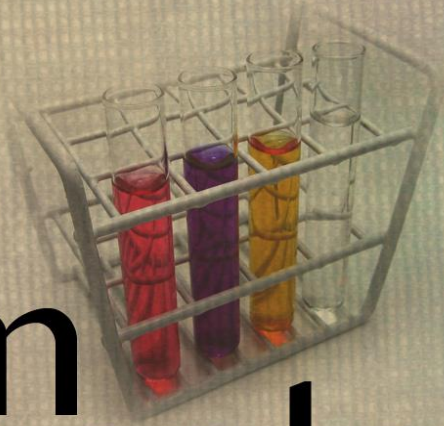




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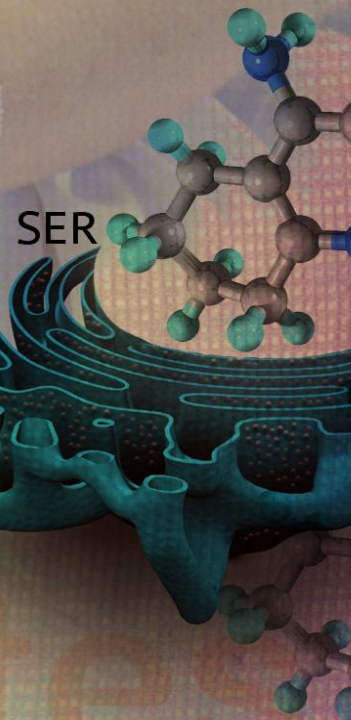


# Pharmacology

## Endocrine block

Lecture 2

Drugs used in hypothyroidism



Done by :

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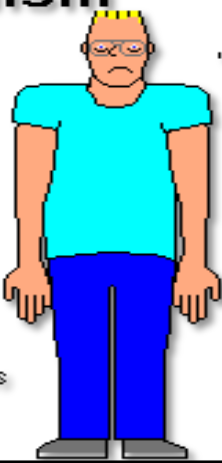
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## Introduction:

- Thyroid gland does not produce enough hormones.
- Can be caused by:
  - Congenital ( cretinism , dwarfism)
  - Autoimmune disorder ( Hashimotos thyroiditis)
  - Irradiation
  - Surgical removal of thyroid gland
  - Thyroid carcinoma
- People who are most at risk include those **over age 50** & mainly in **females**.
- Diagnosed by:  
low free thyroxine and elevated serum TSH
- Manifestations of Hypothyroidism:

- Fatigue and lack of energy
- weight gain
- Dry and cold skin
- Dry hairs
- Constipation
- Slowed thinking
- Bradycardia
- Heavy menses

**Hypothyroidism**  
Easy to diagnose and treat -- if you think of it.



slowing of mind and body

weak heartbeat

constipation

myxedema

high LDL

slow reflexes

hair thinning

depression

"schizophrenia"

irritability

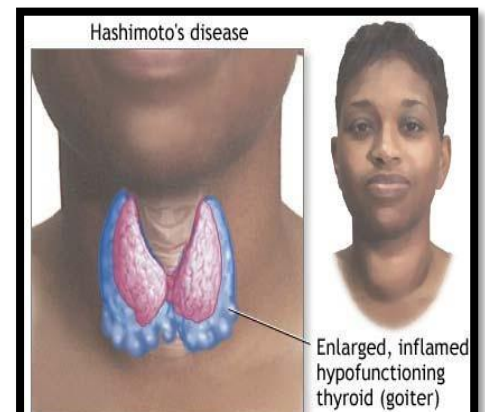
big tongue

croaky voice

dry skin

cold skin

cold intolerance



## + Treatment of Hypothyroidism:

- The only effective treatment for hypothyroidism (unless it is caused by iodine deficiency ) is to administer synthetic thyroid hormone preparations
- Serum TSH is the guide to adjust thyroxine dose.
- Thyroxine (official name: Levothyroxine)& Tri-iodothyronine (Official name: Liothyronine) are synthetic compound, identical to the natural hormones.
- Levothyroxine is the usual first line drug of the choice.(Rang&Dale's pharmacology book)

## + Thyroid preparations:

### 1- LEVOTHYROXINE: (T<sub>4</sub>) (most important):

- A synthetic form of the thyroxine (T<sub>4</sub>) , is the drug of choice for replacement therapy .
- Stable and has a long half life ( 7 days) .
- Administered once daily.
- Oral & Parnteral preparations are available
- Absorption is increased when hormone is given on empty stomach.
- In old patients and in patients with cardiac problems(angina pectoris , heart failure ..etc), treatment is started with reduced dosage.( given gradually )
- Restore normal thyroid levels within 2-3 weeks.

### + Clinical uses:

Hypothyroidism, regardless of etiology (including : Congenital, Autoimmune thyroiditis (Hashimoto thyroiditis) carcinoma)

### + Adverse effects (over dosing):

CHILDREN	ADULTS (Hyperthyroidism - like SX)
<ul style="list-style-type: none"><li>▪ Restlessness, insomnia, accelerated bone maturation.</li></ul>	<ul style="list-style-type: none"><li>▪ Tachycardia, cardiac arrhythmias, tremor restlessness , heat intolerance, , muscle pain ,Change in appetite, diarrhea, weight loss .</li></ul>

### + Adverse effects (under dosing)

Sluggishness ,Mental dullness ,Feeling cold & Muscle cramps

## 2-Liothyronine(T<sub>3</sub>) :

- **More potent (3-4 times) and rapid action than levothyroxine but has a short half life is not recommended for routine replacement therapy, it requires multiple daily doses.**
- **It should be avoided in cardiac patients (angina pectoris , heart failure,..etc).**
- **It is best used for short –term suppression of TSH.**
- **Oral & Parnteral preparations are available**

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## MYXEDEMA COMA:

- **It is an end state of untreated hypothyroidism.**
- **It develops quite and progress slowly to stupor , coma and death.**
- **The treatment of choice is loading dose of levothyroxine intravenously initially followed by oral administration daily.**
- **I.V liothyronine for rapid response but it may provoke cardiotoxicity**
- **I.V hydrocortisone may be used in case of adrenal and pituitary insufficiency.**

## HYPOTHROIDSM AND PREGNANCY:

In pregnant hypothyroid patient 20-30 % increase in thyroxine is required because of:

- **elevated maternal TBG induced by estrogen.**
- **early development of fetal brain which depends on maternal thyroxine**

## SUMMARY ( Drugs used in Hypothyroidism)

	<b>1- Levothyroxine : (T<sub>4</sub>)</b>	<b>2-Liothyronine: (T<sub>3</sub>)</b>
P.K + Other features	<p>1-A synthetic form of the thyroxine (T<sub>4</sub>)                      2-Stable and has a <b>long half life</b> (7 days).                      3-Administered <b>once daily</b>.</p> <p>4-<b>Oral preparations</b> available from                      (0.025 to 0.3) mg tablets                      *Absorption is increased when hormone is                      given on <u>empty stomach</u></p> <p>4-<b>Parnteral preparation</b> 200-500µg .</p> <p>5- Restore normal thyroid levels within 2-3                      weeks.</p> <p>6-levothyroxine is given in a dose of 12.5-25                      µg/day for two weeks and then                      increasing it after every two weeks.</p>	<p>1-<b>More potent</b> (3-4 times)                      2- <b>rapid action</b> than <b>Levothyroxine</b>                      3-has a <b>short half life</b>                      *it is not recommended for routine                      replacement therapy                      4- It requires <b>multiple daily doses</b>.</p> <p>5-<b>Oral preparation</b> available are (5-50µg)                      tablets</p> <p>6-<b>Parnteral use</b> 10µg/ml</p>
Clinical uses	<p><b>-It is the drug of choice for                      (replacement therapy).</b></p> <p>-Hypothyroidism, regardless of etiology                      including:                      1-congenital.                      2-Autoimmune thyroiditis                      ( Hashimoto thyroiditis)                      3- Pregnancy.                      4-Thyroid carcinoma.</p>	<p>1-It is best used for  <b>(short –term suppression of TSH).</b></p>
ADES	<p style="text-align: center; color: green;"><u><b>A-ADVERSE EFFECTS OF OVER DOSE</b></u></p> <p><b>-CHILDREN:</b>                      Restlessness, insomnia, accelerated bone                      maturation.</p> <p><b>-ADULTS:</b>                      Tachycardia, palpitation, cardiac                      arrhythmias, tremor, restlessness, heat                      intolerance, headache, muscle pain,                      change in appetite, diarrhea, weight loss.</p> <hr/> <p style="text-align: center; color: green;"><u><b>B-ADVERSE EFFECTS OF UNDER-DOSING</b></u></p> <p>1-Sluggishness                      2-Mental dullness                      3-Feeling cold                      4-Muscle cramps</p>	<p>-It can cause <b>cardiotoxic effects</b></p>
Pre- cautions	<p>In <b>old patients</b> and in <b>patients with                      cardiac problems</b> , treatment is started with                      reduced dosage.</p>	
Contra- indications #		<p>-It should be <b>avoided</b> in <b>cardiac patients</b>.</p>

## MCQs

**A- A 53 year old female patient with a previous history of angina presented with weight gain, fatigue and lack of energy. The lab results confirmed that she is having hypothyroidism.**

**Which one of the following drugs is contraindicated to treat her symptoms.**

- 1- Levothyroxine
- 2- Liothyronine

**B- In a pregnant hypothyroid patient, the Levothyroxine should be described in:**

- 1- Larger doses than the usual
- 2- Smaller doses than the usual

**C- The drug of choice for treating a patient with hypothyroidism is:**

- 1- Levothyroxine
- 2- Liothyronine