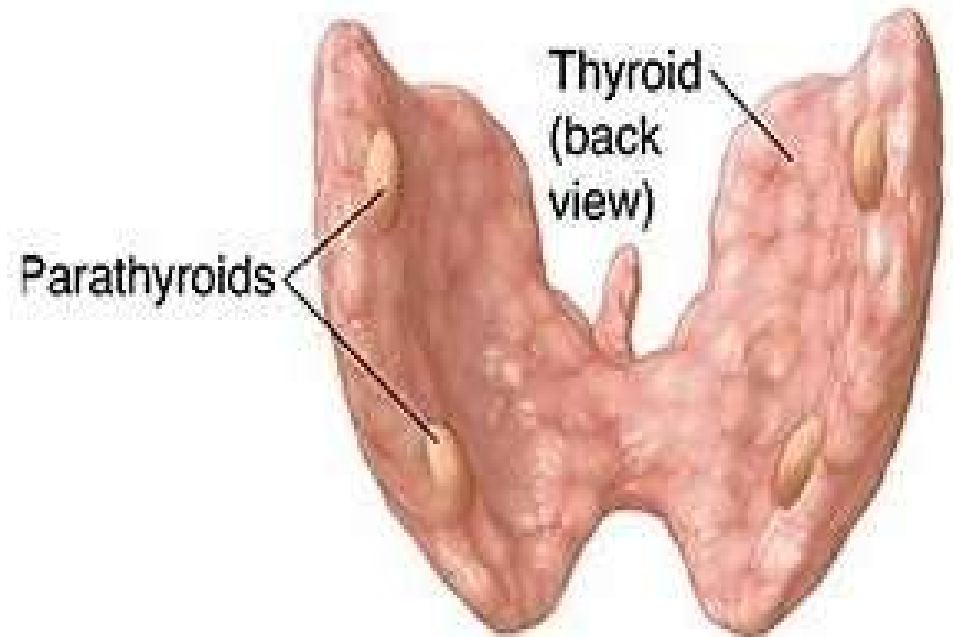
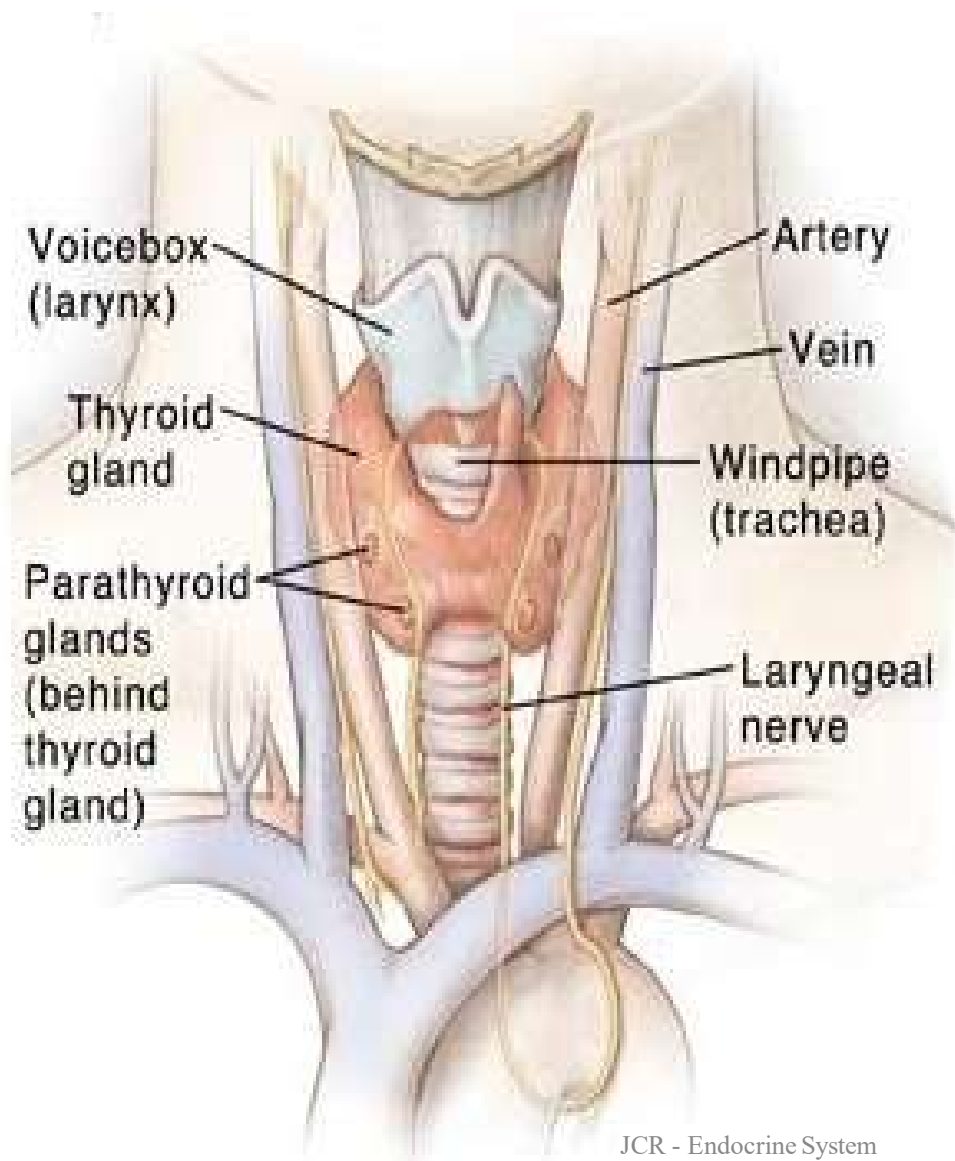


Parathyroid Gland



Structure

- 4 tiny parathyroid glands, in the neck, on the posterior surface of the thyroid gland. Have 2 superiorly & 2 inferiorly.
- Small in size, measuring about 6 mm long, 3 mm wide and 2 mm thick with dark brown color

Histology

- Made up of chief cells & oxyphil cells

Chief cells

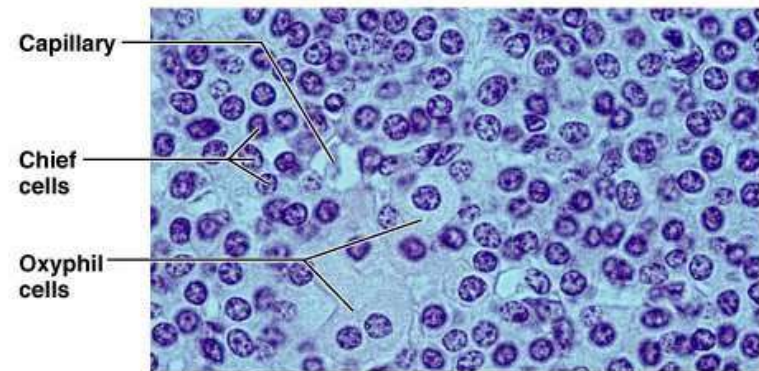
- Secrete parathormone

Oxyphil cells

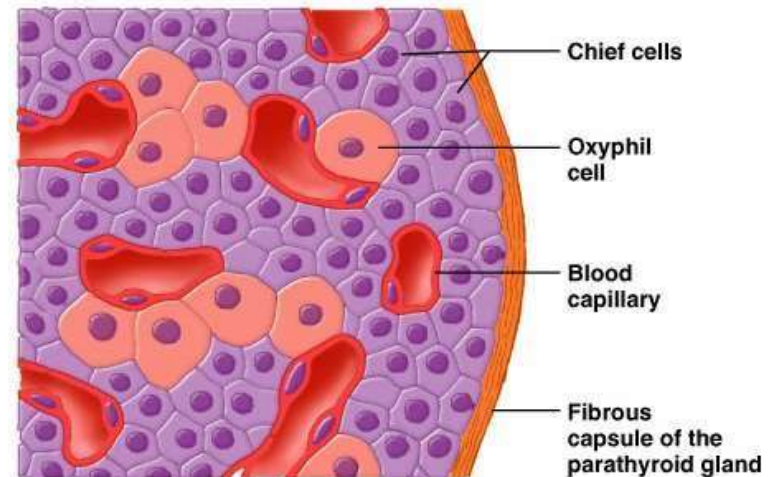
- Degenerated chief cells and their function is unknown.
- May secrete parathormone during physiological condition called **parathyroid adenoma**.

Parathyroids (two types of cells)

- Rare chief cells
- Abundant oxyphil cells (unknown function)
- Chief cells produce PTH
 - Parathyroid hormone, or parathormone
 - A small protein hormone



(b)



(c)

Function of PTH (parathyroid hormone or “parathormone”)

- ***Increases blood Ca^{++} (calcium) concentration when it gets too low***
- Mechanism of raising blood calcium
 1. Stimulates osteoclasts to release more Ca^{++} from bone
 2. Decreases secretion of Ca^{++} by kidney
 3. Activates Vitamin D, which stimulates the uptake of Ca^{++} from the intestine
- Unwitting removal during thyroidectomy was lethal
- ***Has opposite effect on calcium as calcitonin (which lowers Ca^{++} levels)***

Parathormone

- Secreted by the chief cells of the parathyroid glands.
- Essential for the maintenance of blood calcium level within a very narrow critical level.
- Maintenance of blood calcium level is necessary because calcium is an inorganic ion for many physiological functions.

Chemistry

- Parathormone is protein in nature, having 84 amino acids.
- It's Molecular weight is 9,500.

Half life & Plasma level

- Parathormone has a half-life of 10 minutes.
- Normal plasma level of PTH is about 1.5-5.5 mg/dL.

Actions of PTH on Blood Calcium Level

- Primary action of the PTH is to maintain the blood calcium level within the critical range of 9-11 mg/dL
- PTH control blood calcium level by
 1. Reabsorption of Ca from Bones
 2. Reabsorption of Ca from renal tubules (Kidney)
 3. Absorption of Ca from Gastrointestinal tract

On bones

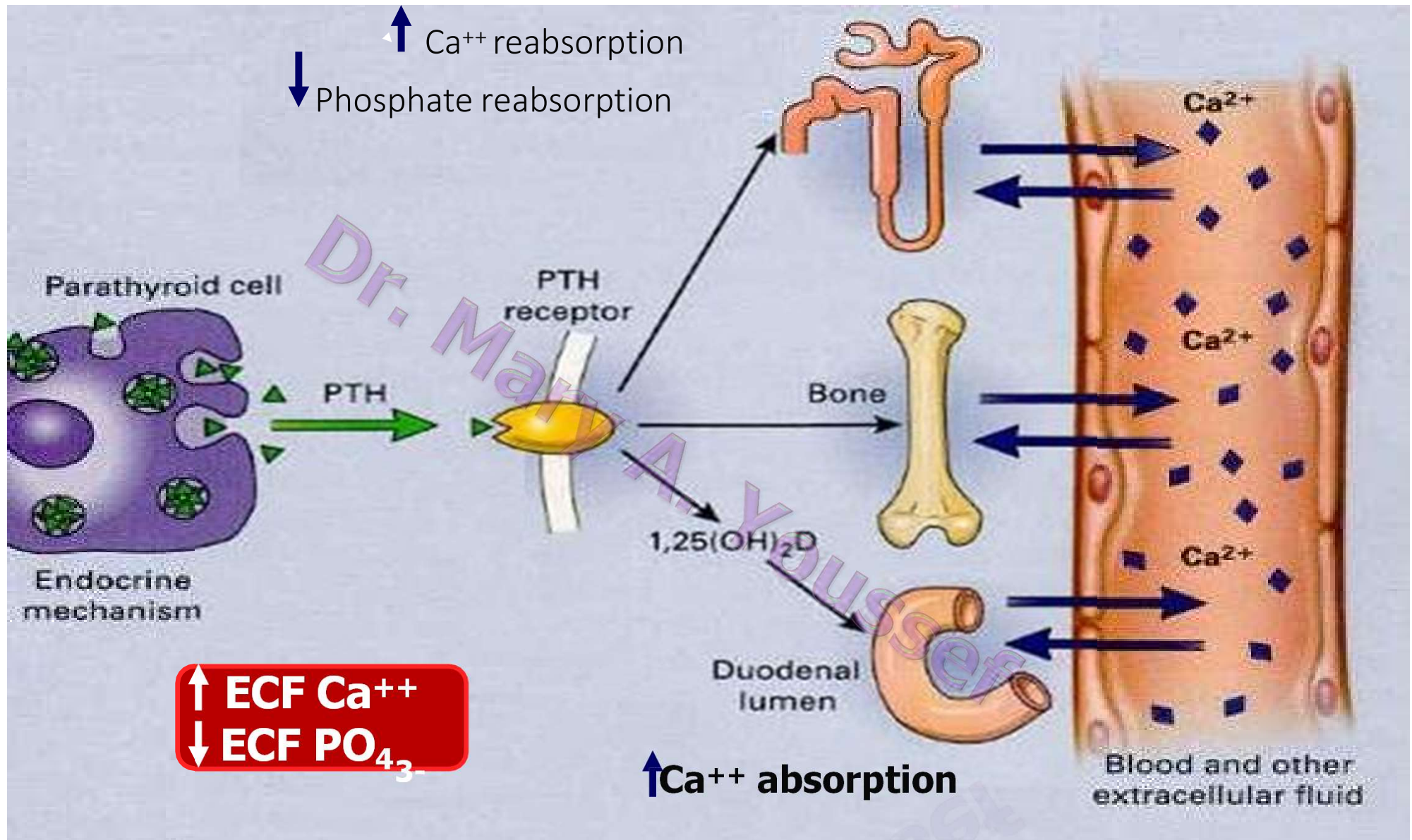
- PTH enhances the reabsorption of Ca from the bones by acting on osteoblasts and osteoclasts of the bone.
- Increases the number and activity of osteoclasts (bone destroying cells).
- Increases collagen synthesis.
- Increases alkaline phosphatase activity.
- Increases local growth factors: IGF and transforming factors.

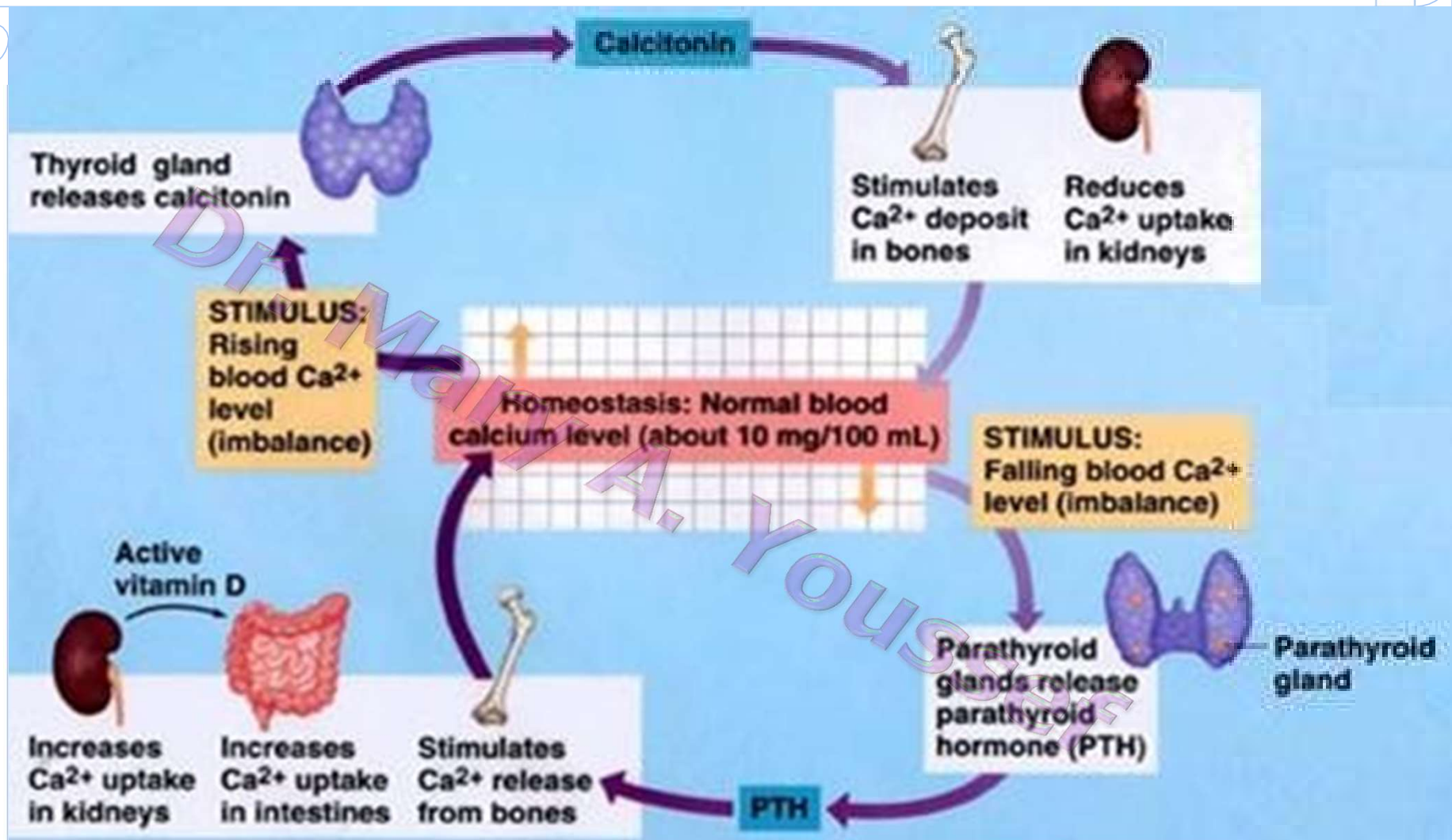
On Kidney

- PTH increases the reabsorption of Ca from the renal tubules along with magnesium ions and hydrogen ions. Increases Ca reabsorption mainly from distal convoluted tubule and proximal part of collecting duct.
- PTH also increases the formation of 1, 25-di-hydroxycholecalciferol (activated form of vitamin D) from 25-hydroxycholecalciferol in kidneys.
- Decreased phosphate, sodium and bicarbonate reabsorption from the proximal tubule.

On Gastrointestinal Tract

- PTH increases the absorption of Ca ions from the GI tract indirectly.
- The activated vitamin D is very essential for the absorption of Ca from the GI tract.
- PTH also increase the absorption of PO₄ & mg.





Disorders of Parathyroid Gland

Tetany

Manifested by neuromuscular excitability due to plasma ionized Ca^{2+}

Causes:

a) Hypoparathyroidism

b) Alkalemia :Decrease the solubility product of Ca^{2+} & PO_4 and leads to reduced ionized Ca^{2+} & precipitation of CaPO_4 **c) Decreased Ca^{2+} absorption** from the intestine:

1.Low calcium intake and Excess intake of antacids (peptic ulcer) lead to Ca^{2+} precipitation and decreased absorption.

Manifestation of Tetany

- These depend on the degree of red blood Ca^{2+} level:
 1. Manifest tetany:
 - Blood Ca^{2+} level is below 7 mg% (N 9-11 mg%).
 - Muscular spasms in the hands and feet (Carpo-pedal spasm).
 2. Latent tetany:
 - Blood Ca^{2+} level is at 7-9 mg%.

Treatment of Tetany

1.IV injection of Ca^{2+} gluconate during spasm. Stops immediately the tetanic spasms.

2.Calcium level is then maintained by giving vitamin D and administration of oral calcium.

3.Acidifying salts as ammonium chloride help Ca^{2+} absorption as they increase the ionization of Ca^{2+} .