ACTION OF THYROID HORMONES.

(1) metabolic actions

(a) on Basal metabolic rate.

↑ BMR by → ↑ O_2 consumption & ↑ Basal metabolism (except brain, ant. pi

↑ $Na^+ K^+$ ATPase.

↑ synthesis of cytochromes & cytochrome oxidase activity.

. ↑ heat production.

↑ BMR → ↑ N_2, K^+ excretion.

↑ vitamin efficiency.

(b) Carbohydrate metabolism - Hyperglycemic.

. ↑ gluconeogenesis.

. ↑ glycogenolysis in liver & muscle.

. ↑ glucose reabsorption from GIT.

(b) Carbohydrate metabolism - Hyperglycemic.

- ↑ gluconeogenesis.
- ↑ glycogenolysis in liver & muscle.
- ↑ glucose reabsorption from GIT.

(C) Fat metabolism.

→ lipolysis: mobilisation of fat from adipose tissue.

→ ↑ FFA → oxidation of FFA ↑.

→ cholesterol synthesis ↑ promotes cholesterol ox. & Biliary excretion.

→ Hepatic uptake ↑ due to ↑ expression of LDL receptors in liver.

→ Net effect → ↓ cholesterol in plasma.

of tissues
, spleen, testes, uterus,

(D) protein metabolism.

- physiological doses → protein anabolism.
- ↑ RNA & protein synthesis → +ve N_2 balance.

Hyperthyroidism → protein catabolism.
Hypothyroidism → ↓ protein synthesis

(E) Vitamin Metabolism.

β carotene → vitamin A.

Hypo → β carotene accum → yellow skin.

(F) Electrolyte & water metabolism.

→ TH help in uniform distribution of water & electrolyte.

→ Hypo → retention of H_2O & $\ominus$

→ Hyper → ↑ phosphate Excretion, Ca^{2+}.

2. On Various Systems.

(a) Blood → ↑Erythropoiesis. → polycythemia. hyper.
anemia hypo.

(b) CVS.

HR → ↑ ; ↑ β receptors in nodal tissue ↑ sensitivity to catecholamines. ; ↑ HR.

Sleeping tachycardia → characteristic of thyrotoxicosis.

CO → ↑ due to ↑ Blood volume due to vasodilation.
↑ HR & ↑ SV.

FOC → ↑ β adrenergic receptor ↑ catecholamine sensitivity
↑ myosin heavy chain with ↑ ATPase activity.
↑ $Na^+ K^+$ ATPase
↑ Ca^{2+} ATPase action.
↑ FOC

SBP → ↑ due to ↑ CO.

DBP → Calorigenic → cutaneous vasodilation
→ PR↓ DBP↓

PP → wide as SBP↑ DBP↓.

(c) Respiration.

↑ O_2 utilization & CO_2 production.
↓
↑ rate & depth of respiration.

GIT

↑ apetite & motility & secretions.

∴ hypo → ↕ apetite ↓ food intake ↓ motility → constipation.

hyper → ↑ ap. ↑ ↑ → diarrhoea.

Skeletal muscle.

muscle weakness in both hypo & hyperthyroidism.

Hypo → general depression of metabolism.

hyper → due to protein catabolism.

Thyrotoxic myopathy.

On Sleep.

Hyper → constant tiredness & difficulty to sleep.

Hypo → Extreme somnolence with sleep of 12–14 hour

Reproduction.

men → lack of TH → loss of libido, oligospermia, sterility.

Excess TH → sometimes impotency.

women →

lack → loss of libido, ↓ fertility menorrhagia.

polymenorrhoea.

Excess → Oligomen / amenorrhoea.

helps in maintenance of milk secretion during lactation.

(h) on CNS.

for → branching of dendrites.
myelination.
↑ no. of synapse.

• essential for neuronal development especially in.
Cerebral cortex, basal ganglia & cochlea.

So TH dy during development
→ mental retardation.
→ motor rigidity.
→ deafness.

TH ↓ reaction time.

∴ Hyper → reflex time ↓.
hypo → reflex time ↑.

• some functions in brain are secondary to ↑ response to catecholamine.

hyperthyroidism → ↑ response to Reticular activating system ↑ irritability sleeplessness restlessness.

hypo → sluggish mental activity.
sleep is increased.

(h). skin.

• maintains normal skin texture.

Hyper.
cutaneous vasodilation.
↑ sweat : soft warm & wet

Hypo.
• coarse, dry, scaly, cold, puffy.
Hypersensitivity to cold.

• normal TH → necessary to remove proteins.

In hypo → mucopolysaccharide like Hyaluronicacid binds to protein → gives tissue gel → interstitial space under skin → ISF ↑ (odema) → ↑ osmotic pressure.

↑ NaCl water retention → dry skin.

GROWTH & DEVELOPMENT.

TH → ↳ normal body growth & skeletal maturation.
- ↑ protein synthesis
- ↑ release & action of GH.

TH absence → GH secretion ↓
growth ↓

dy. of TH on foetal, nancy / childhood → cretinism.

Relation WITH catecholamines.

affinity &
• ↑ no-of β adrenergic receptor.

• ↑ sensitivity of β receptors to catecholamines.

propranolol → Block β receptors.
used in thyrotoxicosis.

Metabolic → Basal
carbs
fats
proteins
Vit.
Water & Electrolyte.

Other → Blood
CVS.
respiration.
CNS
GIT.
• Skeletal muscle
• growth & dev.
• reproduction
• sleep
• skin.
• reaction with Catecholamines.