Vitamin D

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(BIOCHEMISTRY)

Overview

I. Chemistry.
II. Source.
III. Metabolism.
IV. Function.
V. Recommended dietary allowance (RDA).
VI. Deficiency Manifestation.
VII. Hypervitaminosis.

Introduction

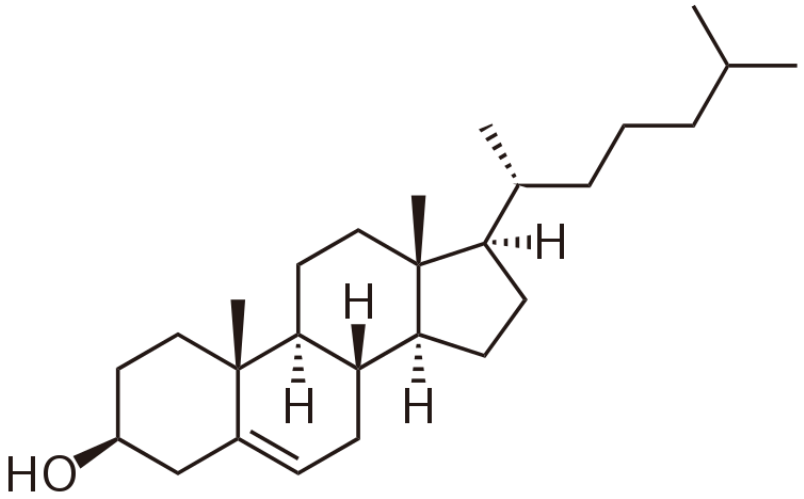
- Fat soluble vitamin.
- Sunshine vitamin.
- It is a steroid prohormone.

Introduction

- **Vitamin D is It is a steroid prohormone:**
  - Produced in body.
  - Released from one tissue and will act on other tissue.
  - Vitamin D will act on nuclear.
  - Like hormone vitamin D has feedback regulation.

Chemistry

- Vitamin D is derived from cholesterol.



Cyclopetao perhydropheatherene ring (CPPP)

Chemistry

- The term vitamin D refers to group of two compounds

1. Vitamin D_2 → Ergocalciferol.
2. Vitamin D_3 → Cholecalciferol.

Source

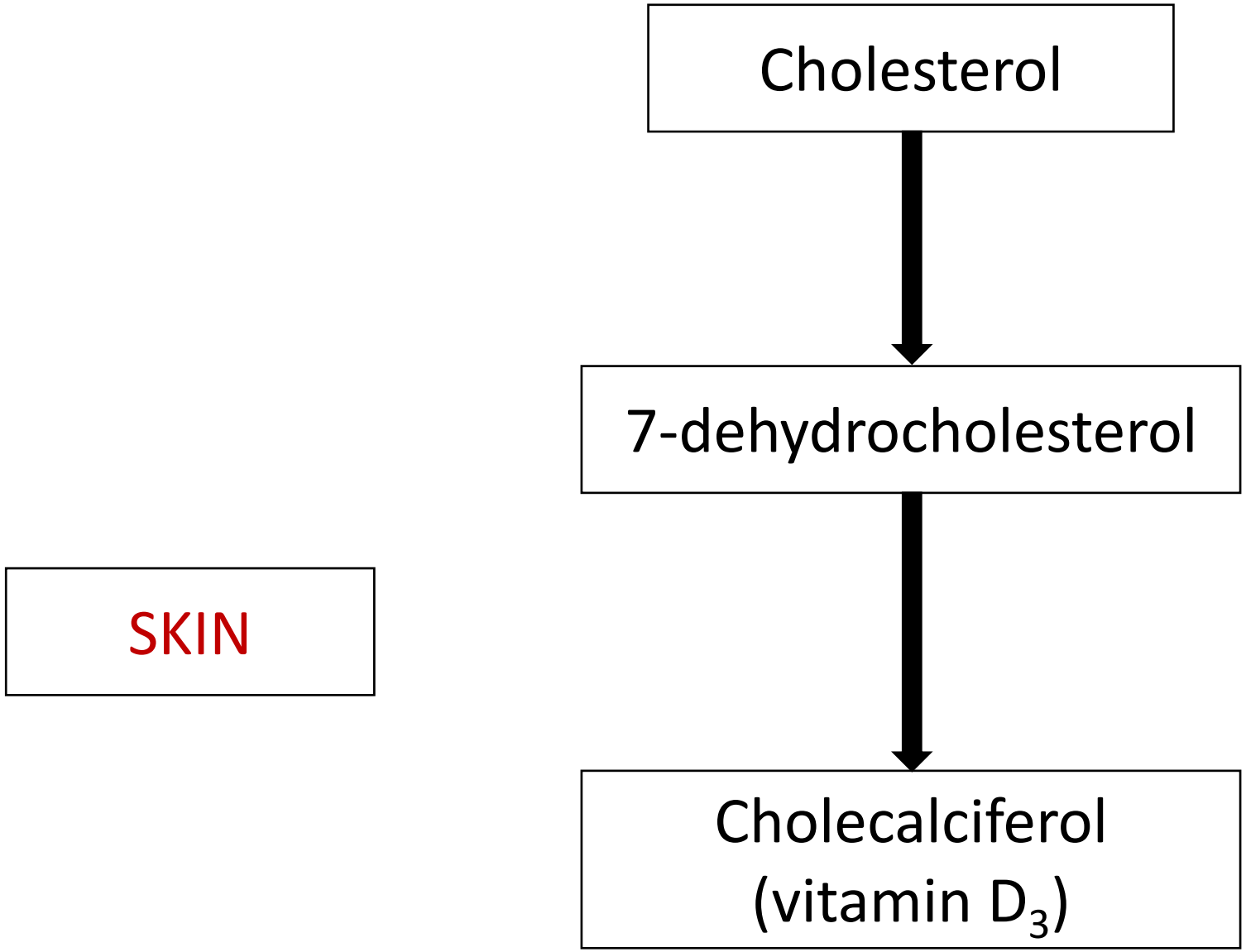
1. Sunlight.
2. Yeast.
3. Fish.
4. Fish liver oil
5. Fortified foods.

Metabolism

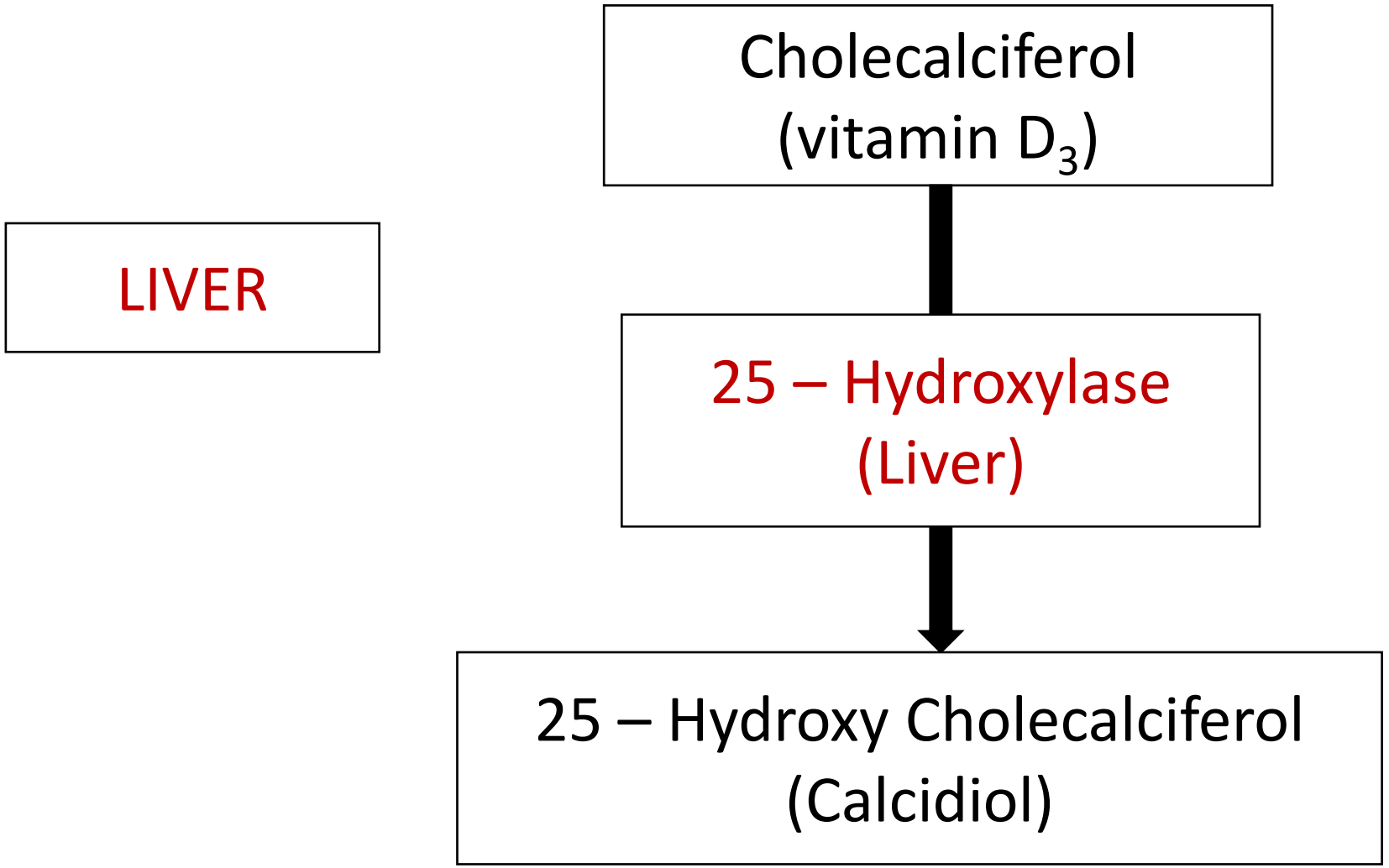
I. Synthesis of Vitamin D.

II. Metabolism of vitamin D from yeast.

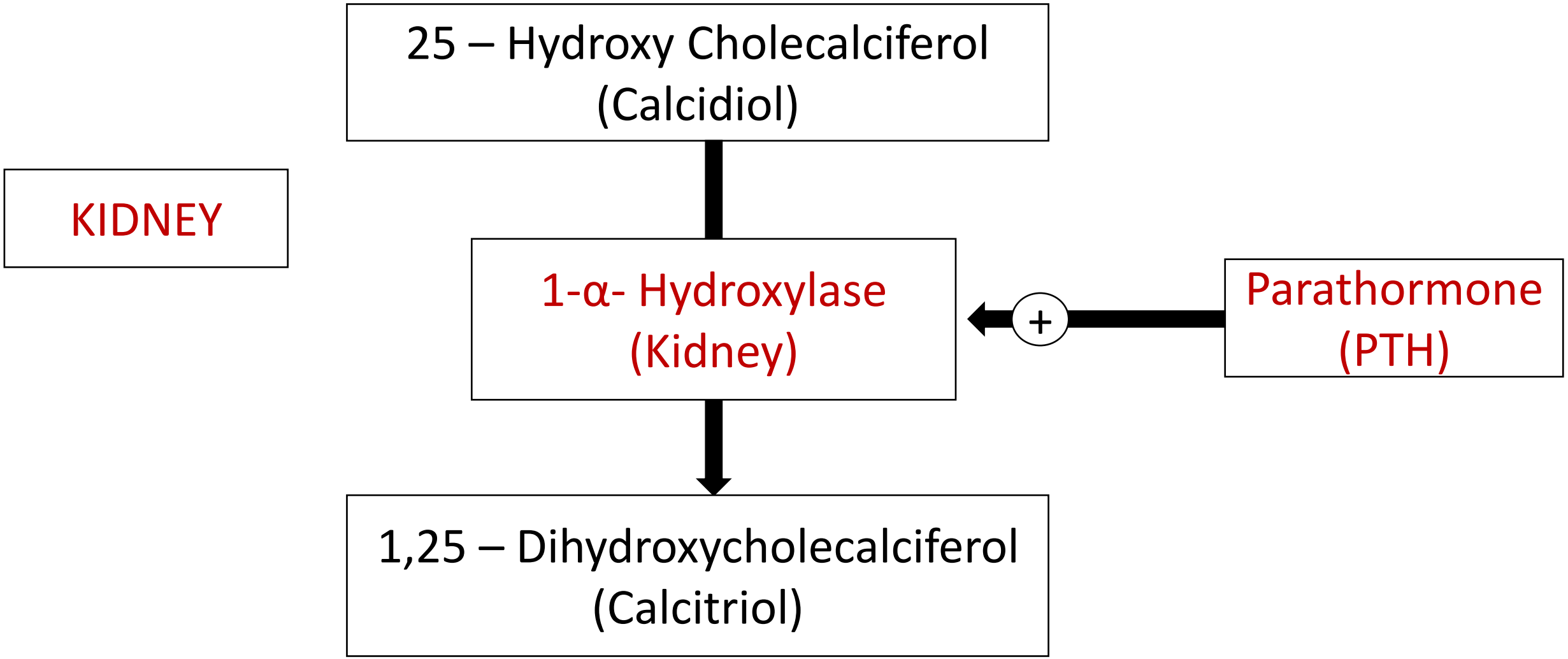
Metabolism - Synthesis of Vitamin D



Metabolism - Synthesis of Vitamin D



Metabolism - Synthesis of Vitamin D



Metabolism

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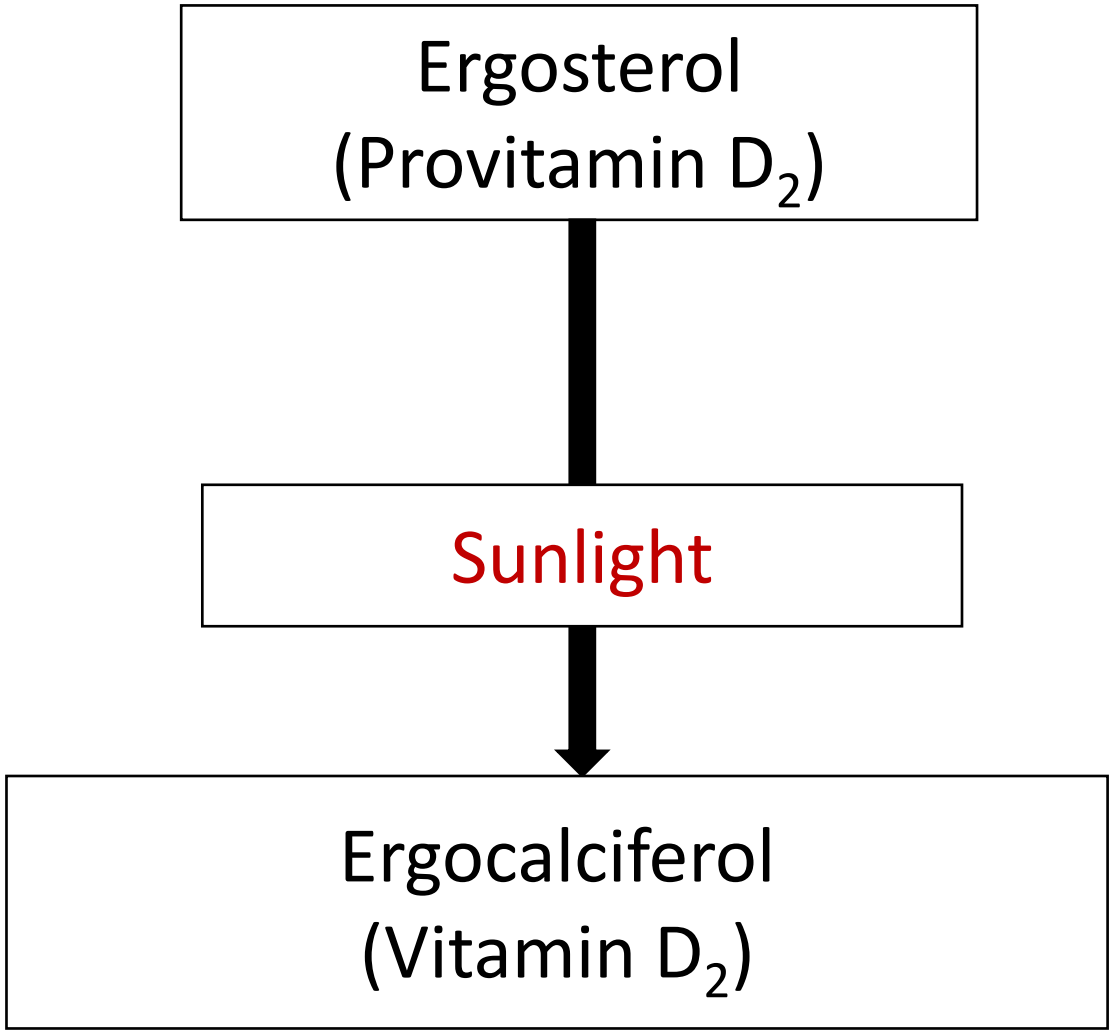
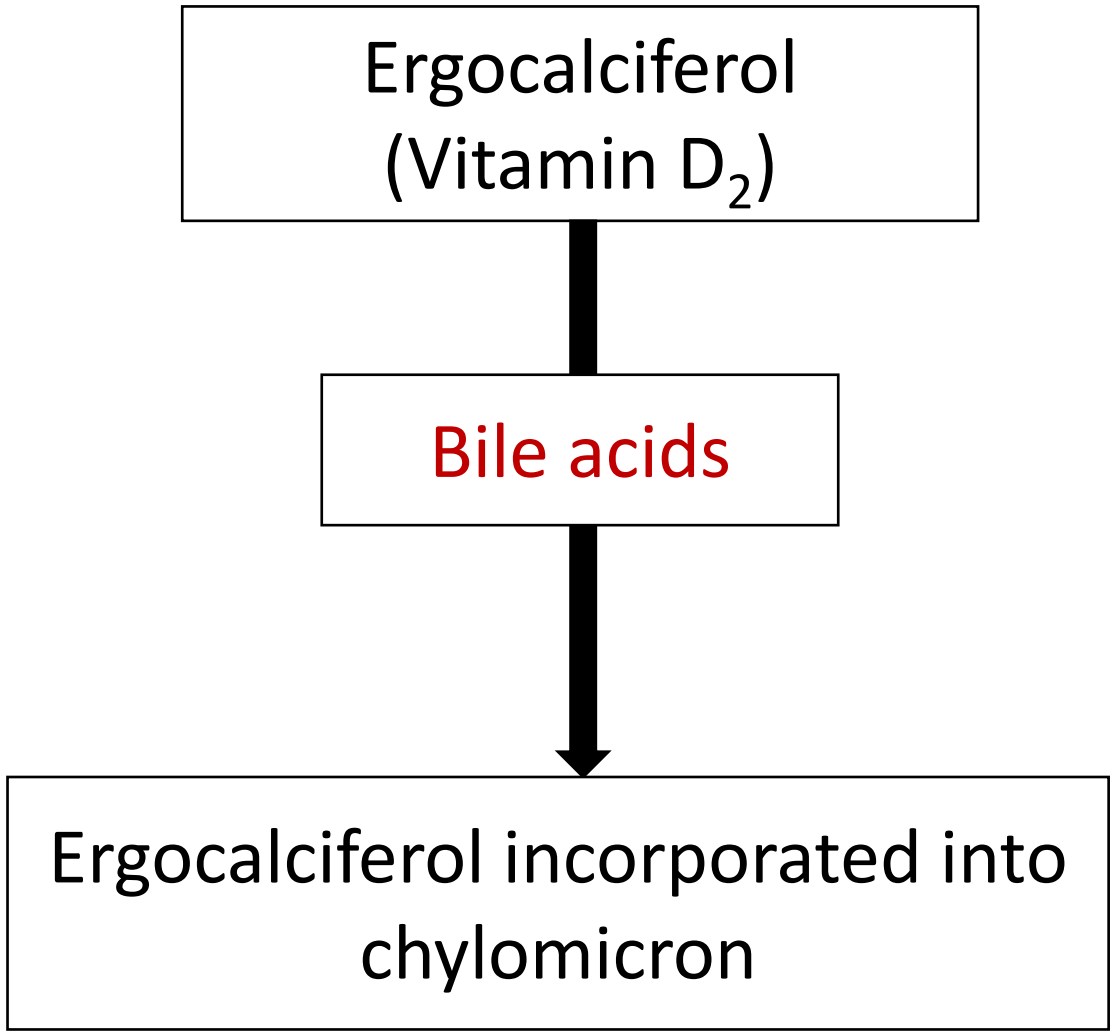
Metabolism - vitamin D from yeast



Metabolism - vitamin D from yeast



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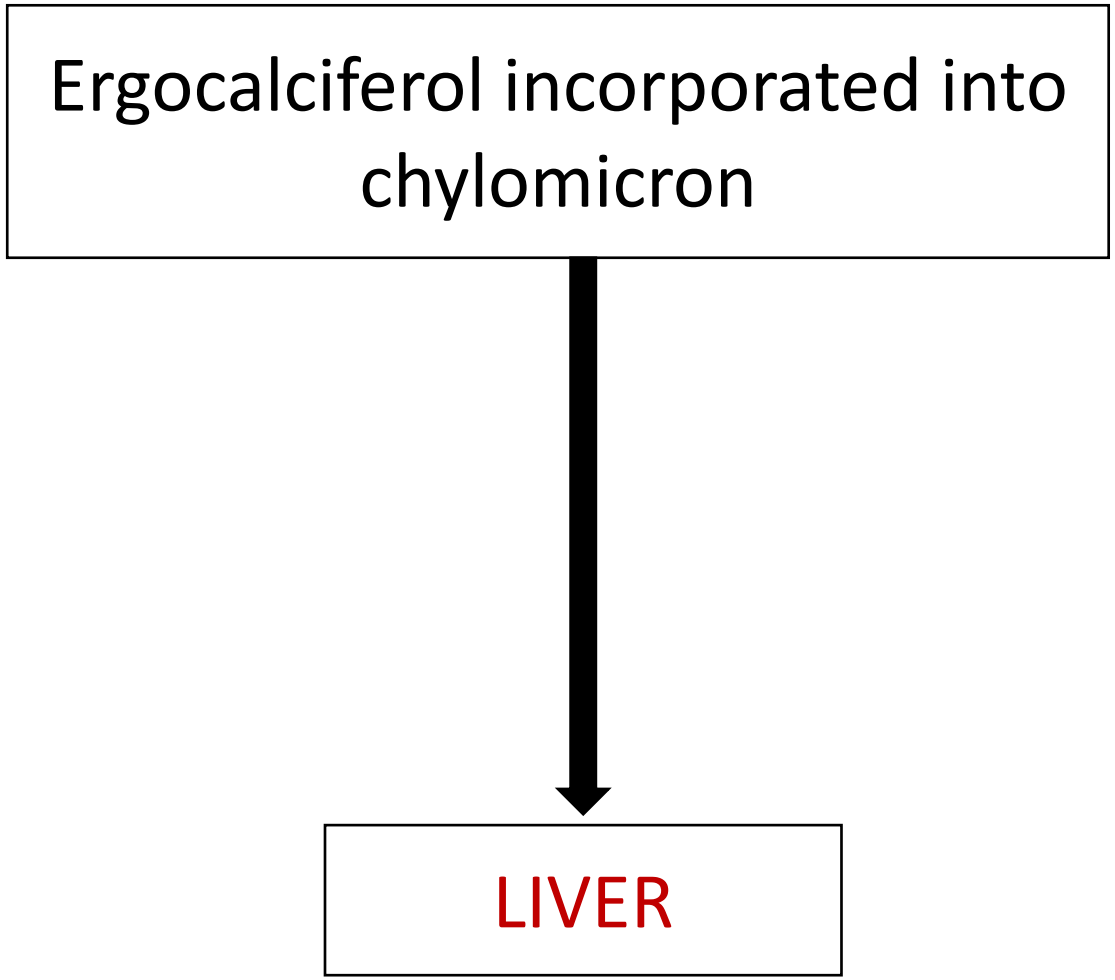

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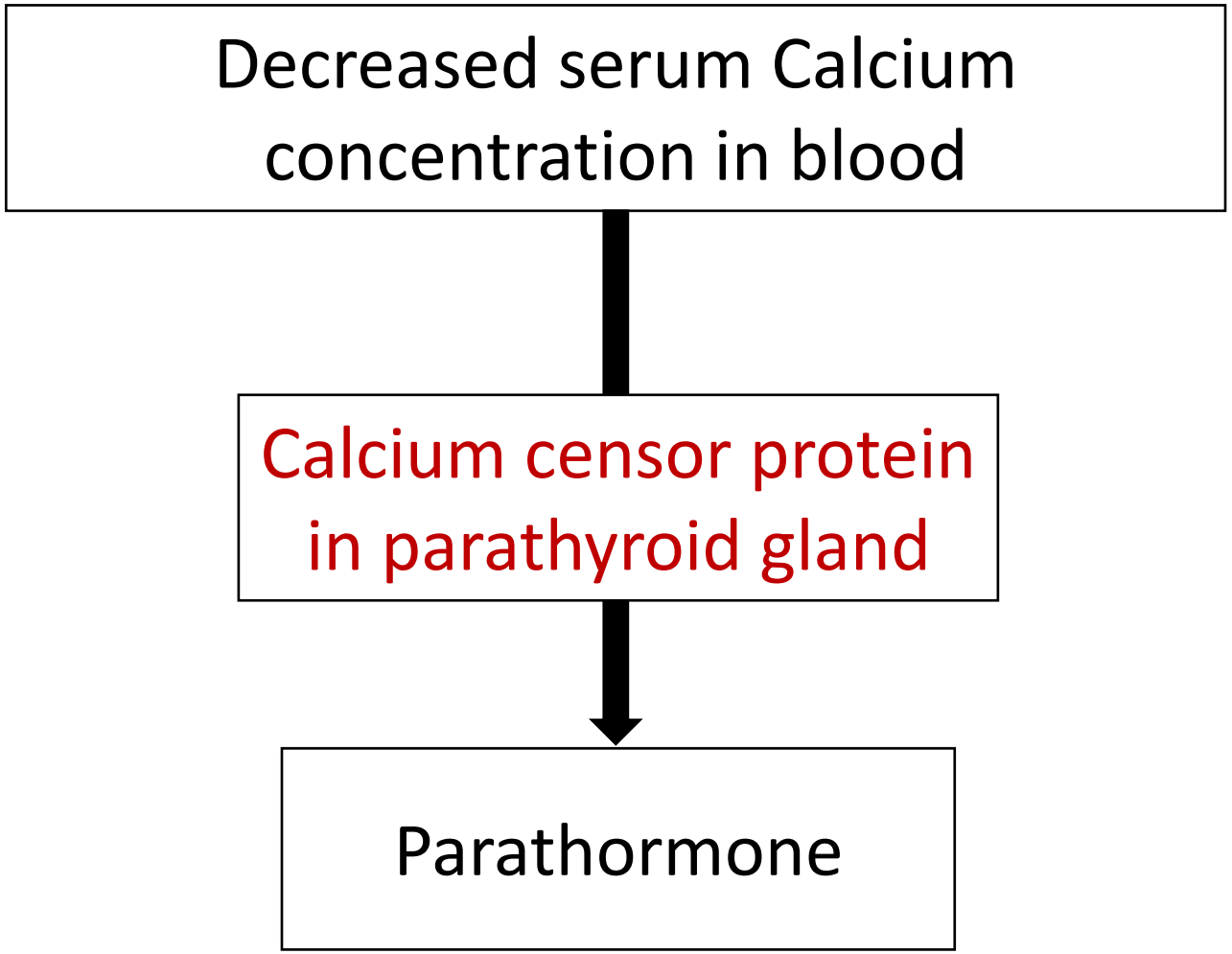
Functions

1. Regulation of calcium and phosphorus concentration in blood.
2. Vitamin D deficiency is a risk factor for COVID – 19 infection.
3. Vitamin D has a role in maturation of hair follicles.
4. Vitamin D has a role in differentiation of keratinocytes in skin. So, used as a treatment in psoriasis.

Functions

5. Vitamin D has immune modulatory function.
6. Vitamin D deficiency is associated with incidence of colon cancer and breast cancer.
7. Vitamin D is protective against pre diabetes and metabolic syndrome.

Function - Calcium and phosphorus homeostasis



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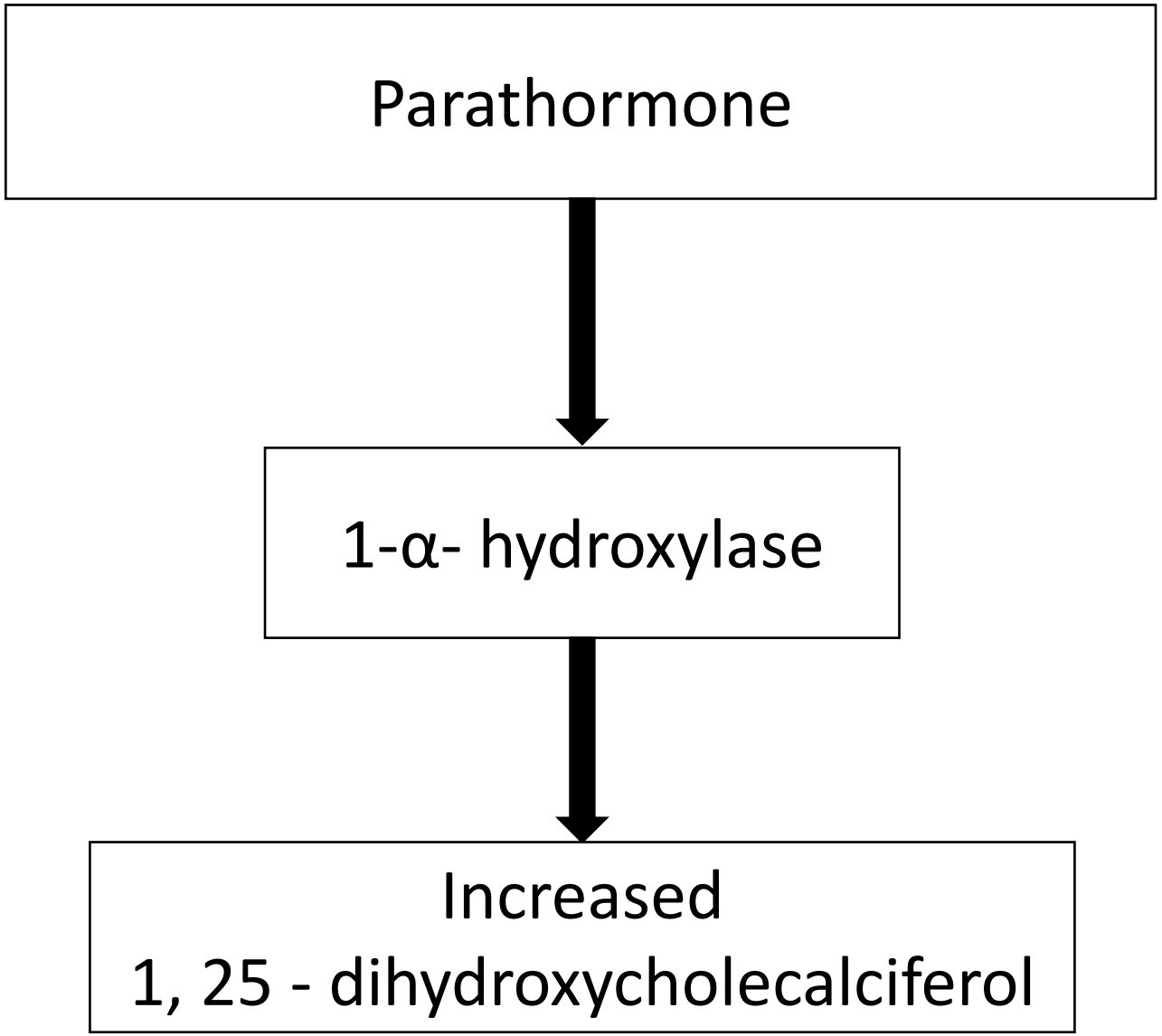

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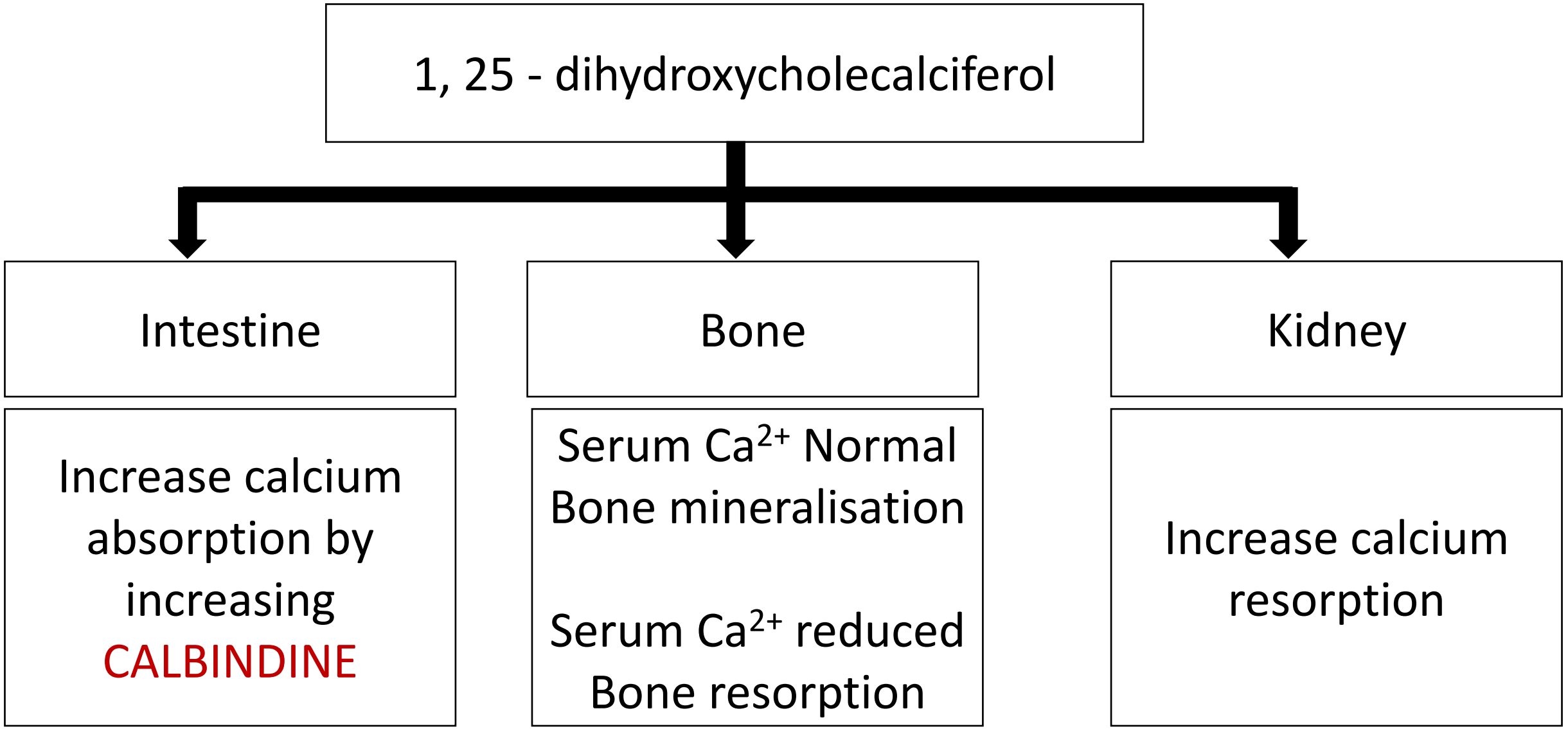

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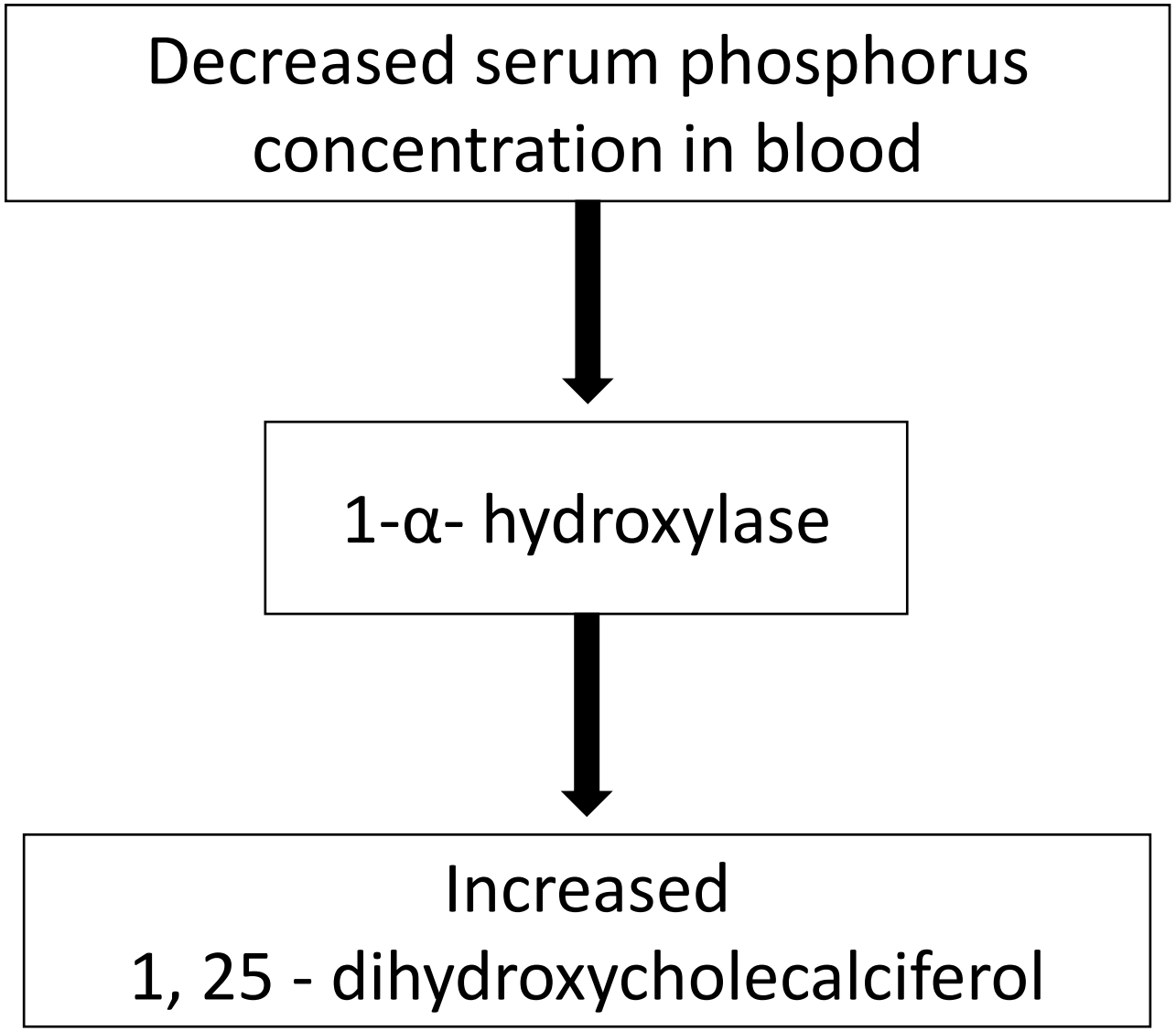

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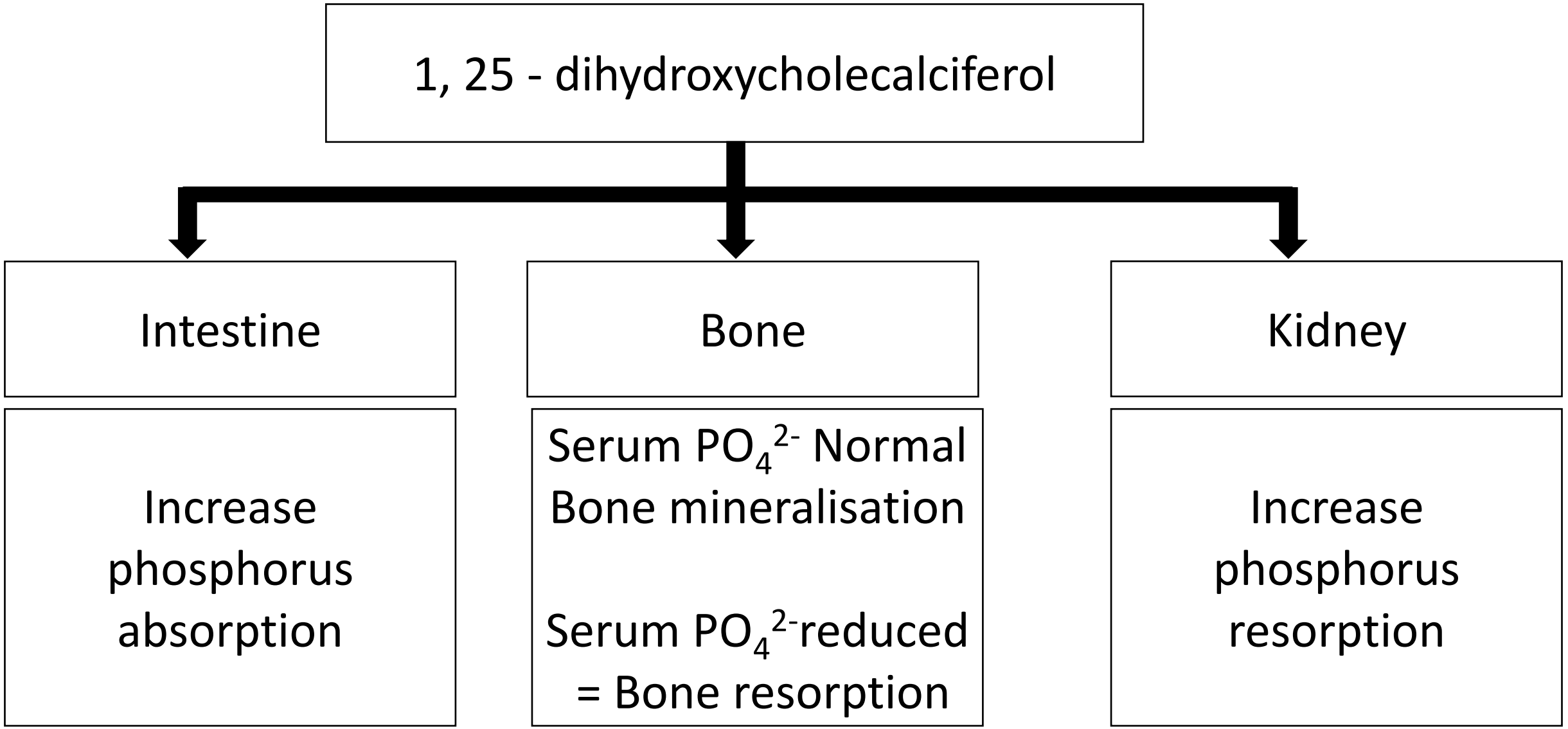

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Recommended dietary allowance (RDA)

- Adult male and female : 5 µg/day.
- Children : 10 µg/day.
- Pregnancy : 10 µg/day.

Reference value:

Total 25 hydroxy vitamin D: > 30 ng/mL.

Deficiency Manifestation

- **Cause:**

i. Reduced exposure to sunlight.
   - Prolonged immobilisation.
   - Excess use of sunscreen.
   - Location and season.

ii. Excess melanin content.

iii. Any cause of steatoria.

iv. Cirrhosis.

v. Nephrotic syndrome.

vi. Chronic kidney disease.

vii. Hypoparathyroidism.

Deficiency Manifestation

- Children → Rickets.
- Adults → Osteomalacia.

Deficiency Manifestation - Rickets

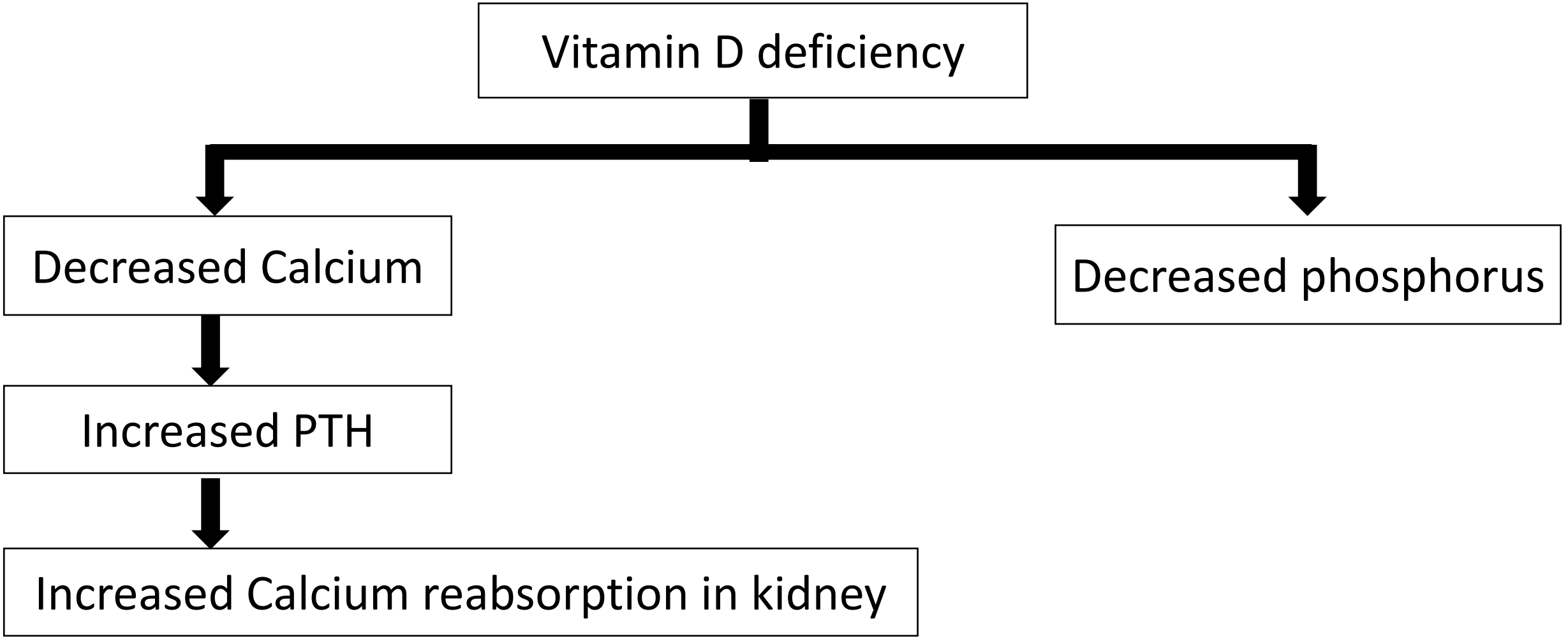
- In children vitamin D deficiency will present as **RICKETS**.
- **Types:**
  i. Nutritional rickets.
  ii. Vitamin D dependent rickets type I.
  iii. Vitamin D dependent rickets type II. (receptor defect)
  iv. Vitamin D resistant rickets.
  v. Hypophosphataemic rickets.

Deficiency Manifestation - Rickets

- **<u>Clinical features:</u>**
  - i. Bow legs.
  - ii. Knock knew.
  - iii. Rachitic Rosary.
  - iv. Harrison’s sulcus.
  - v. Frontal bossing.

Deficiency Manifestation - Rickets

- **<u>Biochemical features in vitamin D deficiency:</u>**



Deficiency Manifestation - Rickets

- **Investigation:**
  - i. Total 25 hydroxy vitamin D.
  - ii. 1,25 dihydroxy vitamin D.
  - iii. Serum calcium.
  - iv. Serum phosphorus.
  - v. PTH.
  - vi. ALP.

Total 25 hydroxy vitamin D:

1. > 30 ng/mL → Normal.
2. 20-29 ng/mL → Insufficiency.
3. 10-19 ng/mL → Deficiency
4. < 10 ng/mL → severe deficiency

Deficiency Manifestation - Rickets

- **Treatment:**

  Calcium supplementation.

  Vitamin D supplementation.

Deficiency Manifestation - Osteomalacia

- In children vitamin D deficiency will present as **Osteomalacia.**
- **Clinical features:**
  - Back pain.
  - Frequent fracture.
- **Investigation:**
- **Treatment:**

Hypervitaminosis

- Serum vitamin D concentration > 150 ng/mL.
- Serum calcium increased.
- **Clinical manifestation:**
  - Neurological manifestation. (depression, lethargy)
  - Gastric ulcer.
  - Nephrogenic diabetes insipidus.

Summary

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Thank You