

MINERALS

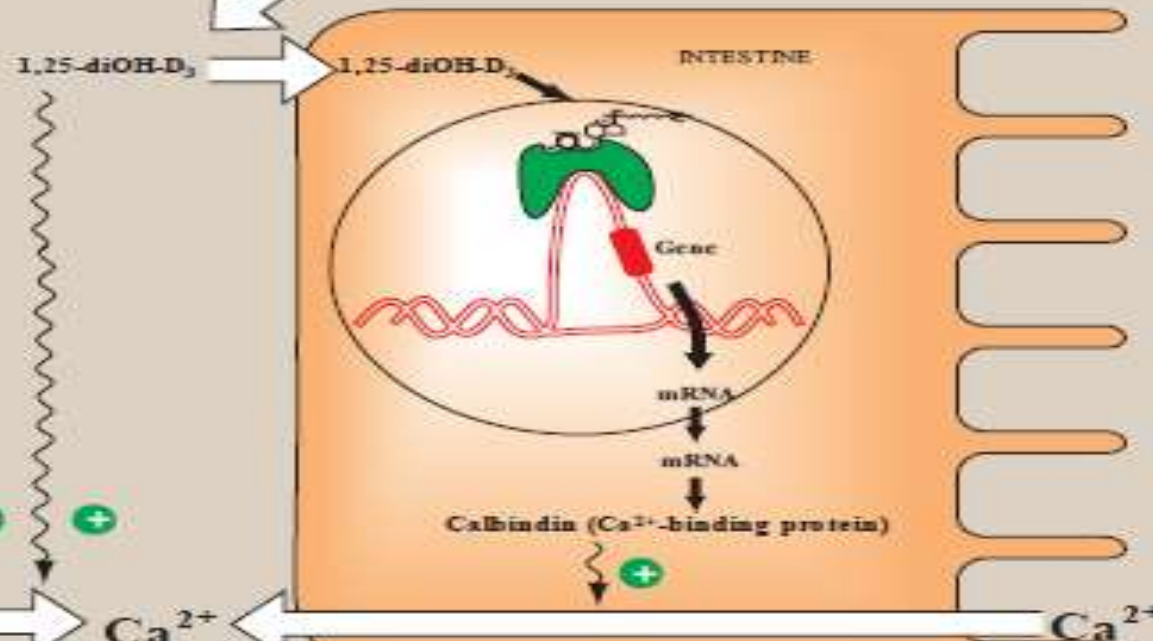
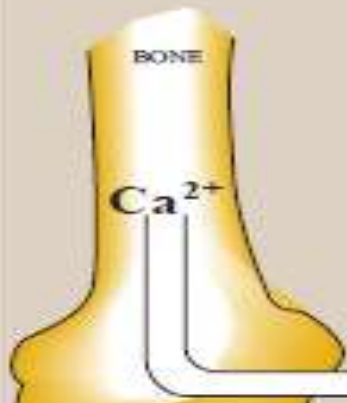
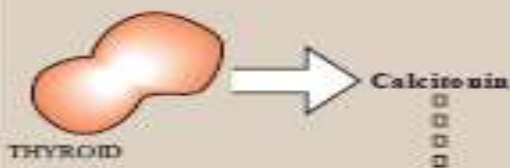
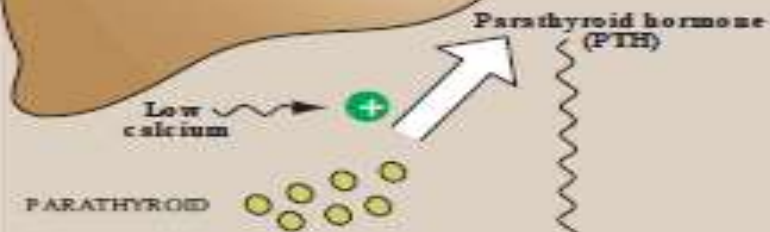
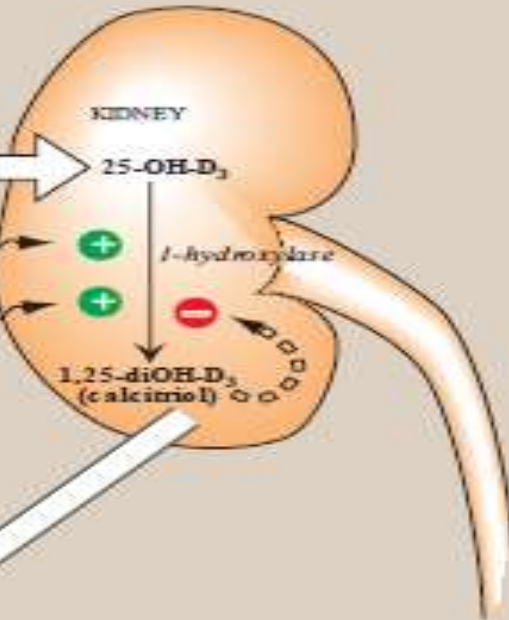
Calcium

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Source: Biochemistry – Lippincott's
Illustrated Reviews

World Wide Web

SKIN → 7-Dehydrocholesterol → Cholecalciferol



Ca²⁺

Ca²⁺

CALCIUM

- Most abundant electrolyte
- 1% of the body weight
- Normal level: 9-11mg/dl
- 99% in bones as phosphates and carbonate
- Bone calcium constantly exchanged with Ca^{++} of interstitial fluid

CALCIUM

Two Forms:

1. **Non-diffusible form:** In firm combination with albumin. Cannot be dialyzed out. 3.4-4.4mg/dl

2. **Diffusible:**

Active form. Increases in hyperparathyroidism and vice versa. 5.54 to 6.23mg/dl. **Tetany if level drops below 4.3mg/dl**

< 0.6mg/dl. Complexed with plasma anions such as citrate and phosphate

Tetany



- Calcium imbalance disease that causes extended periods of spasms in the arm and leg muscles.
- Do NOT confuse this with the bacterial disease tetanus!

Dietary Sources

- Milk and milk products
- Egg yolks, leafy vegetables

Absorption

- Mostly in Proximal parts of small intestine by active transport
- Distal segments by passive transport

Factors affecting Absorption

- **Vitamin D** – Active form
- **PTH**
- **Bile Salts**: Increase absorption by enhanced Vit. D absorption
- **pH**: Acidic pH favours absorption
- **Free Fatty acids** – Unabsorbed fatty acids form insoluble calcium soaps and **decrease** absorption

- Inverse plasma Ca and inorganic Phosphate (Pi) level – Product 30-40 in adult and 40-55 in children. If less than 30, Rickets results

Calcitonin

- **Produced by parafollicular cells (Clear or C cells) of thyroid gland.** Antagonizes the action of PTH. Decreases bone resorption. Increases urinary loss

Functions of Calcium

- Bones and Teeth development - Deficiency leads to Rickets, Osteomalacia
- Blood Clotting
- Excitability of nerves - Decreased ionized Ca, tetany – Death from convulsions and Laryngospasm
- Cofactor or activator of enzymes –
Calmodulin-Calcium complex activates adenylate cyclase, Ca⁺⁺ ATPase, Phosphorylase Kinase etc.

Functions of Calcium

- Release of Acetylcholine
- Contraction of muscles including Heart Muscles.
Increased Ca, Heart stops in Systole
- Secretion from most endocrine and exocrine glands
- Voltage- regulated Ca channels: Four Types

Calcium Balance

- Difference between quantity of Ca ingested and lost from body over a certain period of time
 - a) **Positive**
 - b) **Negative**

Condition with positive balance:

Growth, Pregnancy etc.

Conditions with negative balance:

Rickets and Osteomalacia, Hyperparathyroidism etc.

Hypoparathyroidism results in decreased plasma calcium concentration because of decreased intestinal and renal tubular calcium absorption and lack of bone resorption with consequent dense bone

Hypercalcemia may result from:

- milk alkali syndrome
- vitamin D intoxication
- hyperparathyroidism