

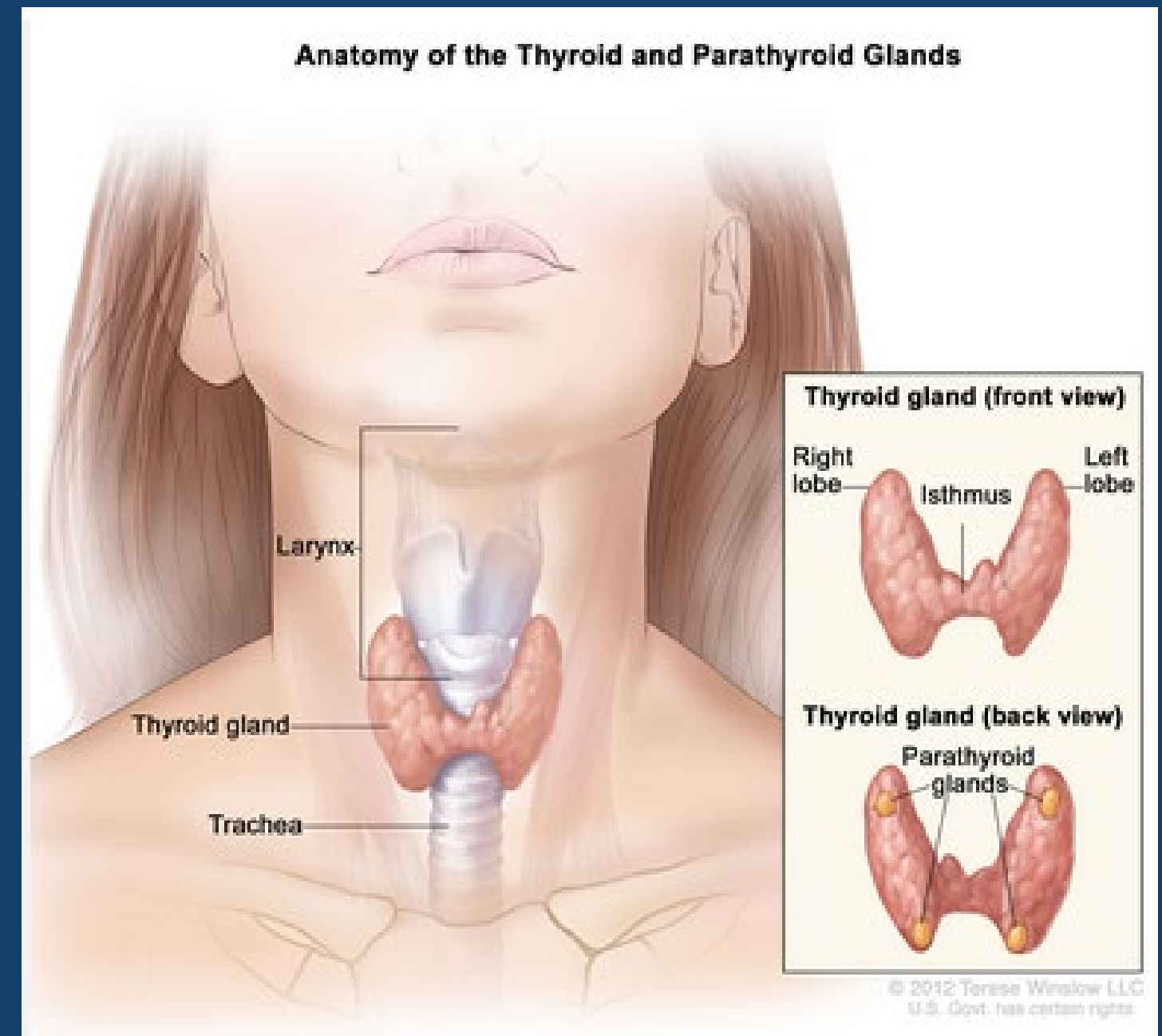
# Hypothyroidism



**Dr. Soubhi Bahna**  
Endocrinologist  
4/15/2026

# Introduction to Thyroid Disease

- Thyroid gland is a small, butterfly-shaped organ located in the neck.
- It plays a crucial role in
  - > regulating metabolism
  - > temperature
  - > weight
  - > energy level
  - > heart rate and CV system
  - > GI system and motility
  - > mood
  - > hormone balance and overall health.

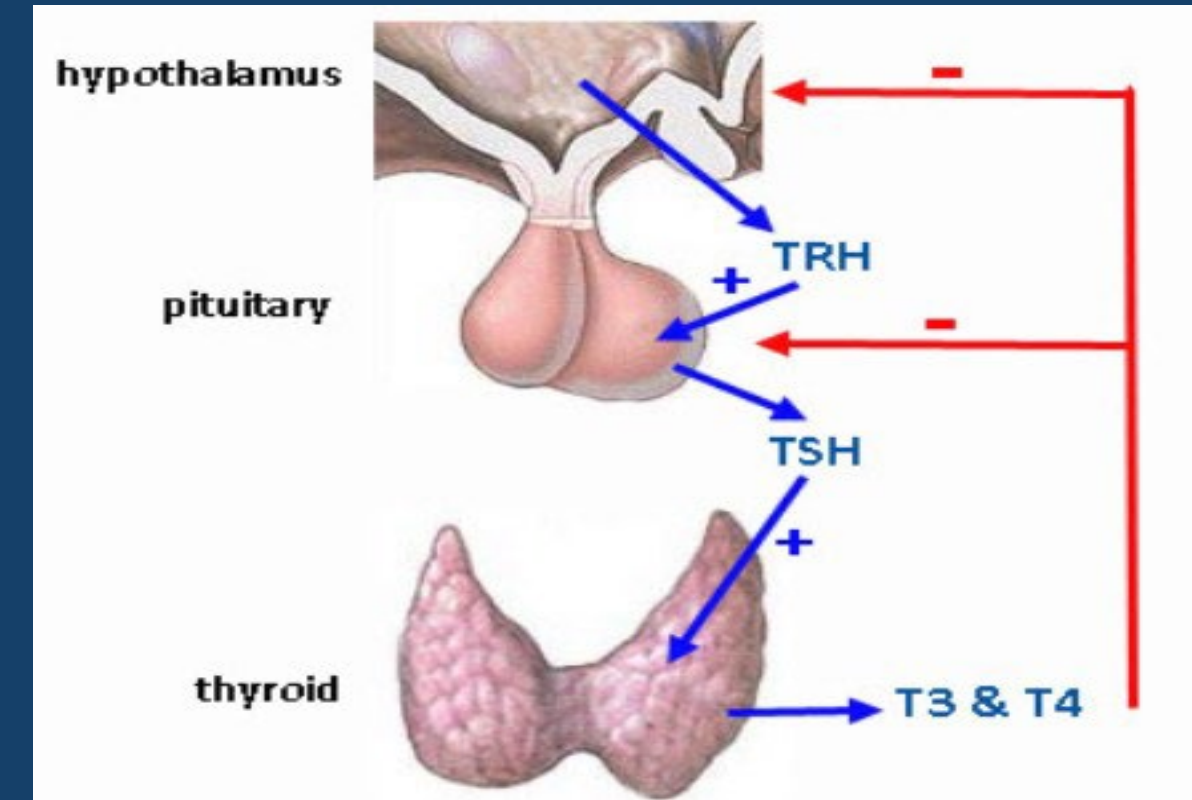


# Introduction to Thyroid Disease

- Thyroid diseases can be divided into:
  - > Function problem = hormonal disorder
  - > Structure problem = thyroid nodules or cancer
- Thyroid function disorder occur when the gland produces **too much or too little** hormone.
- Common types include:
  - > **Hypothyroidism** (underactive thyroid) = too little hormone
  - > **Hyperthyroidism** (overactive thyroid) = too much hormone

# Thyroid Hormone Regulation

- Hypothalamus (TRH)
- Pituitary gland (TSH)
- Thyroid gland (T4 + T3)



- **Negative feedback** : High T3/T4 levels reduce TRH and TSH release to maintain thyroid hormonal balance
- T4 is considered as pre-hormone (or pro-hormone) that must be converted to T3 (active hormone), by enzymes known as deiodinases (e.g., liver, kidneys, heart, muscle and other peripheral tissues ...)

# Primary hypothyroidism

- The problem is within the thyroid's ability to produce thyroid hormones in an efficient manner, causing several signs and symptoms affecting multiple organs
- 2<sup>nd</sup> most common endocrine disease after DM
- Prevalence: 3.8 - 4.6%
- Women > Men (6 - 10 times more common)
- Levothyroxine is the 1<sup>st</sup> recommended treatment per ATA Guidelines
- Levothyroxine is the 3<sup>rd</sup> most prescribed medication

# Causes of Hypothyroidism

- Autoimmune:
  - > Hashimoto's thyroiditis (most common)
  - > atrophic thyroiditis
- Iatrogenic:
  - > I-131 (RAIA) therapy
  - > Thyroidectomy
  - > Radiation therapy of the neck
- Infiltration: amyloidosis, sarcoidosis, hemochromatosis, scleroderma, Riedel's thyroiditis
- Drugs:
  - > Amiodarone
  - > Lithium
  - > Antithyroid drugs
  - > interferon -  $\alpha$
- Congenital (very rare):
  - > absent or ectopic thyroid
  - > Dyshormonogenesis
  - > TSH-R mutation
- Iodine deficiency

# Hashimoto's Disease

The condition is also known as Hashimoto's thyroiditis, chronic lymphocytic thyroiditis, or autoimmune thyroiditis.

It is named after Dr. Hashimoto, a Japanese surgeon and medical researcher, who first described the condition in 1912

## United States & Europe:

- Roughly 12–15% of adults are TPO antibody positive
- Higher rates in women (up to 20–25% in some groups)
- Not everyone with +TPO antibodies develops hypothyroidism
- Only about 2–4% per year of TPO-positive individuals progress to overt hypothyroidism



Hakaru Hashimoto

# Risk Patterns

The presence of TPO positive antibody is more common in:

- Women > Men
- Older adults
- People with other autoimmune diseases (e.g., type 1DM, celiac disease)
- First-degree relatives of patients with autoimmune thyroid disease

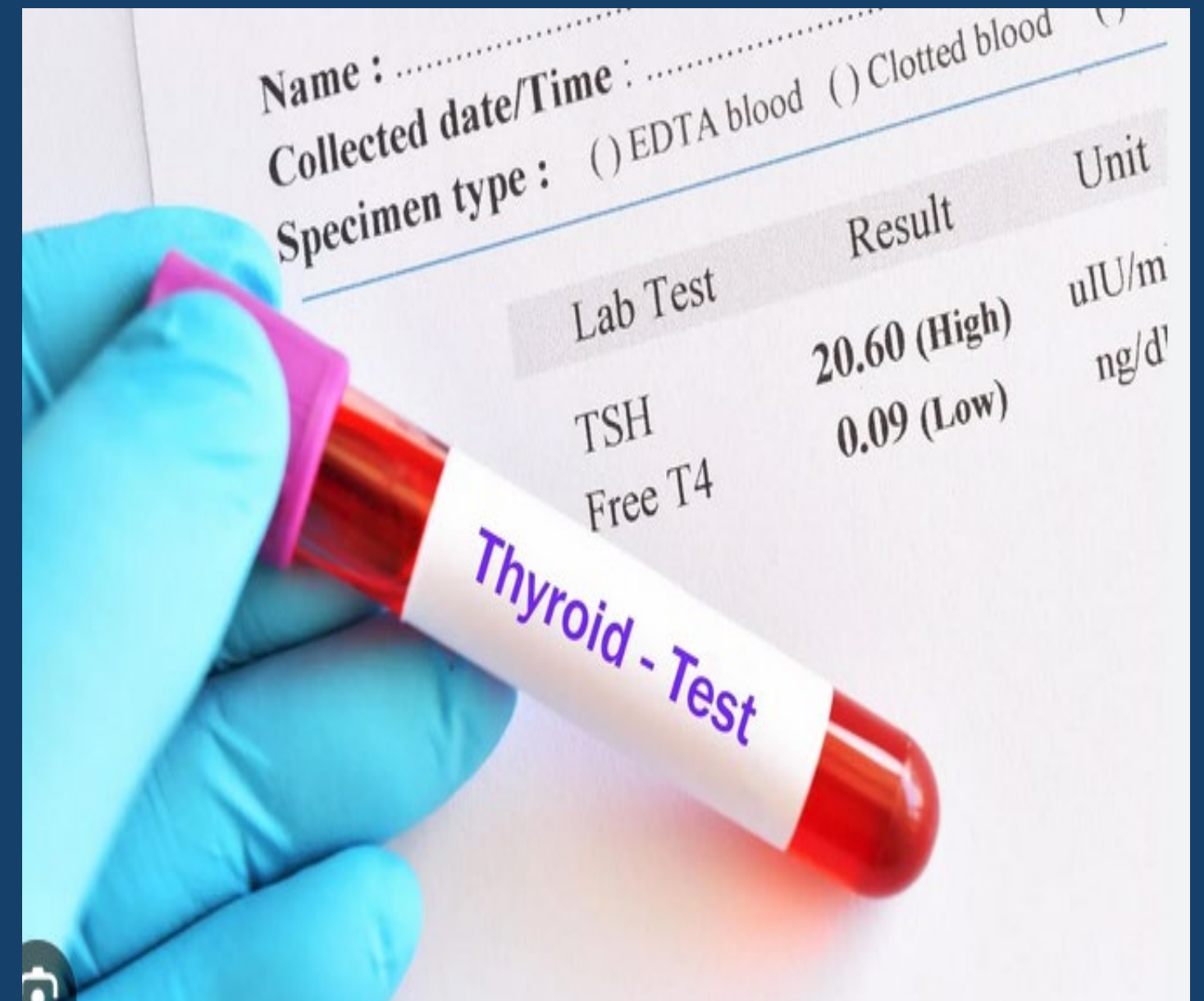
# S & S of Hypothyroidism?

- > Unintended weight gain
- > Fatigue and lethargy
- > Muscle weakness
- > Constipation
- > Cold intolerance
- > Dry skin
- > Hair loss
- > Slowed heart rate
- > Brain fog, difficulty concentration
- > Memory issues
- > Depressed mood
- > Digestive issue
- > Irregular menstrual cycle (female)

| Mechanism                         | Symptoms   | Signs  |
|-----------------------------------|--|--|
| Slowing of metabolic processes    | Fatigue and weakness<br>Cold intolerance<br>Dyspnea on exertion<br>Weight gain<br>Cognitive dysfunction<br>Mental retardation (infant)<br>Constipation<br>Growth failure | Slow movement and slow speech<br>Delayed relaxation of tendon reflexes<br>Bradycardia<br>Carotenemia |
| Accumulation of matrix substances | Dry skin<br>Hoarseness<br>Edema  | Coarse skin<br>Puffy facies and loss of eyebrows<br>Periorbital edema<br>Enlargement of the tongue   |
| Other                             | Decreased hearing<br>Myalgia and paresthesia<br>Depression<br>Menorrhagia<br>Arthralgia<br>Pubertal delay  | Diastolic hypertension<br>Pleural and pericardial effusions<br>Ascites<br>Galactorrhea               |

# Diagnosis

- Elevated TSH
- Low free T4
- Clinical symptoms (fatigue, unintended weight gain, cold intolerance, constipation, dry skin, brain fog ... )



# Treatment Overview

- Hormone replacement therapy
- First- line: Levothyroxine
- Individualized dosing (weight - based)
- Lifelong treatment in almost all cases

# Levothyroxine

- Synthetic LT4 = Levothyroxine (generic name)
- Absorbed in small intestine (60 –80%)
- Long half - life (~6 days)
- Stable hormone levels compared to other thyroid tx options
- ATA and modern medicine favor synthetic LT4 hormones
- Better standardization and safety profile

# Starting LT4 dose

- Start with individualized dose
- LT4 is weight - based medication
- Adjust gradually based on both clinical picture and biochemical levels (blood test results)
- Elderly patients → always lower doses
- Heart disease (A-fib, cardiac arrhythmia) → use caution, low dose
- Pregnancy → Increased dose usually 25-30%

## Starting dose of LT4

**Table 3** Suggested starting dose of levothyroxine for primary hypothyroidism in different clinical situations

|                                      |                               |
|--------------------------------------|-------------------------------|
| Normal otherwise well patients       | 1.6 µg/kg body weight/day     |
| Pregnant patients                    | 2.0–2.4 µg/kg body weight/day |
| Elderly patients                     | 25–50 µg/day                  |
| Patients with ischemic heart disease | 12.5–25 µg/day                |

# Drug Interactions

Thyroid medications absorption affected by:

- Calcium
- Iron
- Iodine (kelp supplement)
- Antacids
- Caffeine
- Food (LT4 must be taken on empty stomach)

Seizure medications increase LT4 clearance

Patient education is essential

**Table 2** Substances that interact with levothyroxine

**Drugs and supplements that decrease the effect of levothyroxine**

Reduced levothyroxine absorption

Iron  
Calcium carbonate  
Cholestyramine  
Aluminum  
Cimetidine  
Sucralfate  
Iodine (includes kelp tablets)  
Selenium  
Magnesium  
Zinc  
Soya  
Fiber  
Caffeine  
Antacids

Increased levothyroxine clearance

Phenytoin  
Carbamazepine  
Phenobarbital  
Rifampicin

Increased levothyroxine binding

Estrogen hormone replacement therapy

**Drugs affected by levothyroxine**

Drug effect enhanced by levothyroxine

Warfarin

# Monitoring thyroid function

- May take up to 4 - 6 months to normalize thyroid function
- Measure serum TSH/Free T4 6 - 8 weeks after initiation or dose change
- Goal TSH 0.5- 4.5 mIU/L for most adults
- Older patients (>70 - 80 years) - TSH up to 6.0 mIU/l is still acceptable
- Semi - annual to annual monitoring if stable

# Other Thyroid treatment options

- Synthetic Liothyronine (T3)
- Combination (T4 + T3)
- Alternative route: IV, IM and SL Levothyroxine
- Weekly oral dosing: last - resort option, unknown long - term AEs

# Synthetic Liothyronine (T3)

- Faster absorption than T4
- Shorter half - life
- Used in special cases:
  - > Myxedema coma and severe hypothyroidism
  - > Persistent fatigue in hypothyroidism patients despite using T4
  - > Off Label use for severe depression (enhance anti - depressant's effect)

# Combination (T4 + T3) Therapy

- These combinations provide higher proportion of active T3 compared to normal human thyroid ratio 14:1 (T4 to T3)
- Synthetic T4 + T3 (lab - made), example: Liotrix (4:1 ratio)
- Desiccated Thyroid Extract (DTE) animal - derived, usually from pigs
- Example: Armour Thyroid, NP Thyroid (4:1 ratio)
- Variable potency and absorption
- Not first line recommendation
- Technically NOT FDA- approved, although it is regulated for use
- Used in selected patients

# Future Perspectives

- Improved formulations, fewer additives, easier absorption to help achieve better and more stable thyroid hormone profile in the blood
- Personalized therapy recommended such as liquid or soft gel LT4 formulations might be a better option for people with:
  - > malabsorption such as lactose intolerance, celiac disease
  - > patients with history of bariatric surgery that can reduce gastric acid production, therefore negatively impacting thyroid medication's absorption

# Conclusion

- Hypothyroidism is a common and treatable disease
- Accurate diagnosis is essential
- Levothyroxine is the standard therapy per ATA Guidelines
- Monitoring ensures optimal outcomes

Thank you for listening!



# Nutrition and Thyroid Health April, 2026



# Agenda

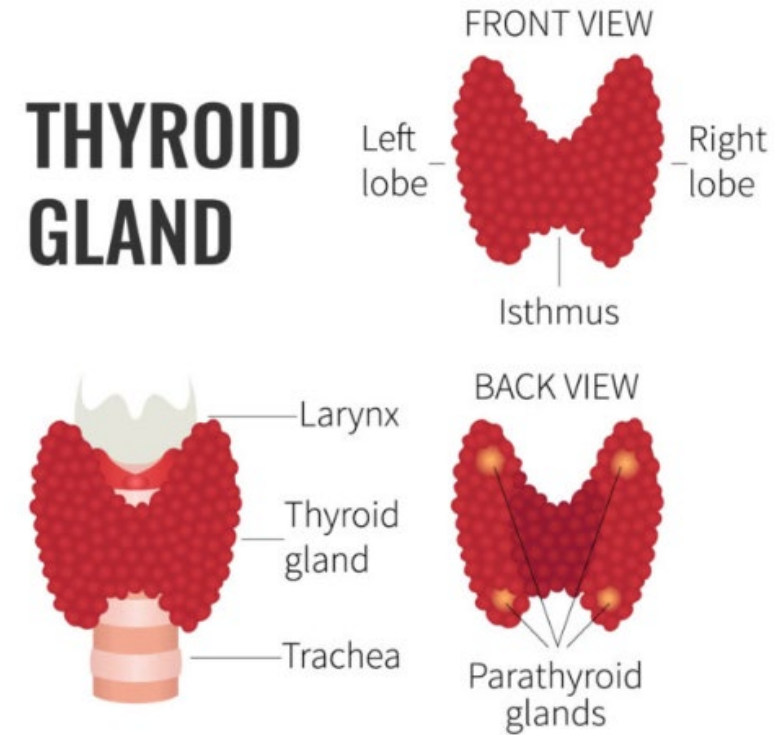
1. Thyroid: What is it?
2. Thyroid Diseases
3. Thyroid Metabolism and Hormones
4. Nutritional Micronutrients and their Role in Thyroid Function
5. Diet and Thyroid Health

# Thyroid: What is it?

A small organ that sits around the trachea and is shaped like a butterfly

Responsible for stimulating many physiological processes throughout the body, but primarily those that relate to metabolism and energy.

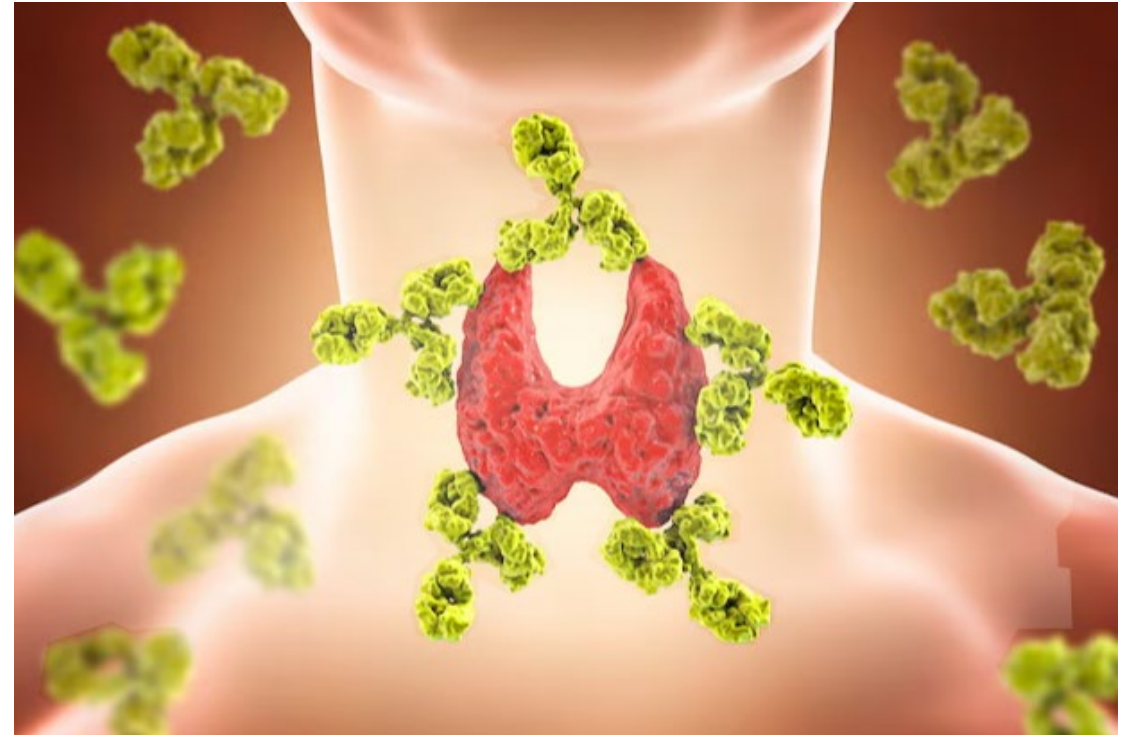
- Increase fat breakdown
- Enhance muscle contraction
- Promote bone growth/development
- Elevate heart rate
- Impact specific nutrient digestion and absorption



# Thyroid: Common Thyroid Diseases

## Thyroid Diseases

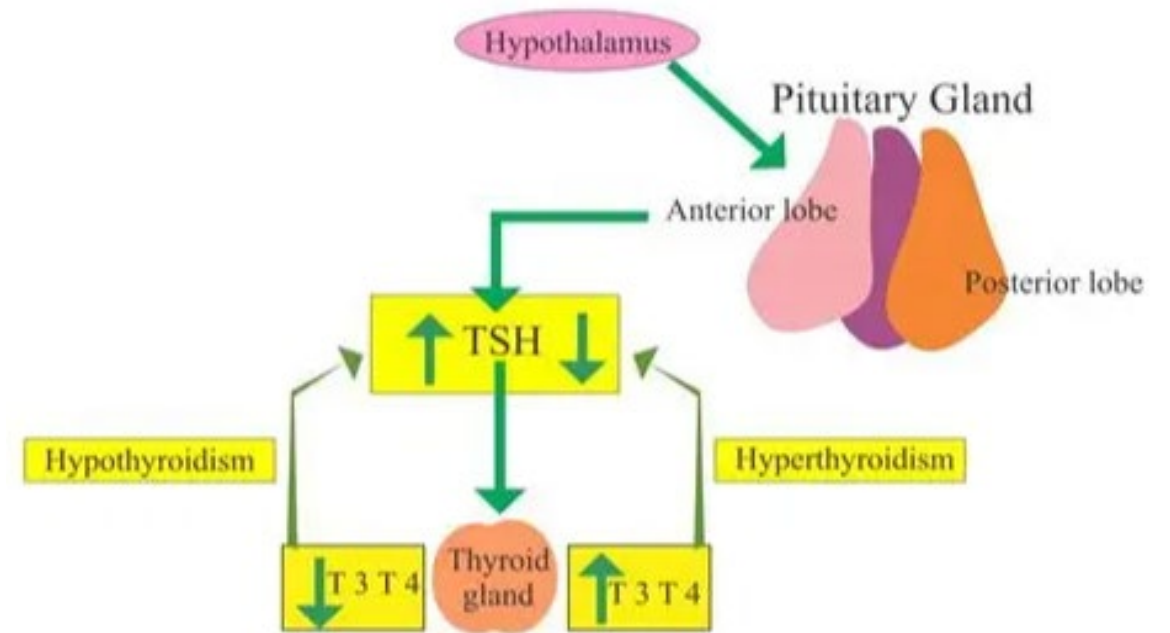
- **Hashimoto's thyroiditis:** autoimmune condition where the thyroid becomes less active/inactive (Hypothyroidism)
- **Grave's disease:** autoimmune condition where the thyroid becomes overactive (Hyperthyroidism)
- **Goiter:** results from Iodine deficiency



# Thyroid Metabolism and Hormones

Hypothalamus in the brain, signals Pituitary gland to release Thyroid Stimulating Hormone (TSH)

This controls the production of T4 and T3 which are specific thyroid hormones.



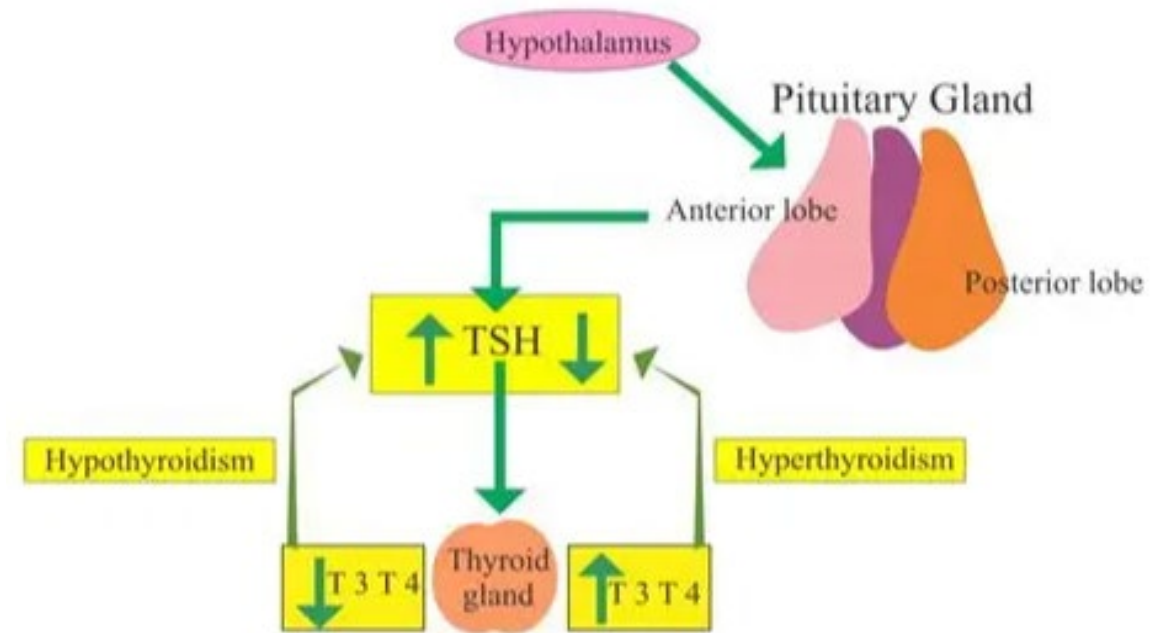
# Thyroid Metabolism and Hormones

**Thyroid Stimulating Hormone (TSH):** released by pituitary gland to stimulate production of T4 and T3

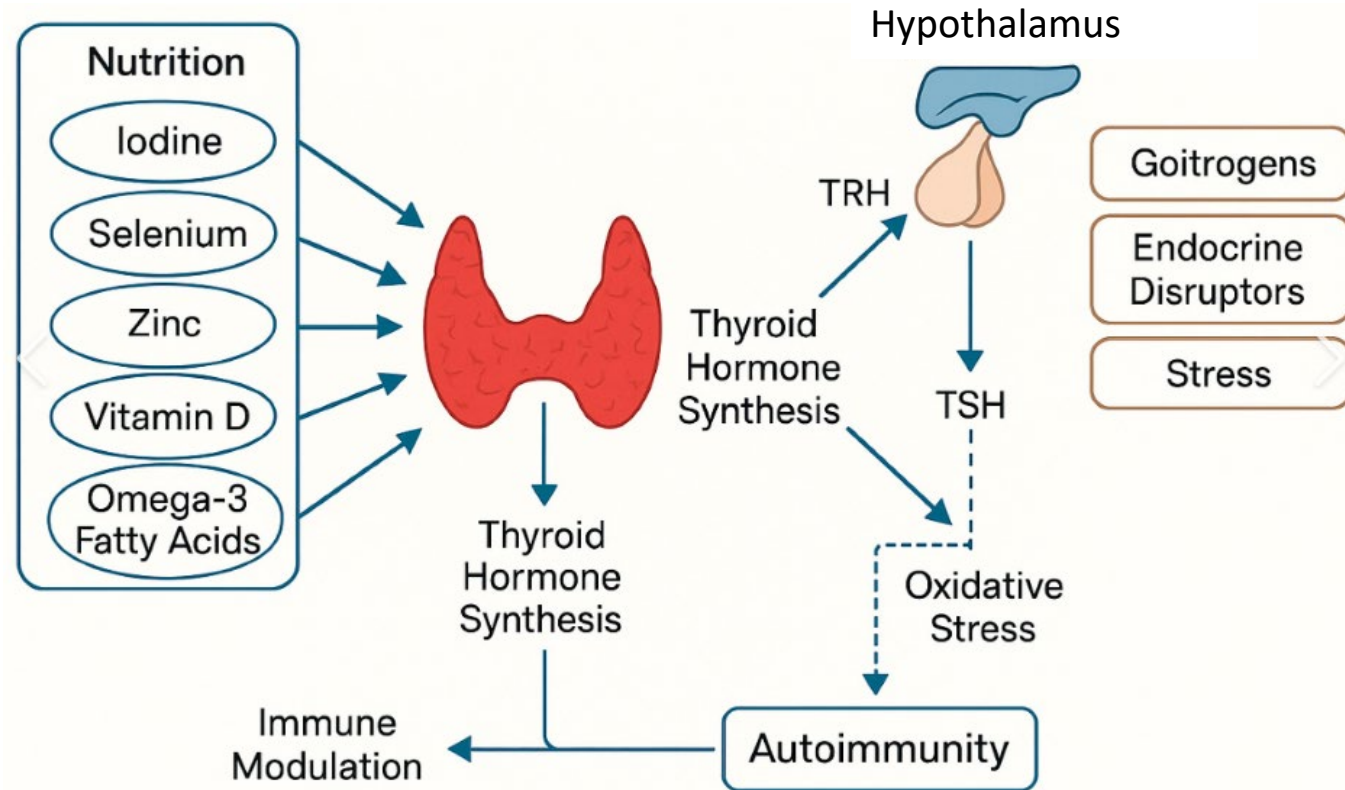
**Thyroxine (T4):** T4 released into the bloodstream, it can convert to T3.

**Triiodothyronine (T3):** "Active form", produced in lesser than T4, but it has a much greater effect on metabolism.


**Calcitonin:** This hormone helps regulate the amount of calcium in the blood.



# Thyroid Metabolism and Micronutrients



# Micronutrients and Thyroid Hormones



A magnifying glass is positioned over a periodic table, focusing on the element Iodine. The table shows various elements with their symbols, names, and atomic numbers. The element Iodine (I) is highlighted in purple and is the central focus of the magnifying glass. The atomic number 53 is visible above the symbol, and the atomic weight 126.9 is below it. The name 'Iodine' is written in a larger font below the symbol. The magnifying glass also shows parts of neighboring elements like Bromine (Br) and Xenon (Xe).

| ATOMIC NUMBER | SYMBOL        | NAME         |
|---------------|---------------|--------------|
| 10            | B             | Boron        |
| 11            | Na            | Sodium       |
| 12            | Mg            | Magnesium    |
| 13            | Al            | Aluminium    |
| 14            | Si            | Silicon      |
| 15            | P             | Phosphorus   |
| 16            | S             | Sulfur       |
| 17            | Cl            | Chlorine     |
| 18            | Ar            | Argon        |
| 19            | K             | Potassium    |
| 20            | Ca            | Calcium      |
| 21            | Sc            | Scandium     |
| 22            | Ti            | Titanium     |
| 23            | V             | Vanadium     |
| 24            | Cr            | Chromium     |
| 25            | Mn            | Manganese    |
| 26            | Fe            | Iron         |
| 27            | Co            | Cobalt       |
| 28            | Ni            | Nickel       |
| 29            | Cu            | Copper       |
| 30            | Zn            | Zinc         |
| 31            | Ga            | Gallium      |
| 32            | Ge            | Germanium    |
| 33            | As            | Arsenic      |
| 34            | Se            | Selenium     |
| 35            | Br            | Bromine      |
| 36            | Kr            | Krypton      |
| 37            | Rb            | Rubidium     |
| 38            | Sr            | Strontium    |
| 39            | Y             | Yttrium      |
| 40            | Zr            | Zirconium    |
| 41            | Nb            | Niobium      |
| 42            | Mo            | Molybdenum   |
| 43            | Tc            | Technetium   |
| 44            | Ru            | Ruthenium    |
| 45            | Rh            | Rhodium      |
| 46            | Pd            | Palladium    |
| 47            | Ag            | Silver       |
| 48            | Cd            | Cadmium      |
| 49            | In            | Indium       |
| 50            | Sn            | Tin          |
| 51            | Sb            | Antimony     |
| 52            | Te            | Tellurium    |
| 53            | I             | Iodine       |
| 54            | Xe            | Xenon        |
| 55            | Ba            | Barium       |
| 56            | La            | Lanthanum    |
| 57            | Ce            | Cerium       |
| 58            | Pr            | Praseodymium |
| 59            | Nd            | Niodymium    |
| 60            | Pm            | Promethium   |
| 61            | Sm            | Samarium     |
| 62            | Eu            | Europium     |
| 63            | Gd            | Gadolinium   |
| 64            | Tb            | Terbium      |
| 65            | Dy            | Dysprosium   |
| 66            | Ho            | Holmium      |
| 67            | Er            | Erbium       |
| 68            | Tm            | Thulium      |
| 69            | Yb            | Ytterbium    |
| 70            | Lu            | Lutetium     |
| 71            | Hf            | Hafnium      |
| 72            | Ta            | Tantalum     |
| 73            | W             | Tungsten     |
| 74            | Re            | Rhenium      |
| 75            | Os            | Osmium       |
| 76            | Ir            | Iridium      |
| 77            | Pt            | Platinum     |
| 78            | Au            | Gold         |
| 79            | Hg            | Mercury      |
| 80            | Tl            | Thallium     |
| 81            | Pb            | Lead         |
| 82            | Bi            | Bismuth      |
| 83            | Po            | Polonium     |
| 84            | At            | Astatine     |
| 85            | Rn            | Radon        |
| 86            | Fr            | Francium     |
| 87            | Ra            | Radium       |
| 88            | Ac            | Actinium     |
| 89            | Th            | Thorium      |
| 90            | Pa            | Protactinium |
| 91            | U             | Uranium      |
| 92            | Np            | Neptunium    |
| 93            | Pu            | Plutonium    |
| 94            | Am            | Americium    |
| 95            | Cm            | Curium       |
| 96            | Bk            | Berkelium    |
| 97            | Cf            | Californium  |
| 98            | Es            | Einsteinium  |
| 99            | Fm            | Fermium      |
| 100           | Mendelevium   |              |
| 101           | Dubnium       |              |
| 102           | Rutherfordium |              |
| 103           | Darmstadtium  |              |
| 104           | Roentgenium   |              |
| 105           | Dubnium       |              |
| 106           | Livermorium   |              |
| 107           | Tennessine    |              |
| 108           | Oganesson     |              |
| 109           | Ununennium    |              |
| 110           | Unbinilium    |              |
| 111           | Untrium       |              |
| 112           | Unquadrium    |              |
| 113           | Unpentium     |              |
| 114           | Unsextium     |              |
| 115           | Unseptium     |              |
| 116           | Unoctium      |              |
| 117           | Unnennium     |              |
| 118           | Unbinilium    |              |

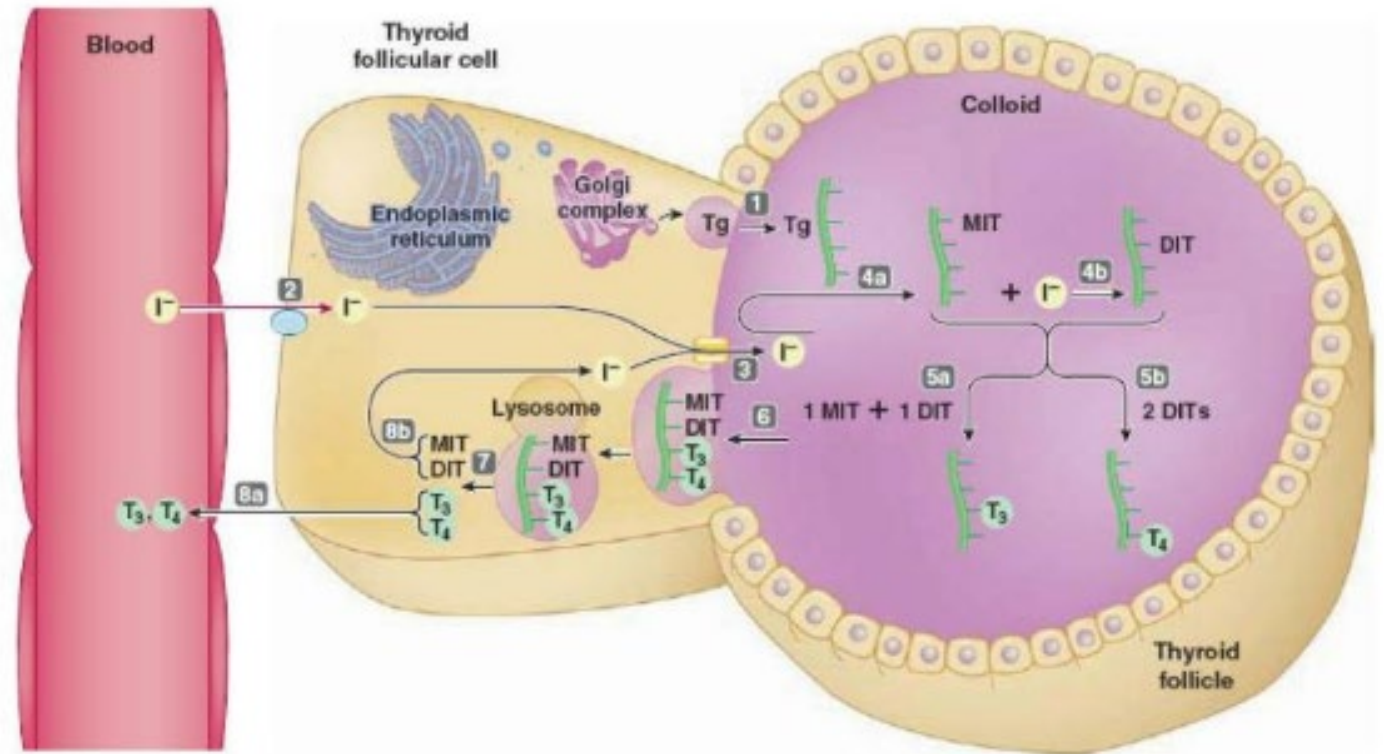
# Micronutrients and Thyroid Hormones: Iodine

## Iodine

Necessary for synthesis of thyroid hormones T4 and T3

Transported inside the thyroid cells to be used towards the reactions

We use 7 Iodide ions to make 1 of each T4 and T3



# Micronutrients and Thyroid Hormones: Iodine

Found in various content in soil and ground water depending on regional location

Food sources include:

- Seaweed
- Cod, Haddock, Lobster, Oysters
- Milk, Greek Yogurt, Cheese
- Eggs
- Cranberries and Prunes
- Potatoes
- Iodized Salt

RDA: 150 mcg/day for adults

Pregnancy: 220 mcg/day

Lactation: 290 mcg/day

UL: 1100 mcg/day



-RDA (Recommended Dietary Allowance): Average intake needed to meet nutritional needs of 97-98% of population

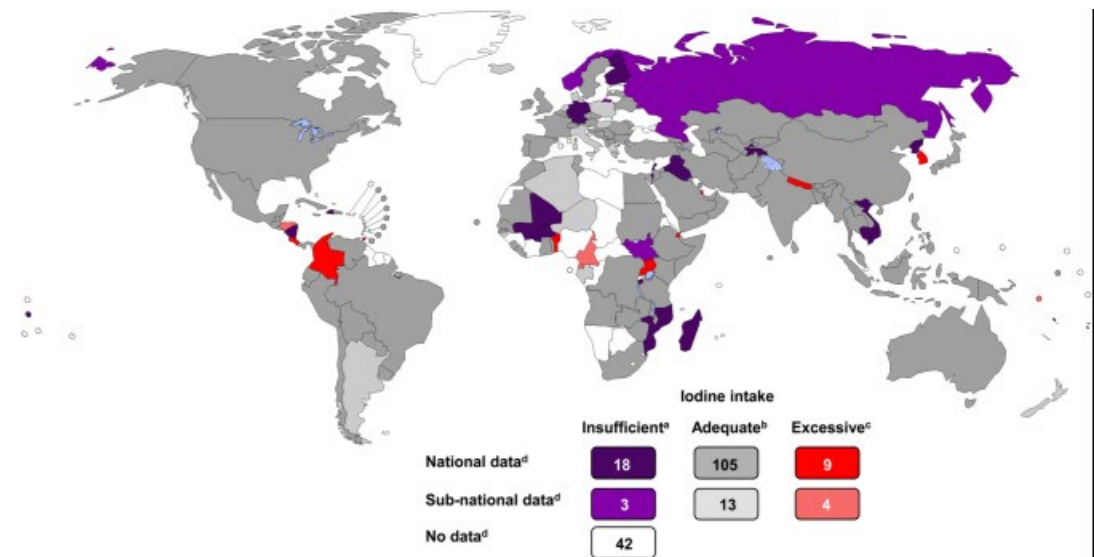
-UL (Tolerable Upper Limit): Maximum amount of intake unlikely to cause adverse health effects

# Micronutrients and Thyroid Hormones: Iodine

## Iodized Salt

Public health initiative in the early 1920s that added iodine to salt to prevent goiter

As of 2020, 124 countries mandate the iodization of salt, 21 leave it voluntary



# Micronutrients and Thyroid Hormones: Iodine

## Food Interactions --"Goitrogens"

Foods reduce the absorption of iodine

Not concerning in healthy individuals, only those with autoimmune thyroid disease or iodine deficiency

- Cruciferous vegetables
- Soy foods
- Cassava Root
- Strawberries
- Peaches
- Flax seeds
- Red wine
- Teas

**FUN FACT:** steaming/boiling can reduce goitrogenic effect by 30-65%.  
Fermenting can increase goitrogenic effects




# Micronutrients and Thyroid Hormones: Iodine

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## Thyroid Disease Food-Medication Interactions

- Synthroid (Levothyroxine): Always take on empty stomach and wait at least 1 hour before eating food
  - Soy foods, walnuts, flax seeds, and grapefruit
  - Iron, calcium, magnesium supplements should be taken > 4hrs from medication
- Propylthiouracil (PTU): N/A
- Methimazole: N/A

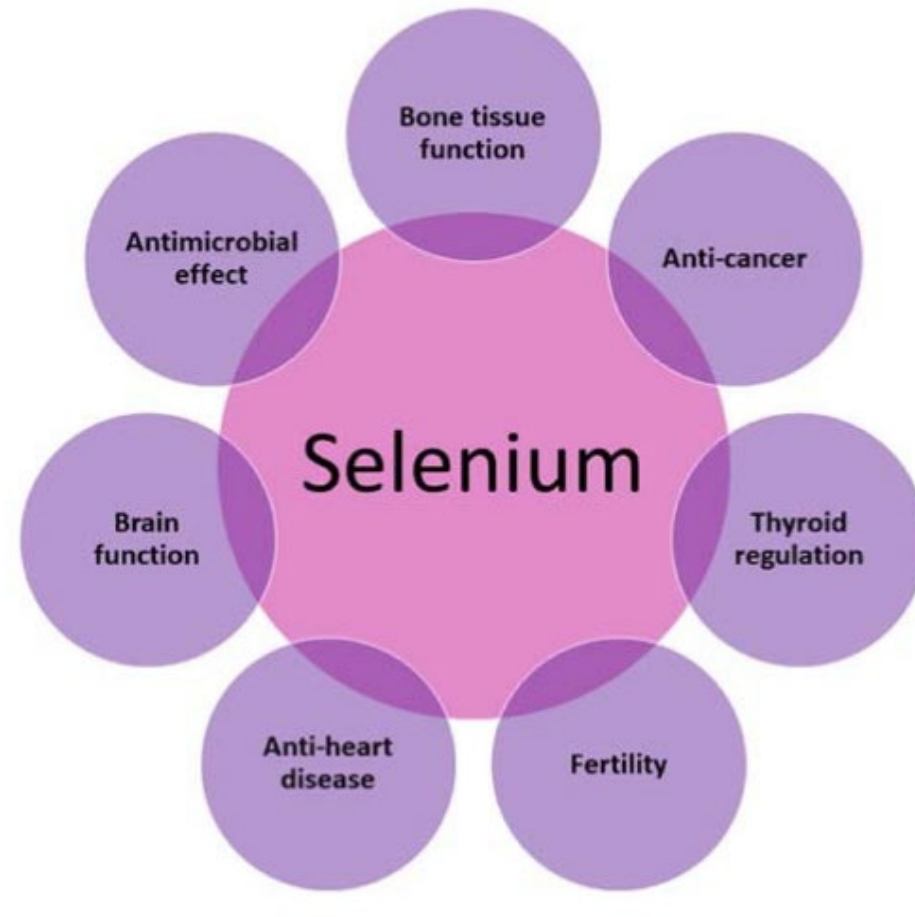
# Micronutrients and Thyroid Hormones: Selenium



The image shows a portion of the periodic table with a magnifying glass centered on the element Selenium (Se). The magnifying glass highlights the element's symbol, atomic number (34), atomic weight (78.96), and its classification as a non-metal. The surrounding elements and their properties are also visible.

| Group    | 13 IIIA                      | 14 IVA                        | 15 VA                           | 16 VIA                          | 17 VIIA                        | 18 VIII                         |                                |
|----------|------------------------------|-------------------------------|---------------------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|
| Period 2 | 5 B<br>Boron<br>10.811       | 6 C<br>Carbon<br>12.011       | 7 N<br>Nitrogen<br>14.007       | 8 O<br>Oxygen<br>15.999         | 9 F<br>Fluorine<br>18.998      | 10 Ne<br>Neon<br>20.180         |                                |
| Period 3 | 13 Al<br>Aluminium<br>26.982 | 14 Si<br>Silicon<br>28.086    | 15 P<br>Phosphorus<br>30.974    | 16 S<br>Sulfur<br>32.065        | 17 Cl<br>Chlorine<br>35.453    | 18 Ar<br>Argon<br>39.948        |                                |
| Period 4 | 30 Zn<br>Zinc<br>65.39       | 31 Ga<br>Gallium<br>69.723    | 32 Ge<br>Germanium<br>72.630    | 33 As<br>Arsenic<br>74.922      | 34 Se<br>Selenium<br>78.96     | 35 Br<br>Bromine<br>79.904      |                                |
| Period 5 | 48 Cd<br>Cadmium<br>112.41   | 49 In<br>Indium<br>114.82     | 50 Sn<br>Tin<br>118.710         | 51 Sb<br>Antimony<br>121.757    | 52 Te<br>Tellurium<br>127.603  | 53 I<br>Iodine<br>126.905       |                                |
| Period 6 | 80 Hg<br>Mercury<br>200.59   | 81 Tl<br>Thallium<br>204.38   | 82 Pb<br>Lead<br>207.2          | 83 Bi<br>Bismuth<br>208.98      | 84 Po<br>Polonium<br>(209)     | 85 At<br>Astatine<br>(210)      | 86 Rn<br>Radon<br>(222)        |
| Period 7 | 112 Uub<br>Ununbium<br>(285) | 113 Uut<br>Ununtrium<br>(288) | 114 Uuq<br>Ununquadium<br>(291) | 115 Uup<br>Ununpentium<br>(294) | 116 Uuh<br>Ununhexium<br>(297) | 117 Uus<br>Ununseptium<br>(301) | 118 Uuo<br>Ununoctium<br>(304) |

# Micronutrients and Thyroid Hormones: Selenium

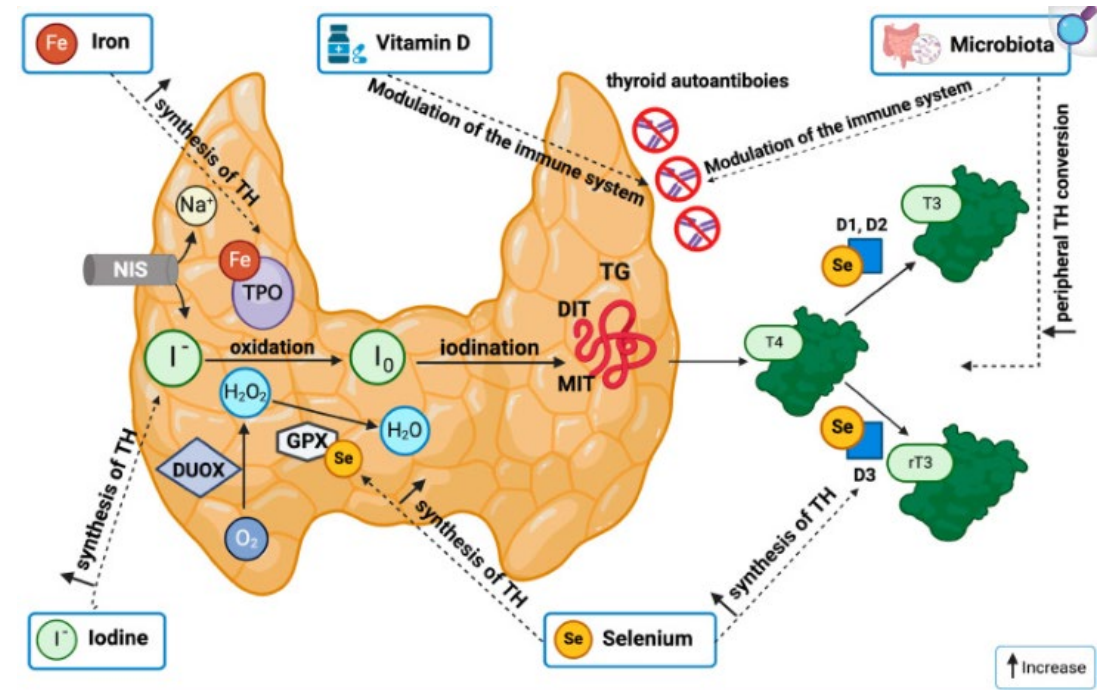


# Micronutrients and Thyroid Hormones: Selenium

## Selenium and Thyroid Hormones

Acts as a cofactor for glutathione peroxidase (GPX) enzyme which support the increase in thyroid hormone production

Involved in conversion of T4 into T3



# Micronutrients and Thyroid Hormones: Selenium

Food sources include:

- Brazil nuts, walnuts, pumpkin seeds
- Sardines
- Haddock
- Chicken and beef
- Mushrooms
- Potatoes
- Eggs

RDA: 55 mcg/day for adults

Pregnancy: 60 mcg/day

Lactation: 70 mcg/day

UL: 400 mcg/day



-RDA (Recommended Dietary Allowance): Average intake needed to meet nutritional needs of 97-98% of population

-UL (Tolerable Upper Limit): Maximum amount of intake unlikely to cause adverse health effects

# Diet and Thyroid Health

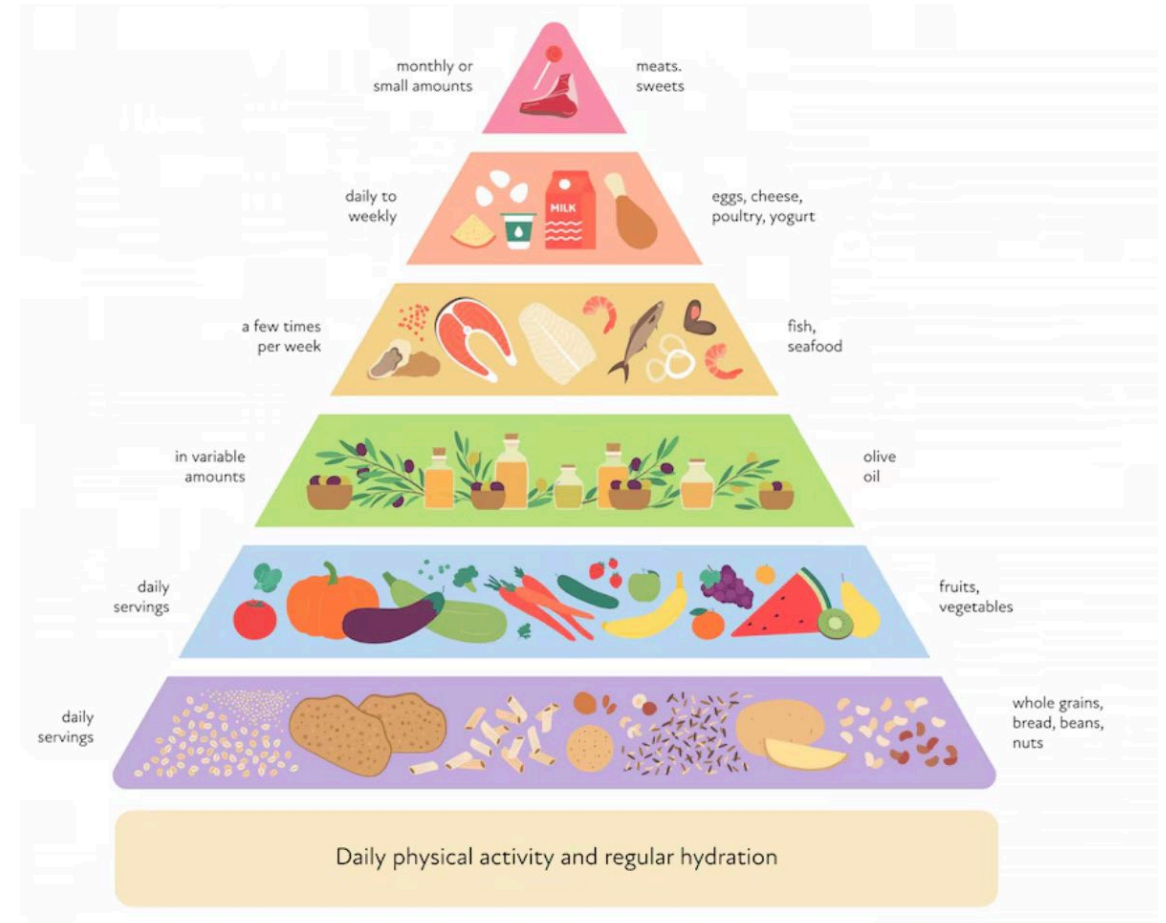




# Diet and Thyroid Health: "Mediterranean Diet"

## The "Mediterranean" diet includes:

- High amounts of (few times per day)
  - Fruit
  - Vegetables
  - Whole Grains
  - Beans/Legumes
  - Nuts
  - Olive Oil
- Moderate intake of (few times per week)
  - Fish/Seafood
  - Eggs
  - Poultry
  - Cultured dairy
- Low amounts of (few times per month)
  - Sweets/Added Sugars
  - Red meat



# Diet and Thyroid Health

## Practical tips

- Have a small salad with breakfast and use olive oil
- Eat a serving of mixed nuts or seeds alongside fruit once per day
- Add whole grains like quinoa, farro, or rice onto salads
- Add leafy greens into soups
- Eat fresh vegetables with bean dip





Schedule an appointment with one of South Bay's Best **Registered Dietitian Nutritionists** (RDNs) or enroll in one of our classes TODAY!

*Thank You!*

Call (310) 891-6707 for more information

[www.torrancememorial.org/nutrition](http://www.torrancememorial.org/nutrition)