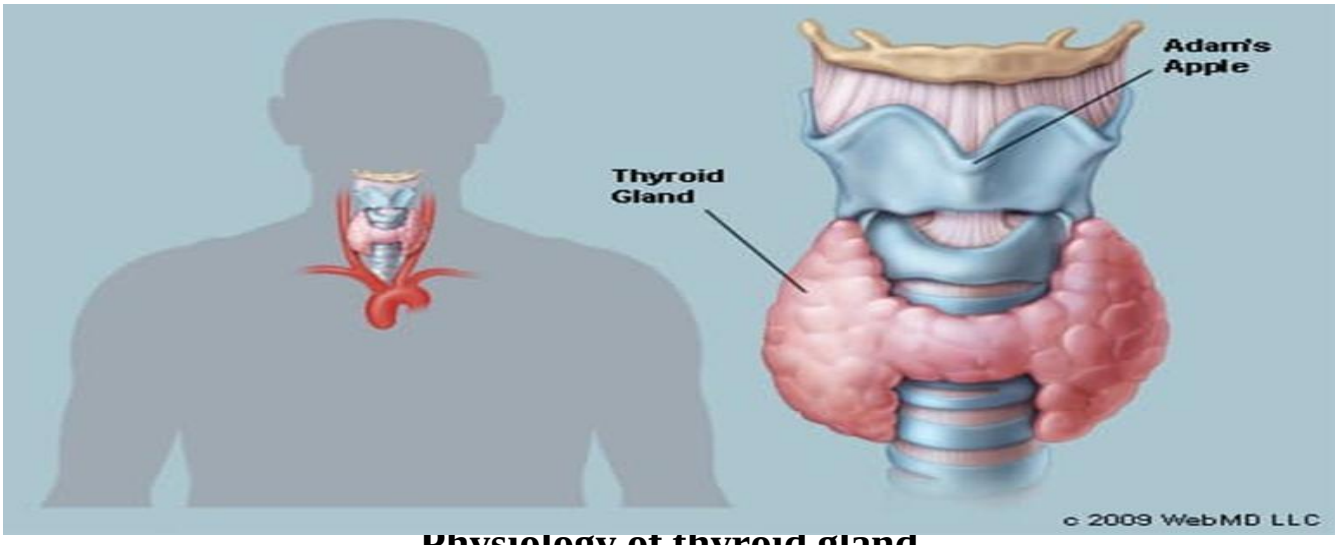
Thyroid

-The thyroid is one of the largest endocrine glands

-The thyroid gland is a butterfly-shaped organ catted in the front of the neck on the trachea just below the larynx (below the Adam's apple)

- It composed of two lobes, left and right,. It weighs 25 grams in adults.



Physiology of thyroid gland

The thyroid gland secretes three hormones:

1 - Two thyroid hormones

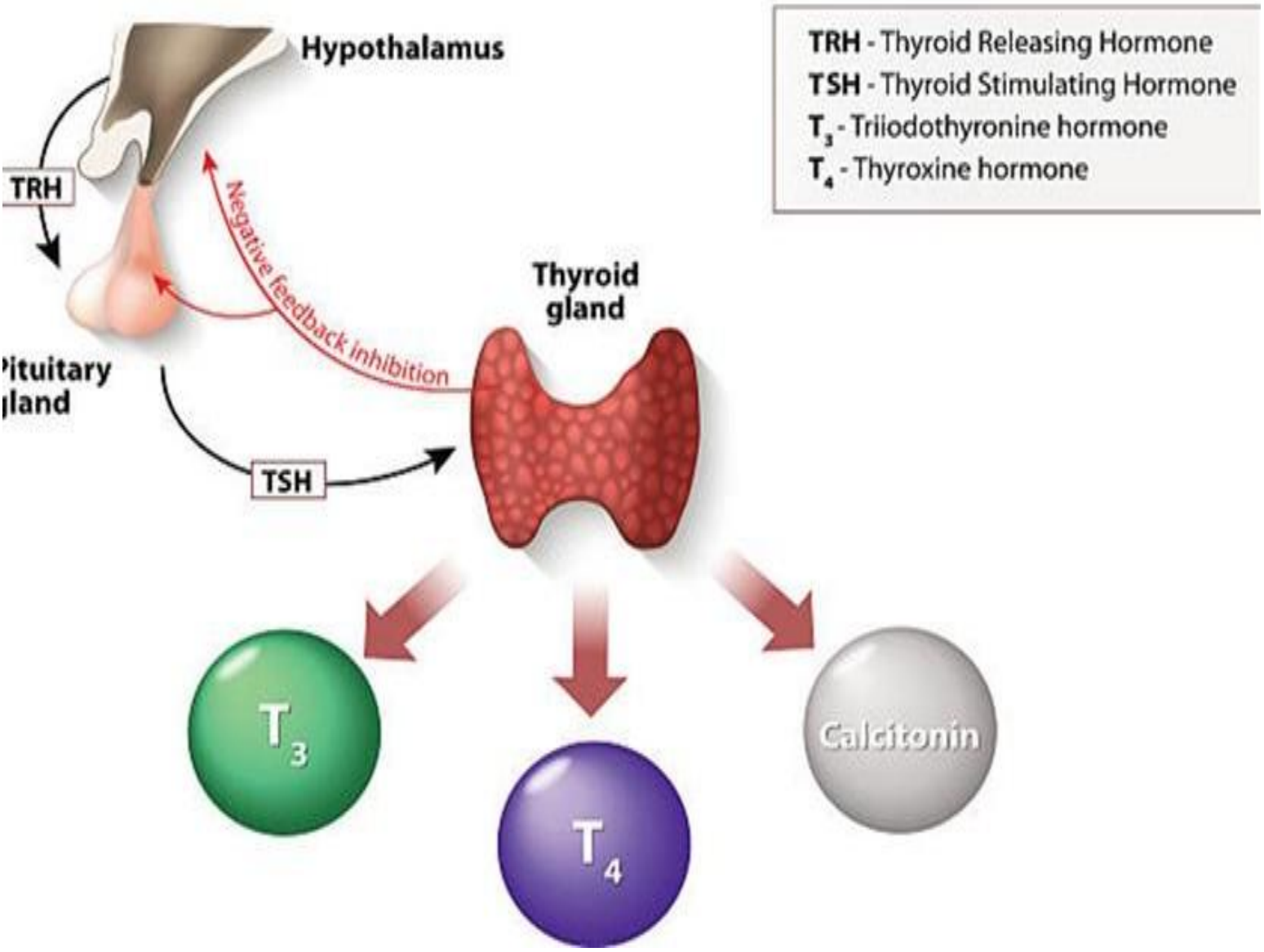
triiodothyronine (T3)

thyroxine (T4)

2-Calcitonin

Calcitonin secreted by Para follicular cells and plays a role in calcium homeostasis.

THYROID HORMONES



<u>In the bloodstream</u>,
<u>less than 1% of the circulating T3 and T4 remains free (unbound)</u>.
This free T3 and T4 can cross the cell membranes and able to enter and affect the body tissues.
The<u> remaining 99 % of circulating T3 and T4 is bound</u> to specific transport proteins called
a - thyroxine-binding globulins (TBGs),
b- albumin

This "(bounding of thyroxine with albumin)" prevents their free diffusion into body cells.

When blood levels of T3 and T4 begin to decline, bound T3 and T4 are released from these plasma proteins and readily cross the membrane of target cells

If the levels of these transport proteins changes, will lead to changes in level of bound T4 and T3.

This frequently happens during **pregnancy** and with the use of **birth control pills**

Pregnancy leads to marked changes in thyroid hormone physiology.

1- The gland is increased in size by 10%,
2- Thyroxine production is increased by 50%
3- Iodine requirements are increased.

Both T3 and T4 are highly plasma protein bound.
Unbound form(free form)(FT3, FT4) is biologically active

Thyroid diseases

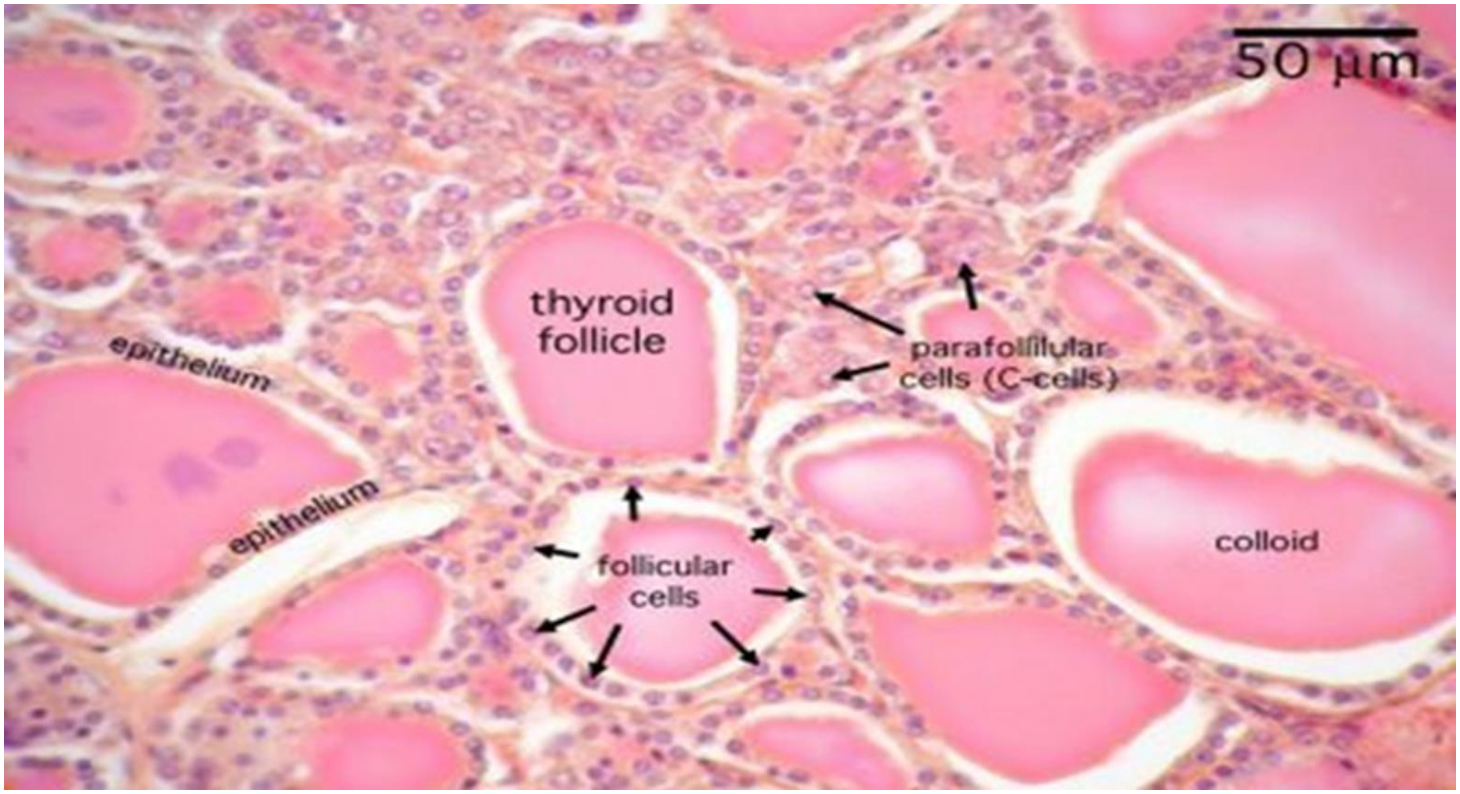
Pathophysiology

Thyroid hormone is required for the normal functioning of numerous

tissues in the body.

In healthy individuals, the thyroid gland predominantly secretes thyroxine (T4), which is converted into triiodothyronine (T3) in other organs by iodothyronine deiodinase

- The tissue of the thyroid gland is composed mostly of **thyroid follicles**.
- The **thyroid follicles** are made up of a central cavity filled with a sticky fluid called **colloid** surrounded by a wall of epithelial follicle cells.
- These follicles are the center of thyroid hormone production and that production is dependent on the essential component: **iodine**



Thyroid diseases

Goiter : Its an enlargement of the thyroid

What are goitrogens?

Goitrogens : are substances that interfere with the synthesis of T4 and T3.

In an effort to compensate for the reduced production of T4 and T3, thyroid follicles enlarge and become lined by hyperplastic epithelium.

Inefficient synthesis of T3/T4 leads to an accumulation of colloid in follicles. These dilated follicles cause enlargement of the thyroid known as **goiter**

Many women have normal thyroid function but have immunological evidence of **thyroid autoimmunity** (as evidenced by autoantibodies) or are **iodine deficient**, and develop evidence of hypothyroidism before or after giving birth.

- There are five general types of thyroid disease, each with their own symptoms.
- A person may have one or several different types at the same time

The five groups of thyroid diseases are

1. **Hypothyroidism (low function)** caused by not having enough free thyroid hormones
2. **Hyperthyroidism (high function)** caused by having too many free thyroid hormones
3. **Structural abnormalities**, most commonly a **goiter** (enlargement of the thyroid gland)
4. **Tumors** which can be benign or malignant
5. **Abnormal thyroid function tests without any clinical symptoms**

(subclinical hypothyroidism or subclinical hyperthyroidism).

Hypothyroidism:

is a disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormones.

It can cause a number of symptoms, such as poor ability to tolerate cold, a feeling of tiredness, and others .

Untreated cases of hypothyroidism during pregnancy can lead to :

1- delays in growth and intellectual development in the baby or
2- congenital iodine deficiency syndrome

Causes of Hypothyroidism :

1. Inadequate function of the thyroid gland itself (primary hypothyroidism).
2. Inadequate stimulation by thyroid-stimulating hormone (TSH)from pituitary gland (secondary hypothyroidism)
3. Inadequate release of thyrotropin-releasing hormone (TRH)from th hypothalamus (tertiary hypothyroidism)

Primary hypothyroidism is more common than central hypothyroidis

Iodine deficiency is the most common cause of primary hypothyroidis

In areas with sufficient dietary iodine, hypothyroidism is most common caused by the autoimmune disease Hashimoto's thyroiditis (chronic autoimmune thyroiditis).

After women give birth, about 5% develop postpartum thyroiditis which can occur up to nine months afterwards. This is characterized by a short period of hyperthyroidism followed by a period of hypothyroidism; 20–40% remain permanently hypothyroid.
Autoimmune thyroiditis is associated with other immune-mediated diseases such as diabetes mellitus type 1, celiac disease, rheumatoid arthritis and systemic lupus erythematosus

Possible symptoms of hypothyroidism (low function) are:

1. Unexplained weight gain
2. Slow heart rate (bradycardia)
3. Feeling Cold
4. Constipation
5. Depressed mood
6. Memory difficulty (Poor memory and concentration)
7. Tiredness (Low levels of thyroid hormone slow down metabolism and can cause painful muscle breakdown
8. Hair loss: hair follicles are regulated by thyroid hormone

In female : irregular menstrual cycle

Hyperthyroidism

is the condition that occurs due to excessive production of thyroid hormones by the thyroid gland

Possible symptoms of hyperthyroidism (high function) are:

1. Unexplained weight loss
2. Fast heart rate (tachycardia) or palpitations
3. Feeling hot, excess sweating (Heat is a product of burning calories)
4. Diarrhea
5. Difficulty sleeping (insomnia)
6. Anxiety, irritability
7. Tremors
8. Exophthalmos (bulging eyes)

Goiter (enlargement of the thyroid gland)

Postpartum thyroiditis (PPT) : (thyroiditis after delivery) occurs in about 5 -7% of women during the year after they give birth.

PPT typically has several phases,

the **first** of which is **hyperthyroidism.**

This form of hyperthyroidism usually corrects itself within weeks or months without the need for treatment