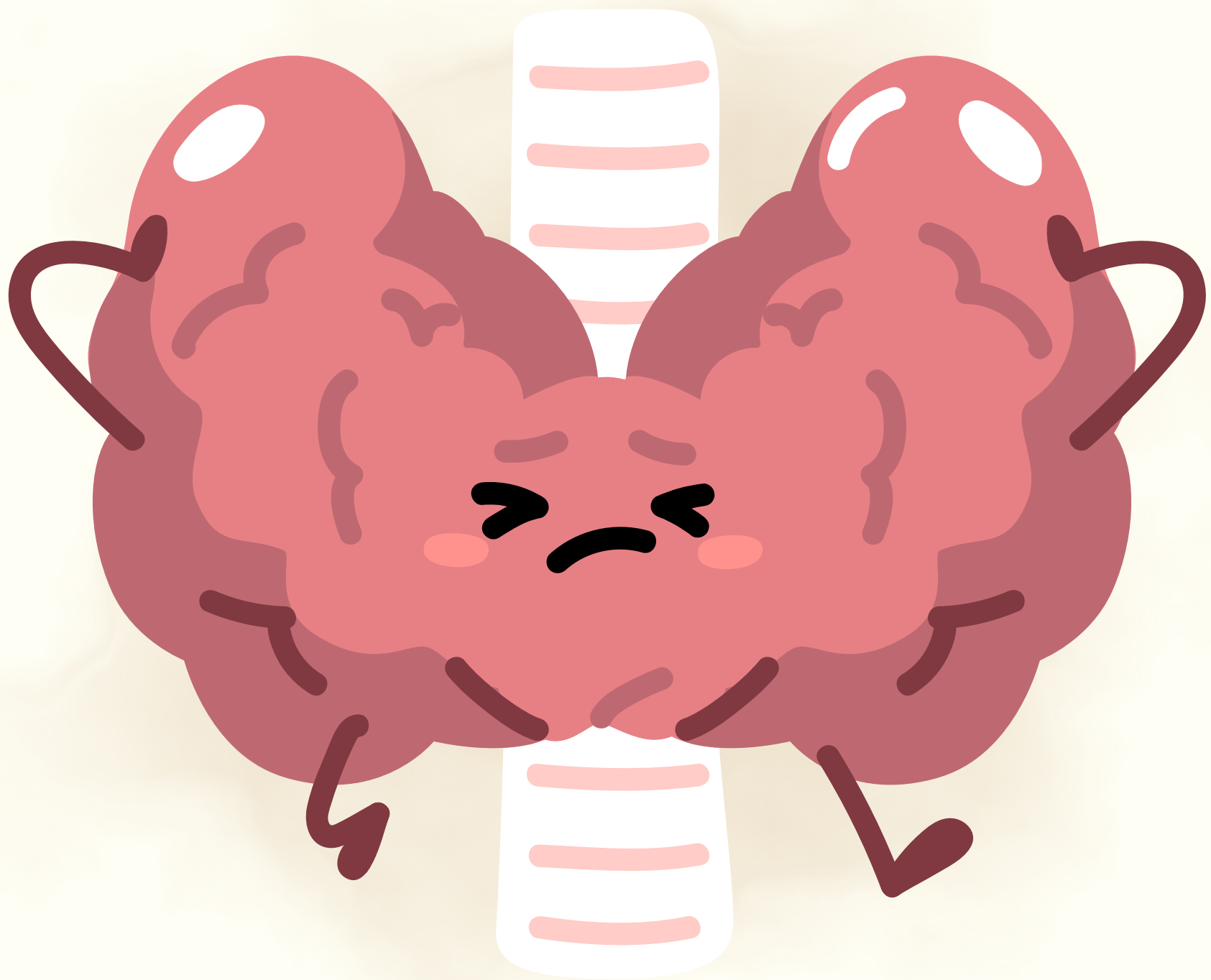


Matrix unlocked

HYPERTHYROIDISM / HYPOTHYROIDISM



MUM
IM'S

Thyroid Hormone Function



Before we dive into Hyper vs. Hypothyroidism... let's meet the Thyroid Hormone! Thyroid hormones (T3 & T4) keep our body running smoothly. An easy way to remember their functions is the "7 B's":

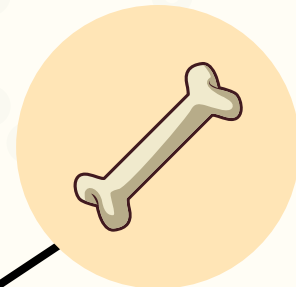
Brain maturation



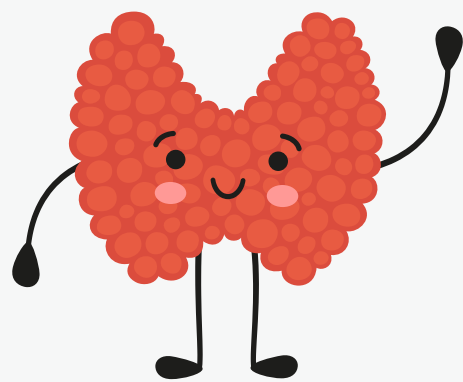
Stimulates surfactant synthesis in **B**abies



Bone growth



7B's

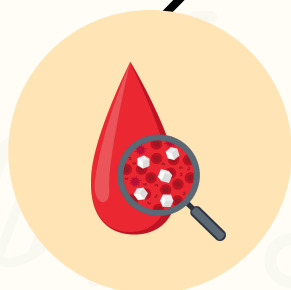
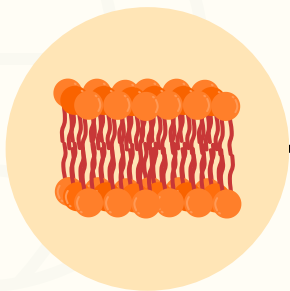


functions

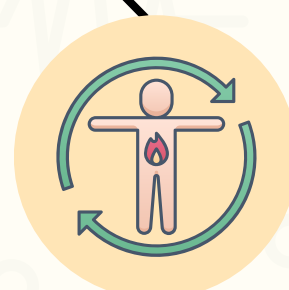
β_1

B β_1 -adrenergic effects

Break down lipids
($\uparrow$ lipolysis)



Blood sugar
($\uparrow$ glycogenolysis, gluconeogenesis)



Basal metabolic rate $\uparrow$

Definition & Causes

Hyperthyroidism

VS

Hypothyroidism

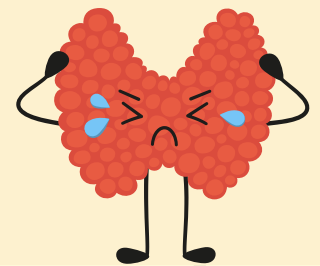
Definition



Thyrotoxicosis: Clinical condition that results from excess thyroid hormones, regardless of the cause

Hyperthyroidism: Condition characterised by the overproduction of thyroid hormones by the thyroid gland

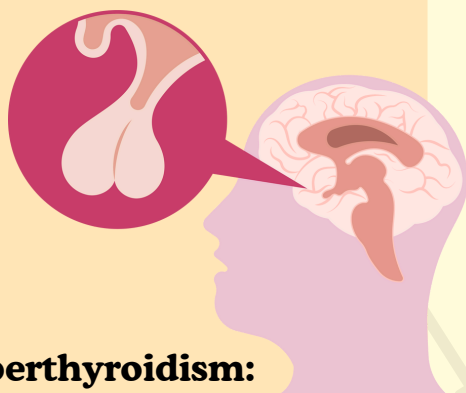
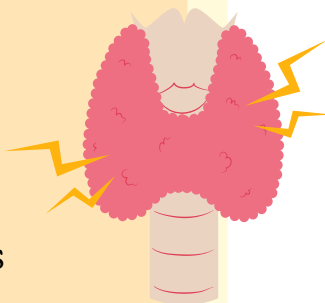
Clinical condition that results from insufficient production of thyroid hormones



Causes

Primary hyperthyroidism:

- Graves disease
- Toxic multinodular goitre
- Toxic adenoma
- Subacute (de Quervain's) thyroiditis
- Painless sporadic thyroiditis
- Postpartum thyroiditis
- Exogenous thyroid hormone
- Amiodarone-induced thyrotoxicosis

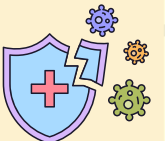


Secondary hyperthyroidism:

- TSH secreting adenoma
- Gonadotropin secreting tumour (e.g. choriocarcinoma, gestational trophoblastic disease)

Autoimmune:

- Hashimoto thyroiditis
- Graves disease with TSH receptor-blocking antibodies



Iatrogenic:

- Radioactive iodine ablation
- Thyroidectomy
- Drugs (e.g. carbimazole, propylthiouracil, amiodarone, lithium)



Transient thyroiditis:

- Subacute (de Quervain's) thyroiditis
- Postpartum thyroiditis



Iodine deficiency (e.g. in mountains regions)



Congenital (e.g. thyroid aplasia)



Infiltrative:

- Amyloidosis
- Riedel thyroiditis
- Sarcoidosis

Secondary hypothyroidism (e.g. pituitary adenoma) → TSH deficiency



Signs & Symptoms

Systems

Hyperthyroidism

Hypothyroidism

General



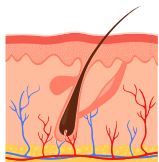
- Heat intolerance
- Weight loss despite increased appetite



- Cold intolerance
- Weight gain despite decreased appetite



Skin & Hair



- Warm, moist skin
- Onycholysis
- Thyroid acropachy

- Cold, dry skin
- Brittle nails
- Alopecia
- Loss of lateral eyebrows (Queen Anne sign)



Eyes

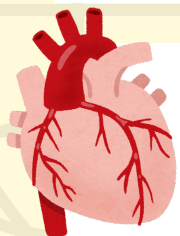
- Lid retraction, lid lag
- Exophthalmos



- Periorbital oedema

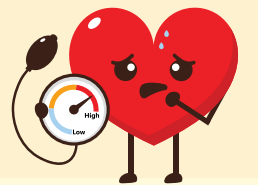


CVS

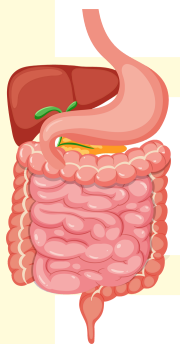


- Palpitations
- Tachycardia
- Atrial fibrillation
- Systolic hypertension
- Heart failure

- Bradycardia
- Hypertension
- Pericardial effusions



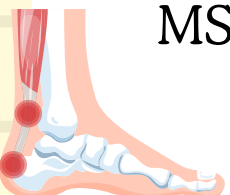
GI



- Diarrhoea

- Constipation

MSK



- Proximal myopathy
- Osteoporosis



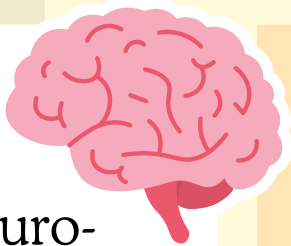
- Hypothyroid myopathy (e.g. cramps, stiffness, myalgia)
- Carpal tunnel syndrome



Signs & Symptoms

Systems

Neuro-
psychiatric



Hyperthyroidism

- Anxiety
- Restlessness
- Insomnia
- Tremor
- Hyperreflexia

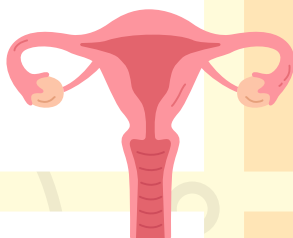


Hypothyroidism

- Fatigue, somnolence
- Depression
- Impaired cognition
- Woltman's sign (delayed relaxation phase of a deep-tendon reflex)



Reproductive



- Oligo/amenorrhoea
- Gynaecomastia
- Infertility
- Loss of libido, impotence

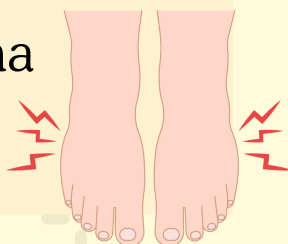


- Menorrhagia
- Galactorrhoea
- Infertility
- Loss of libido, impotence

Others

-

- Non-pitting edema (myxedema)



Graves' Disease: Clinical signs



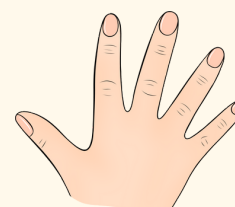
Goitre
with bruit



Pretibial
myxedema



Exophthalmos



Thyroid
acropachy



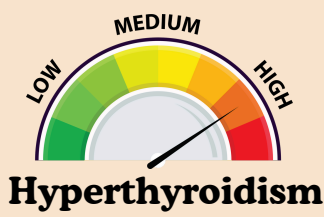
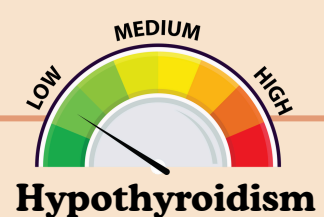


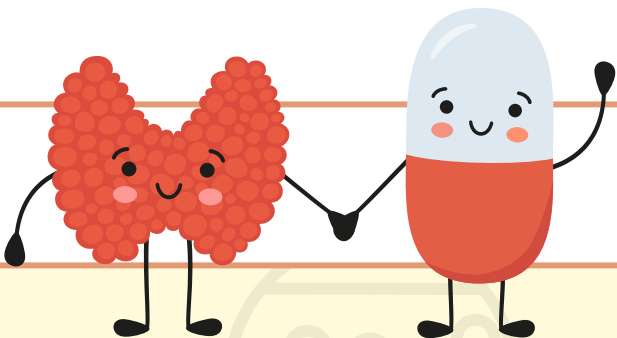
Investigations & Treatment

Investigations	Hyperthyroidism	Hypothyroidism
Thyroid Function Tests (TFT)	↓ TSH, ↑ Free T4/T3 (Primary)	↑ TSH, ↓ Free T4 (Primary)
Antibodies	↑ TRAb (Graves')	Anti-TPO, Anti-TG ↑ (Hashimoto's)
Imaging	- Radioactive iodine uptake scan → diffuse uptake (Graves'), patchy (Multi Nodular Goitre), single hot nodule (toxic adenoma) - US thyroid: goitre/nodules	US thyroid: (goitre, nodules)
Baseline/Monitoring	- FBC, LFT (before antithyroid drugs, risk: agranulocytosis, hepatotoxicity) - ECG: Atrial fibrillation, tachycardia	- FBC (anaemia) - Lipid profile (↑ cholesterol)

Abbreviations: TSH = Thyroid Stimulating Hormone, T4 = Thyroxine, T3 = Triiodothyronine, TRAb = TSH receptor antibody, Anti-TPO = Anti-thyroid peroxidase antibody, Anti-TG = Anti-thyroglobulin antibody

Treatment

 Hyperthyroidism	1. Anti-thyroid drugs - Carbimazole - First line for hyperthyroidism - Avoid in 1st trimester pregnancy due to teratogenic effects (e.g. aplasia cutis) - Side effects: Agranulocytosis, pruritic rash, cholestatic jaundice - Propylthiouracil - Preferred in 1st trimester pregnancy, thyroid storm - Side effects: Severe hepatotoxicity, agranulocytosis, ANCA-associated vasculitis 2. Symptomatic relief - Propranolol (for tremor, palpitations, anxiety) 3. Definitive therapy - Radioactive Iodine (RAI) ablation - Surgery (thyroidectomy) – if large goitre, compressive symptoms, severe ophthalmopathy or RAI contraindicated
 Hypothyroidism	Levothyroxine replacement (lifelong)



Thyroid Emergencies

Thyroid Storm (Hyperthyroidism)

- Infections
- Untreated or inadequately treated thyrotoxicosis
- Surgery (thyroidal or non-thyroidal)
- Acute illness:
 - Diabetic ketoacidosis
 - Adrenal insufficiency
- Iodine exposure
- Pregnancy and delivery



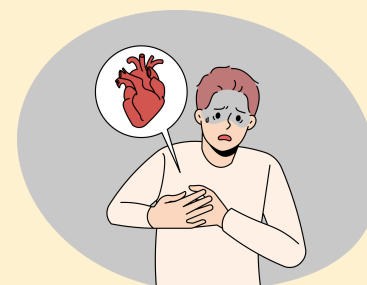
VS



Triggers

Myxedema Coma (Hypothyroidism)

- Infections
- Medications (e.g. sedatives, anaesthetics, lithium)
- Severe illness (e.g. heart failure, stroke)
- Trauma



- CNS manifestations (e.g. restlessness, delirium, mental aberration/psychosis, somnolence/lethargy, coma) 
- Fever
- Tachycardia, atrial fibrillation, heart failure
- GI/Hepatic manifestations (e.g. nausea, vomiting, diarrhoea, jaundice)



Clinical features

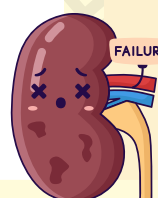
Cardinal symptoms:

- Impaired mental status → coma
- Hypothermia
- Myxedema



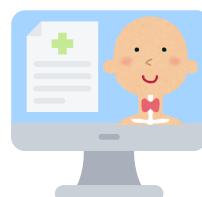
Other complications:

- Hyponatremia, hypoglycaemia
- Bradycardia, hypotension, heart failure
- Hypoventilation and hypercapnia
- Renal failure
- Anaemia



Mnemonic: "4P's"

- P**ropranolol - controls tachycardia, reduces T4→T3 conversion
- P**ropylthiouracil (PTU) - blocks thyroid hormone synthesis
- P**rednisolone (or Hydrocortisone) - reduces T4→T3 conversion & covers adrenal insufficiency
- P**otassium iodide (Lugol's iodine) - blocks release of preformed hormone (give **after** PTU)



Management



Mnemonic: "5S's"

- S**upportive Care - ICU care, airway and ventilatory support, fluid and electrolyte balance
- S**low rewarming (Passive rewarming), avoid active rewarming (risk of vasodilation/collapse)
- S**teroids - IV Hydrocortisone (until adrenal insufficiency excluded)
- S**ynthroid (Levothyroxine)
- S**earch and treat precipitating cause (infection, MI, stroke, drugs)

References

1. Davidsons Principles & Practice of Medicine 22th Edition (pg. 740-745)
2. eTG
3. Malaysia CPG Management of Thyroid Disorders
https://www.moh.gov.my/moh/resources/Penerbitan/CPG/Endocrine/CPG_Management_of_Thyroid_Disorders.pdf
4. AMBOSS

