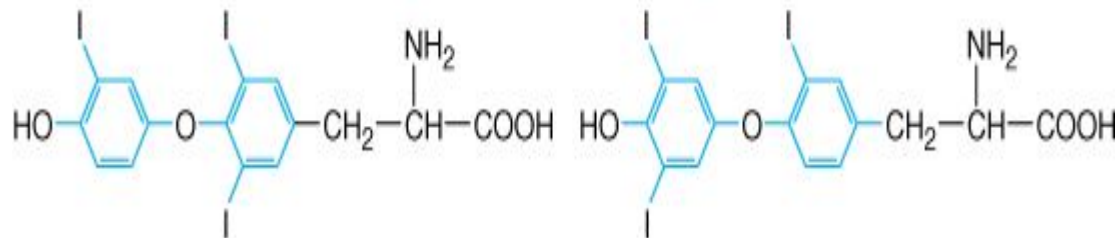


**Thyroxine (T<sub>4</sub>)**

3,5,3',5'-Tetraiodothyronine

*Deiodinase 1 or 2*  
(5'-Deiodination)

*Deiodinase 3>2*  
(5-Deiodination)



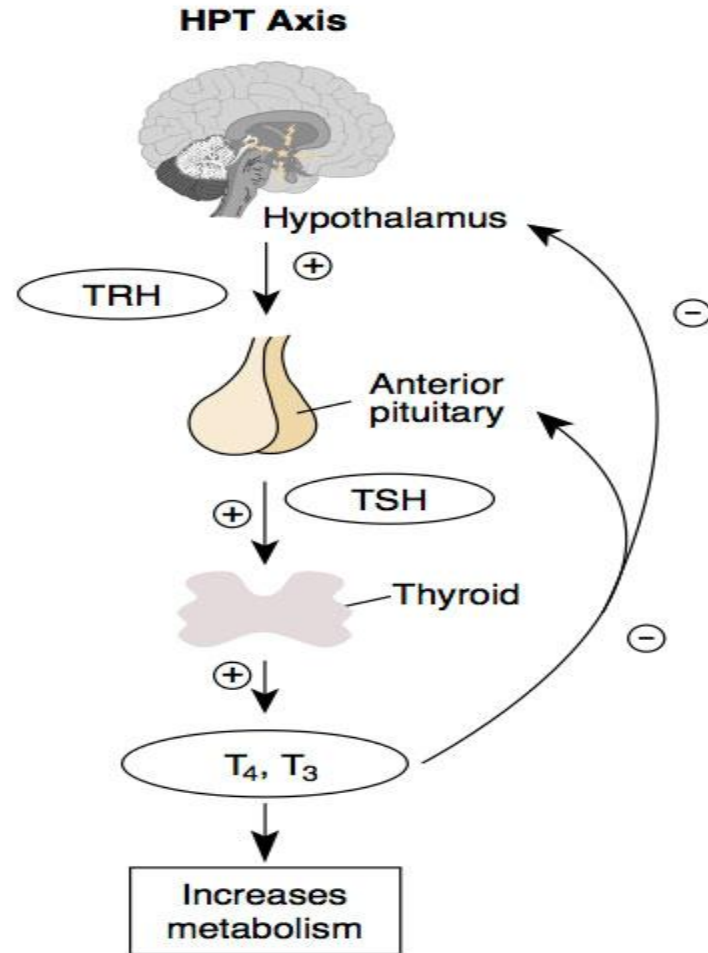
**Tri-iodothyronine (T<sub>3</sub>)**

3,5,3'-Triiodothyronine

**Reverse T<sub>3</sub> (rT<sub>3</sub>)**

3,3',5'-Triiodothyronine

# Regulation of thyroid function



# Hyperthyroidism

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overproduction  
of thyroid hormones by the thyroid

## Thyrotoxicosis

the condition of thyroid hormone excess, not  
always due to overproduction

# Classification

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- ▣ **Subclinical hyperthyroidism:**

TSH low, FT4&FT3 normal, no symptoms

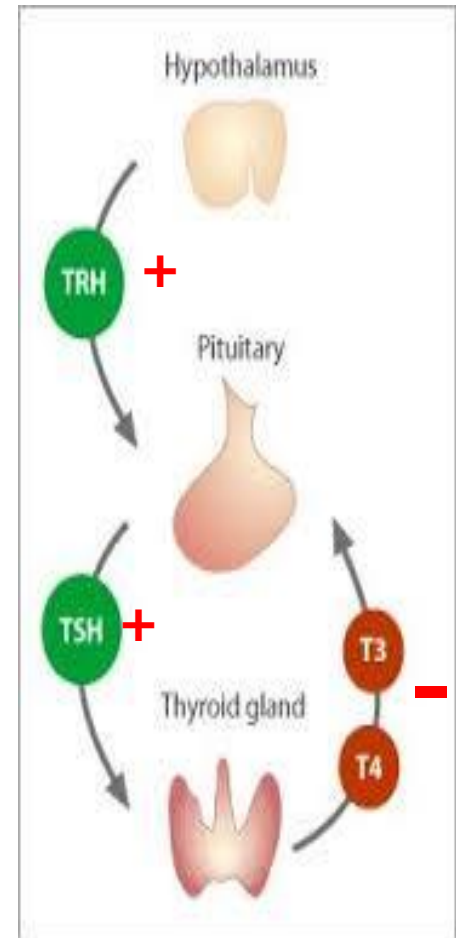
- ▣ **Clinical hyperthyroidism:**

TSH low, FT4&FT3 high

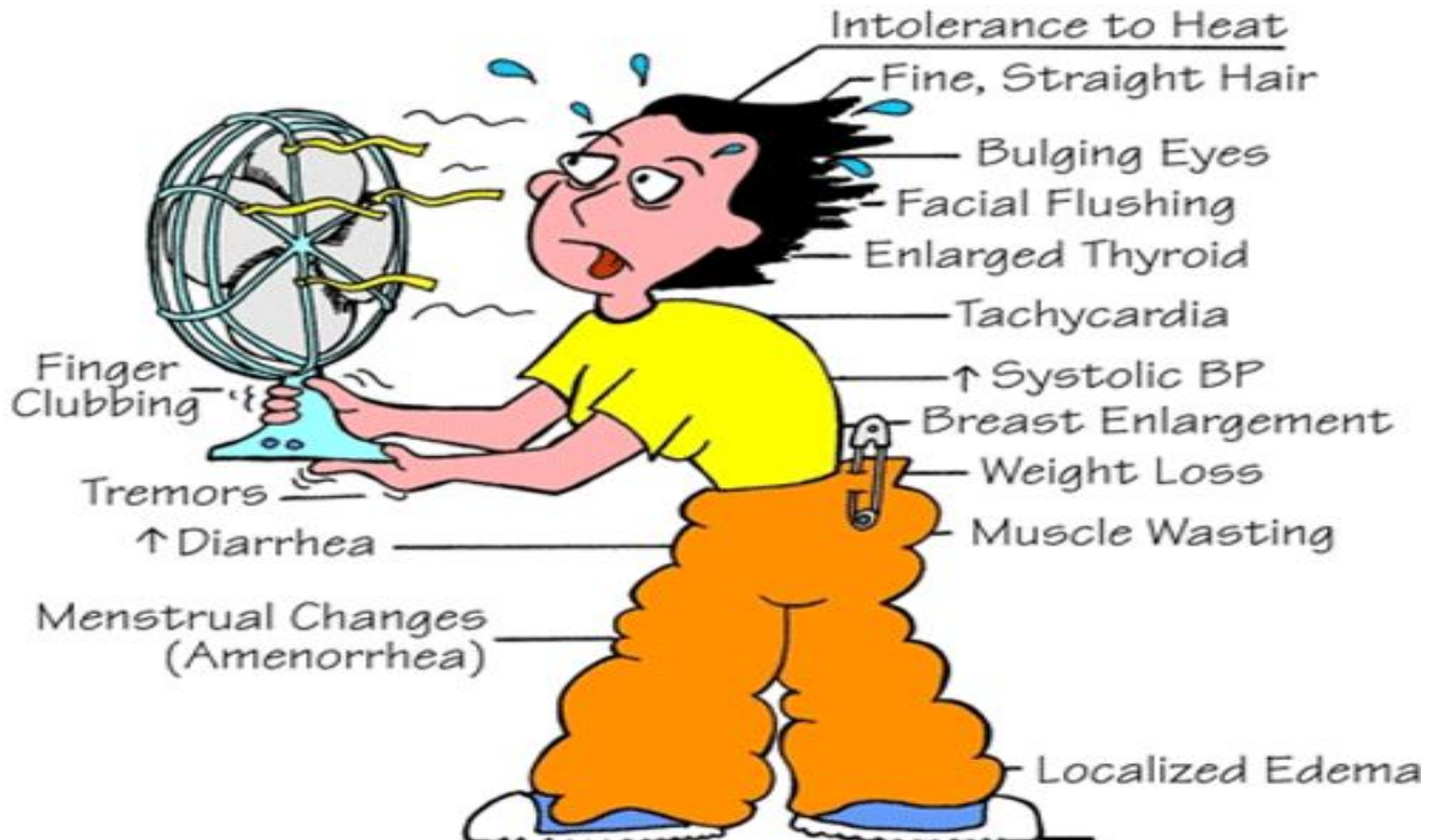


# The main causes of thyrotoxicosis

- ❖ **Primary hyperthyroidism (TSH↓, FT4&FT3↑)**
  - Graves' disease
  - Multinodular toxic goiter
  - Autonomous toxic adenoma
  - Iodine overload, Procor
- ❖ **Secondary hyperthyroidism (TSH↑, FT4&FT3↑)**
  - TSH-producing pituitary adenoma
  - Thyroid hormone resistance
  - Gestational thyrotoxicosis
- ❖ **Thyrotoxicosis without hyperthyroidism**
  - Sub acute thyroiditis
  - Silent thyroiditis
  - Thyrotoxicosis facticia



# Thyrotoxicosis symptoms and signs



# Apathetic thyrotoxicosis

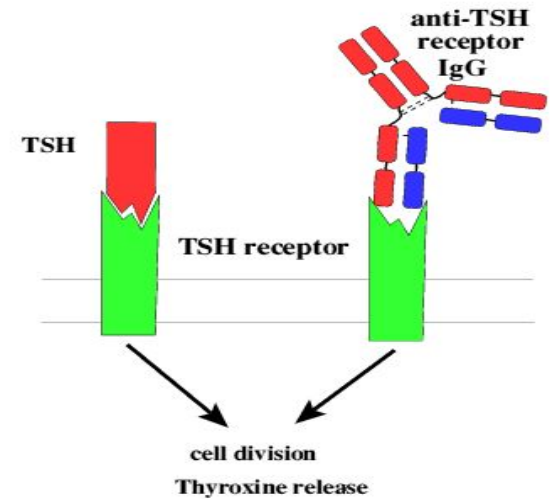
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- ❖ Old patients
- ❖ Weakness, weight loss
- ❖ Depression, pseudo-dementia
- ❖ Cardiac arrhythmias
- ❖ CHF exac.
- ❖ Pathological fractures



# Graves' disease

- ❖ 2% ♀, ♀:♂=10:1, age 20-50
- ❖ More frequent in I sufficient areas
- ❖ Frequently starts after pregnancy
- ❖ Smoking is important for ophthalmopathy development
- ❖ TSI antibodies are produced in thyroid and immune organs
- ❖ 15% spontaneous remission after 10-15 years





# Clinical picture of Graves' diseases



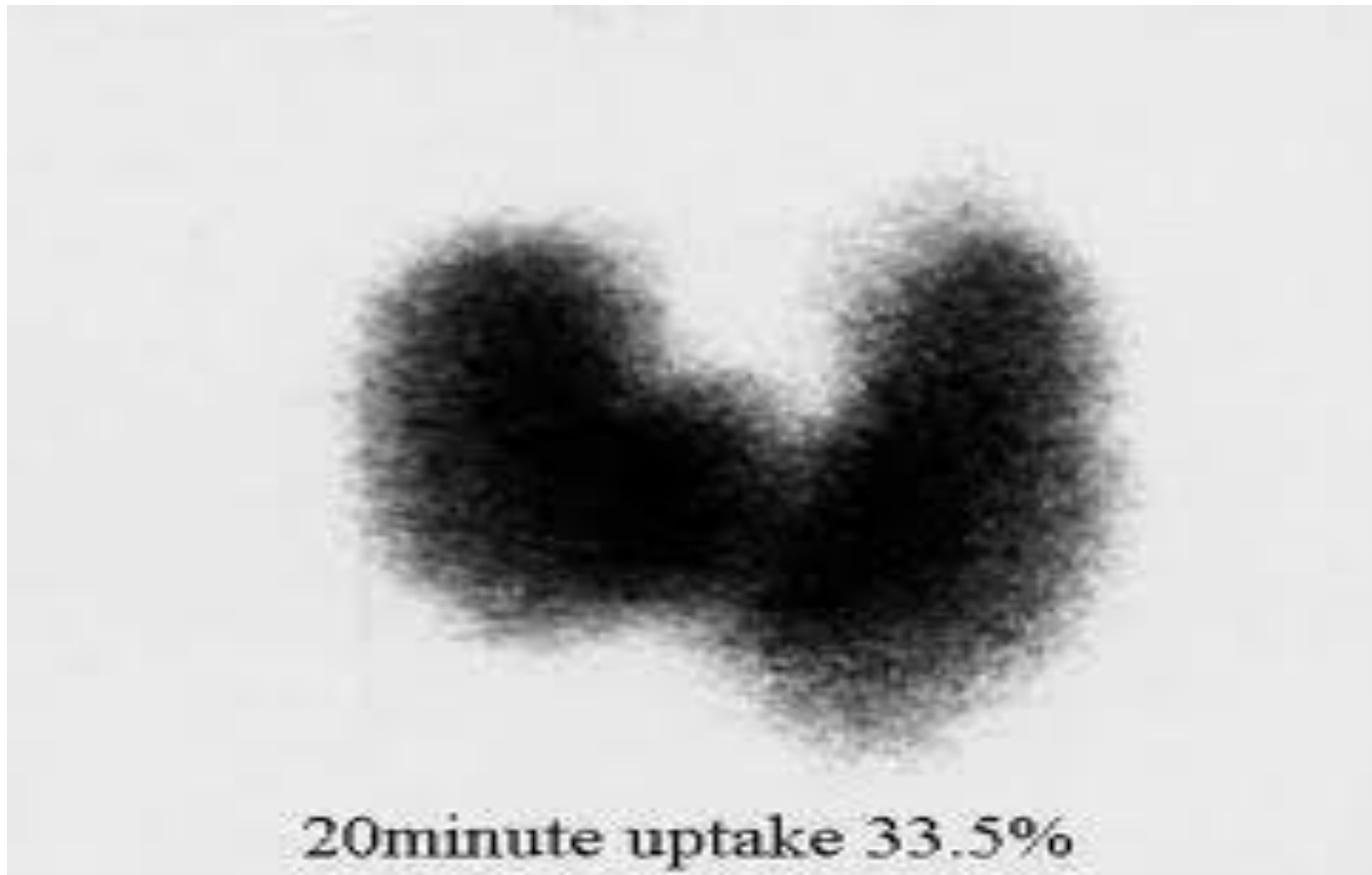
- A. Graves' Ophthalmopathy (10%)
- B. Thyroid dermopathy (<5%)
- C. Thyroid acropachy (<1%)

## LAB:

- **TSH** ↓ **FT4** ↑, **FT3** ↑
- **Anti bodies TSI** ↑
- anemia, elevation of liver enzymes

# Nuclear imaging Tc99-m

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# Treatment of Graves' disease

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- ❖ Beta-blockers for tachycardia
- ❖ Anti-thyroid drugs (Mercaptizole, PTU)
- ❖ Radio-Iodine ablation
- ❖ Total/subtotal thyroidectomy
- ❖ Ophthalmopathy: stop smoking, artificial tears, GK, operation

# Multinodular toxic goiter

- ❖ Diffuse thyroid enlargement with autonomimic nodules
- ❖ Clinical or subclinical hyperthyroidism
- ❖ Goiter is more frequent in I poor regions
- ❖ Massive I intake leads to thyrotoxicosis
- ❖ Mass-effect of retrosternal goiter
- ❖ **TSH ↓, FT4 ↑, FT3 ↑↑**
- ❖ Diagnosis: US, Tc scan
- ❖ Treatment: beta-blocers, antithyroid, operation, I ablation





# Nuclear imaging Tc99-m

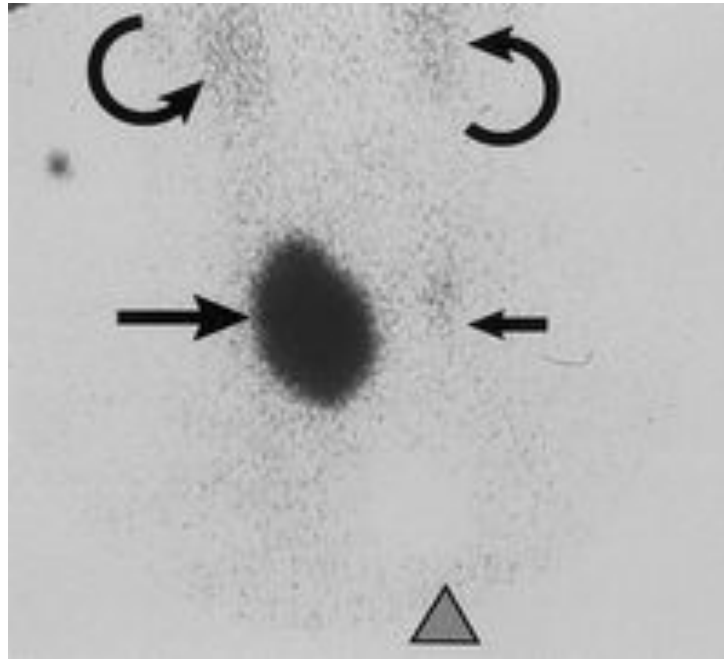
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# Autonomous toxic adenoma

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- ❖ Single autonomic thyroid nodule with causes thyrotoxicosis, rest of the thyroid is depressed

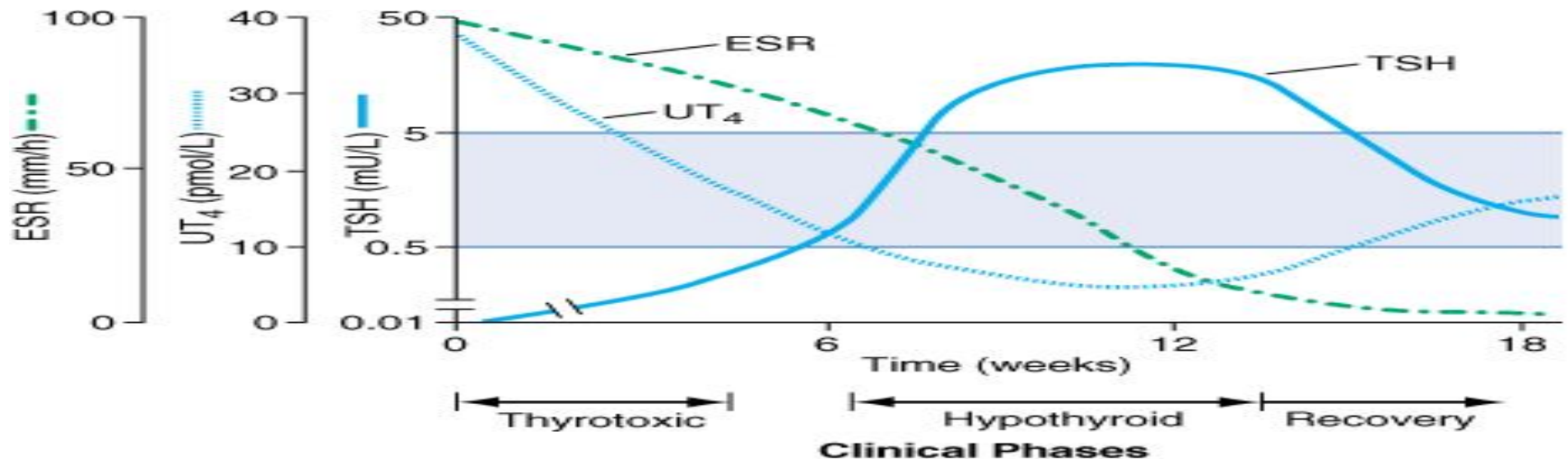


- ❖ treatment: usually I ablation

# Subacute thyroiditis

## (painful or viral thyroiditis)

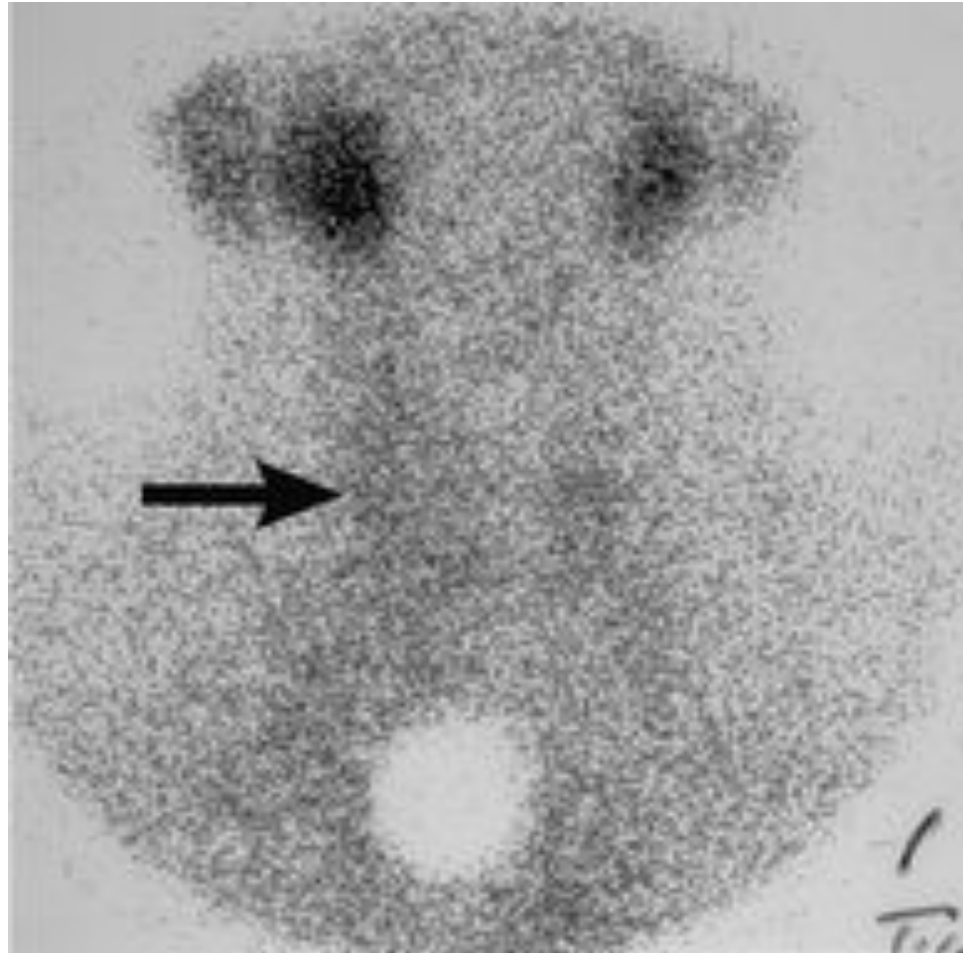
- ❖ Acute viral infection that leads to thyroid destruction
- ❖ Fever, sore throat, sharp pain in the thyroid region, dysphagia, headache, weakness



- ❖ Diagnosis: ESR $\uparrow$  and radioiodine uptake  $\downarrow$
- ❖ Treatment: high dose NSAIDs, GK

# Nuclear imaging Tc99-m

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# Thyroid Storm (Thyrotoxic Crisis)

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- ❖ Sever and life threatening TTx
- ❖ Precipitated factor: infection, operation, trauma, labor
- ❖ RAF, CHF, high fever, vomiting, diarrhea, acute liver failure, agitation, confusion, coma
- ❖ Support treatment, treatment of precipitated factor, aggressive reduction of temperature, TTx treatment, beta-blockers, GK, Lughole solution





# Hypothyroidism

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decreased level of thyroid hormones  
due to low thyroid function

# Classification

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- ❑ **Subclinical hypothyroidism:**  
TSH high, FT4&FT3 normal, no symptoms
- ❑ **Overt (clinical) hypothyroidism:**  
TSH high, FT4&FT3 low



# The main causes for hypothyroidism

## ❖ Primary hypothyroidism

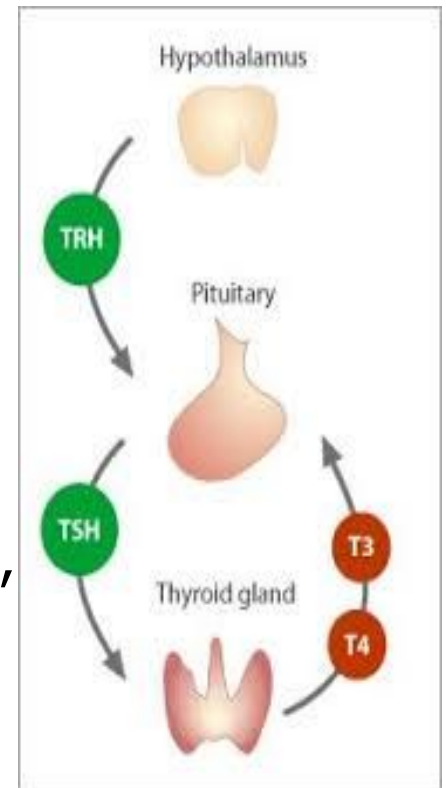
**(TSH ↑, FT4 ↓)**

- Hashimoto's thyroiditis
- Congenital hypothyroidism
- Iodine deficiency

## ❖ Secondary hypothyroidism

**(TSH ↓, FT4 ↓)**

- Pituitary/hypothalamic (adenoma, operation, hemorrhage, inflammation)



# Hypothyroidism symptoms and signs



# Clinical picture

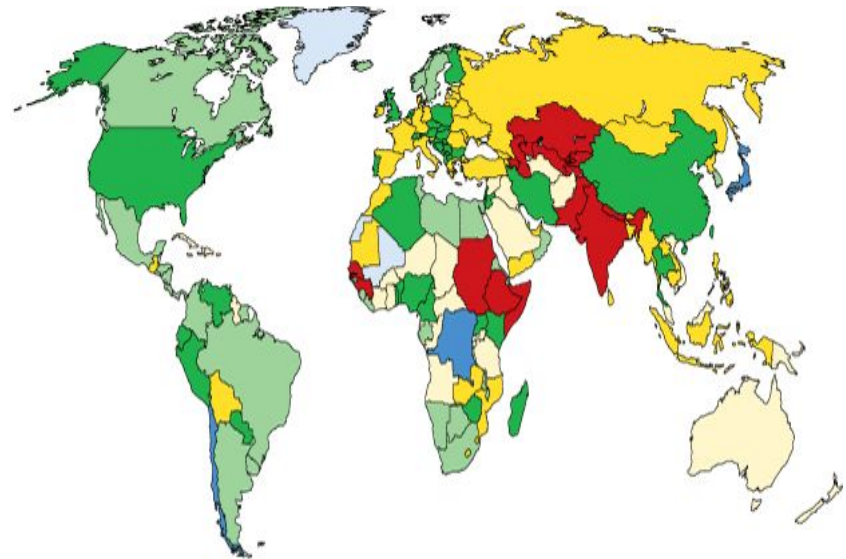
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❖ subclinical hypothyroidism: 6%-8% ♀ , 3% ♂

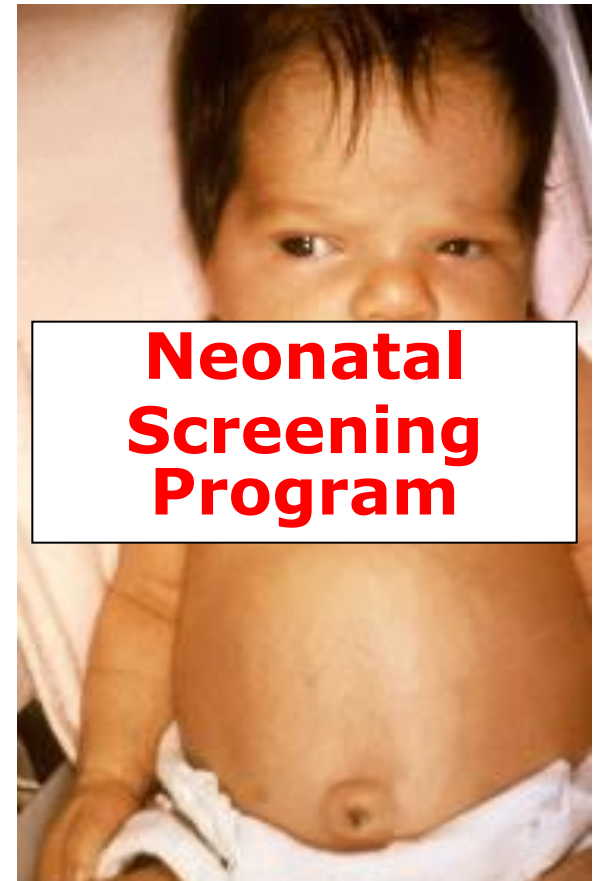
# Endemic Iodine deficiency

- ❖ According to WHO:  
2 billions people lives in I deficient areas
- ❖ More cases of goiter, overt hypothyroidism and cretinism
- ❖ Iodification of water, bread, salt
- ❖ No need in Israel



# Congenital Hypothyroidism

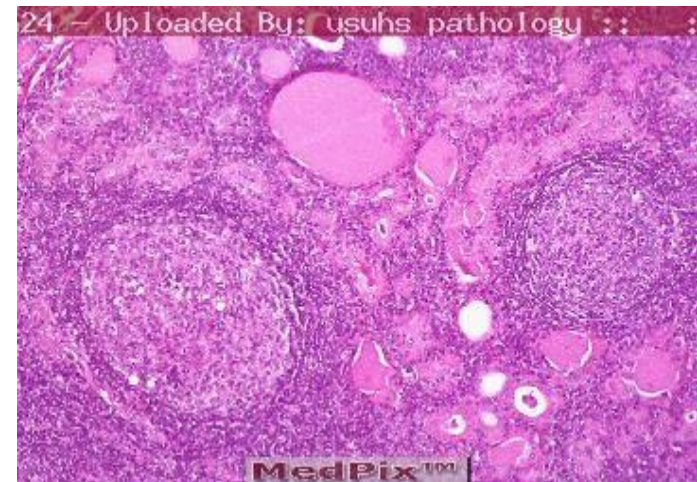
- ❖ 1:4000 newborns, ♂: ♀ = 1:2
- ❖ 85% thyroid agenesis or ectopic
- ❖ 90% newborns look good first
- ❖ 10% prolonged jaundice, failure to thrive, hypotonia, macroglossia, large umbilical hernia, late fontanelles closure
- ❖ congenital cardiac anomalies\*4
- ❖ Constant neurological deficit if the treatment delayed





# Hashimoto's (*goitrous*) thyroiditis

- ❖ 4:1000 ♀ 1:1000, ♂
- ❖ Slow development, age 60
- ❖ Small irregular goiter
- ❖ Clinical or subclinical hypothyroidism
- ❖ **TSH ↑, FT4 ↓, FT3 ↓**
- ❖ Antibodies anti-TPO (90%)
- ❖ Treatment: LEVOTHYROXINE to start with 1.2 mkg/kg/day



# Myxedema Coma

- ❖ Old undiagnosed patients
- ❖ Precipitated factor: infection, operation, hypothermia
- ❖ Poor prognosis
- ❖ Confusion, anasarca, bradycardia, hypothermia, hypoxia, coma
- ❖ Treatment: Eltroxine+Liothyronine (T3)  
**Don't miss adrenal insufficiency!**



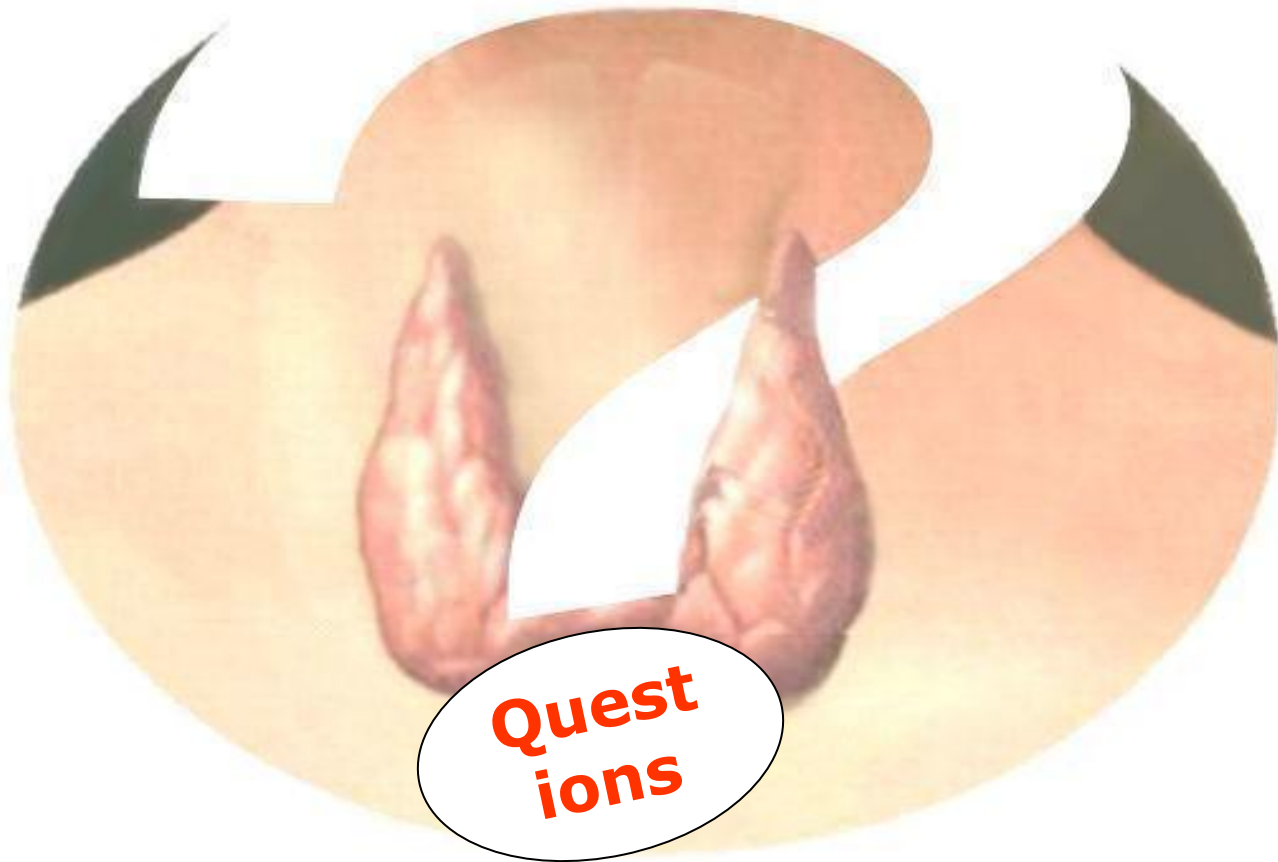
# Sick Euthyroid Syndrome

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- ❖ Abnormal level of thyroid hormones without thyroidal disorder in critically ill patients
- ❖ TSH low, FT4 normal, FT3 low, rT3 high
- ❖ Treatment of intercurrent disease
- ❖ Follow up thyroid functions



# YOUR THYROID and YOU



**Questions**