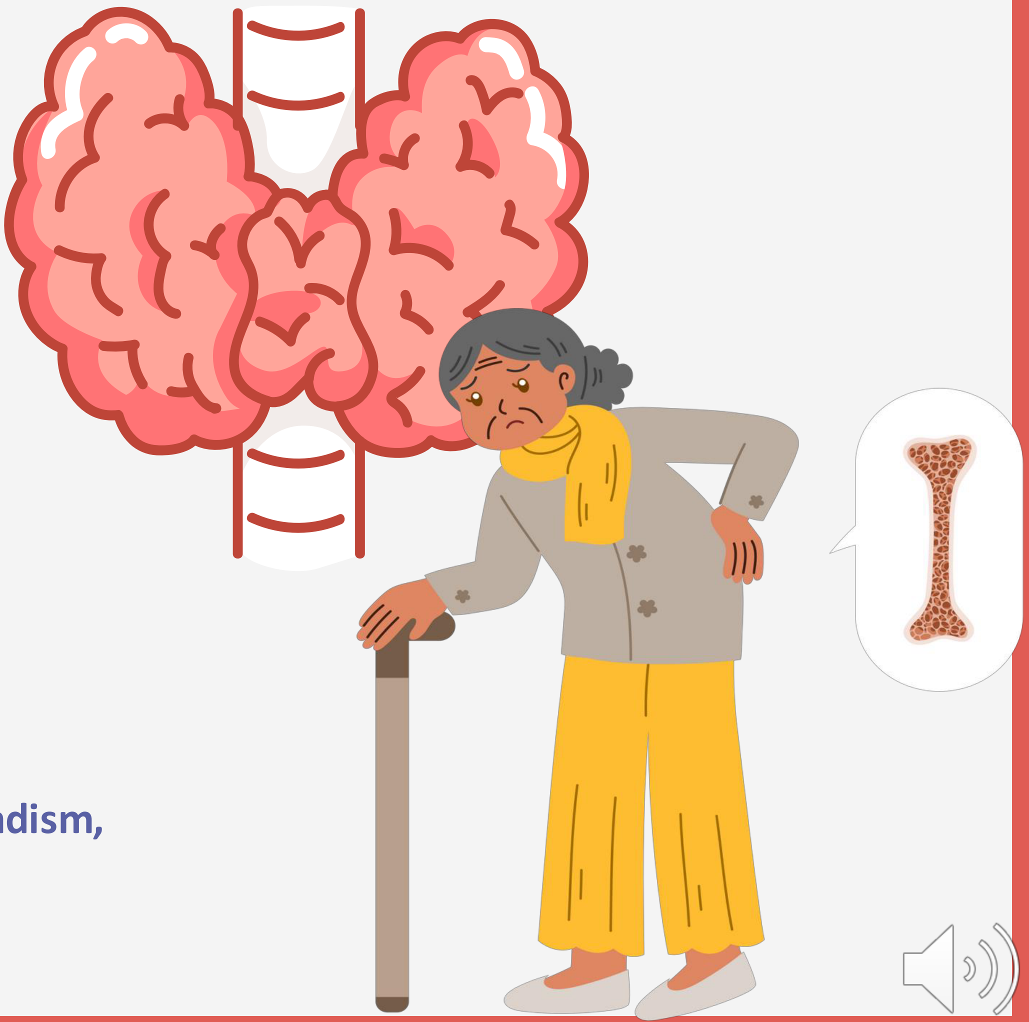
PHARMACOLOGY 201 | DR. MORA

Endocrine System



Pituitary, Thyroid, Parathyroid, Adrenal, Hypogonadism, and Osteoporosis

Learning Objectives

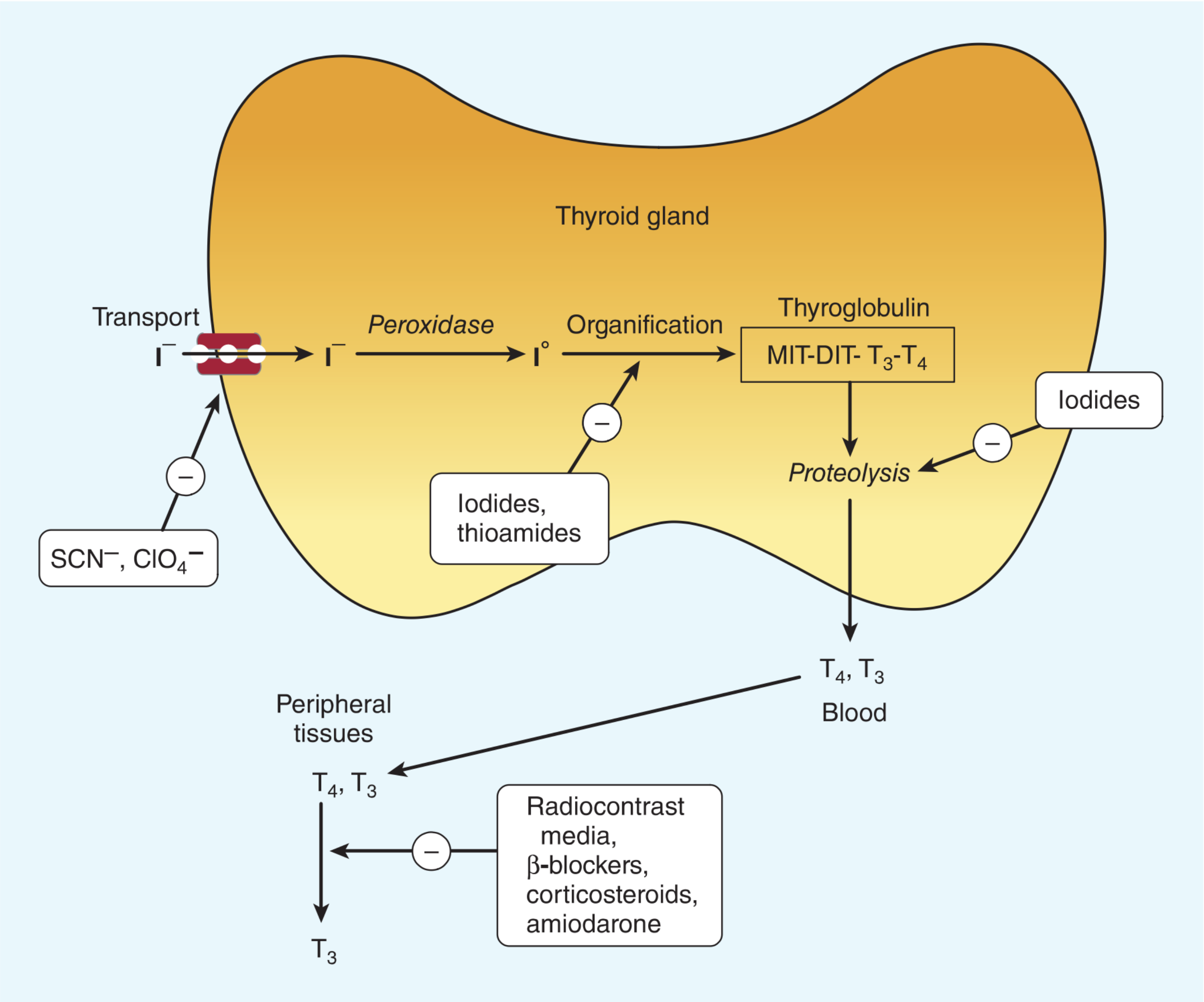
1. Describe the mechanism of action and clinical uses of vasopressin and desmopressin, including differences in V1 and V2 receptor activity.
2. Explain how dopamine agonists regulate pituitary hormone secretion, particularly their role in treating hyperprolactinemia and acromegaly.
3. Identify the therapeutic applications and adverse effects of somatostatin receptor ligands, such as octreotide, in endocrine and GI conditions.
4. Compare the pharmacologic properties and clinical indications of levothyroxine and liothyronine, including considerations in special populations.
5. Summarize the mechanisms and uses of antithyroid drugs (methimazole and PTU), including their role in hormone synthesis inhibition and peripheral conversion.

Learning Objectives

6. Discuss the indications and safety considerations for radioactive iodine therapy in hyperthyroidism and thyroid malignancies.
7. Describe the mechanism of action and indications for calcium-sensing receptor mimetics, including cinacalcet in hyperparathyroid conditions.
8. Explain the role of bisphosphonates and SERMs in bone metabolism disorders, including mechanisms and long-term monitoring.
9. Recognize the clinical use, benefits, and risks of vitamin D and calcium supplementation in metabolic bone disease and deficiency states.
10. Outline the indications, actions, and contraindications of sex hormone-related therapies, including testosterone, clomiphene and leuprolide.

HPA Medications

Thyroid Medications



Thyroid gland

Transport

I^- → I^-

Peroxidase

I°

Organification

Thyroglobulin

MIT-DIT- T_3-T_4

Iodides

Proteolysis

SCN^-, ClO_4^-

Iodides,
thioamides

T_4, T_3

Blood

Peripheral
tissues

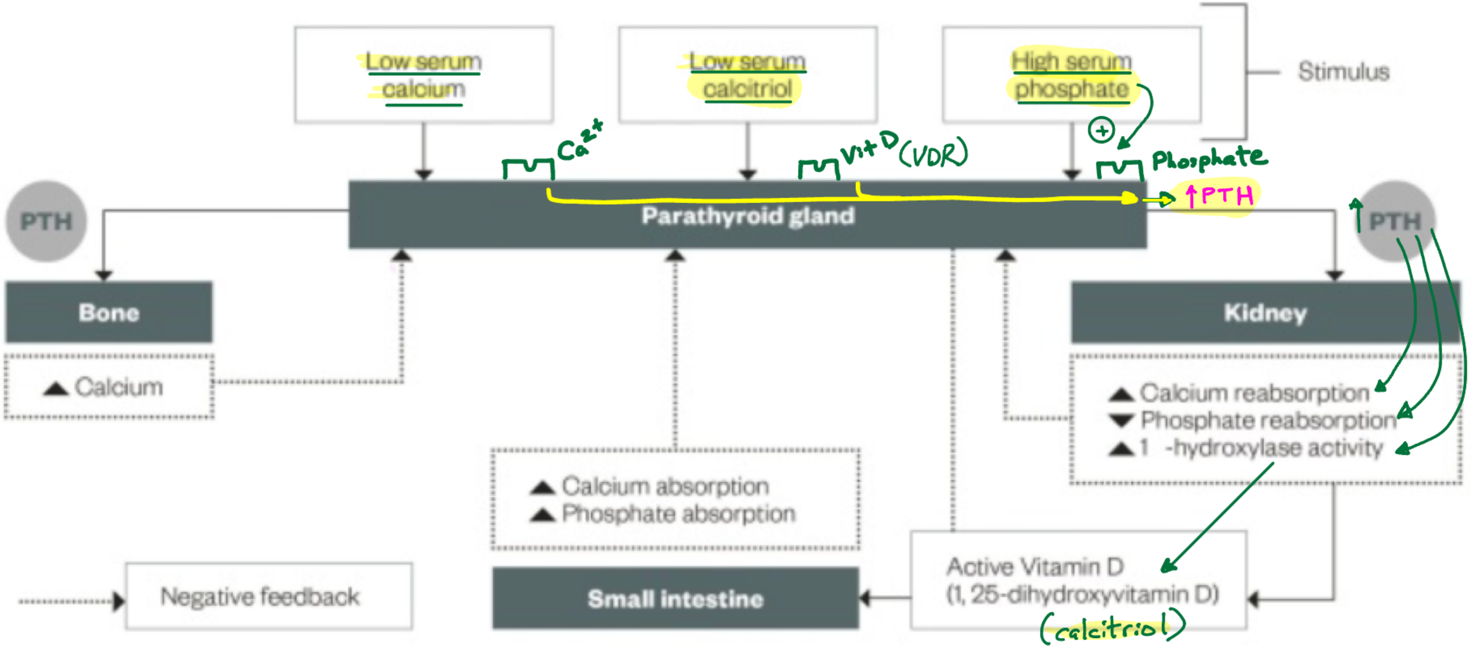
T_4, T_3

T_3

Radiocontrast
media,
β-blockers,
corticosteroids,
amiodarone

Calcium Metabolism, Parathyroid, Bones

Normal Parathyroid Regulation



Low serum calcium

Low serum calcitriol

High serum phosphate

Stimulus

Parathyroid gland

PTH

Bone

▲ Calcium

Kidney

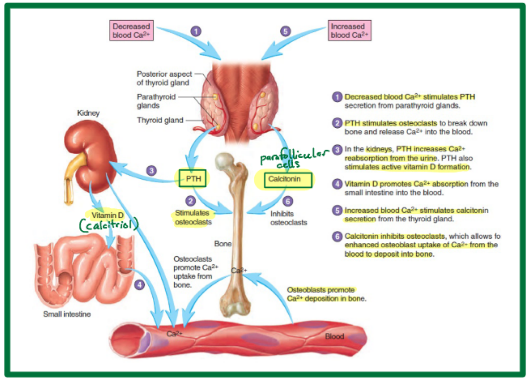
▲ Calcium reabsorption
▼ Phosphate reabsorption
▲ 1 -hydroxylase activity

▲ Calcium absorption
▲ Phosphate absorption

Small intestine

Active Vitamin D
(1, 25-dihydroxyvitamin D)
(calcitriol)

Negative feedback



① Decreased blood Ca^{2+} stimulates PTH secretion from parathyroid glands.

② PTH stimulates osteoclasts to break down bone and release Ca^{2+} into the blood.

③ In the kidneys, PTH increases Ca^{2+} reabsorption from the urine. PTH also stimulates active vitamin D formation.

④ Vitamin D promotes Ca^{2+} absorption from the small intestine into the blood.

⑤ Increased blood Ca^{2+} stimulates calcitonin secretion from the thyroid gland.

⑥ Calcitonin inhibits osteoclasts, which allows fo enhanced osteoblast uptake of Ca^{2+} from the blood to deposit into bone.

Sex Hormone Related Drugs

References

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2. Golan DE, Armstrong EJ, Armstrong AW, eds. Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy. 4. Edition. Wolters Kluwer; 2017.
3. Papadakis, M., Rabow, M., McQuaid, K., & Gandhi, M. (2024). CURRENT medical diagnosis and treatment 2025 (64th ed.). Columbus, OH: McGraw-Hill Education.
4. Whalen K, Lerchenfeldt S, Giordano CR, eds. Pharmacology. Eighth edition. Wolters Kluwer Health; 2023.