Physiology Team

# ENDOCRINE BLOCK

## LECTURE 9

Parathyroid glands


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# OBJECTIVES

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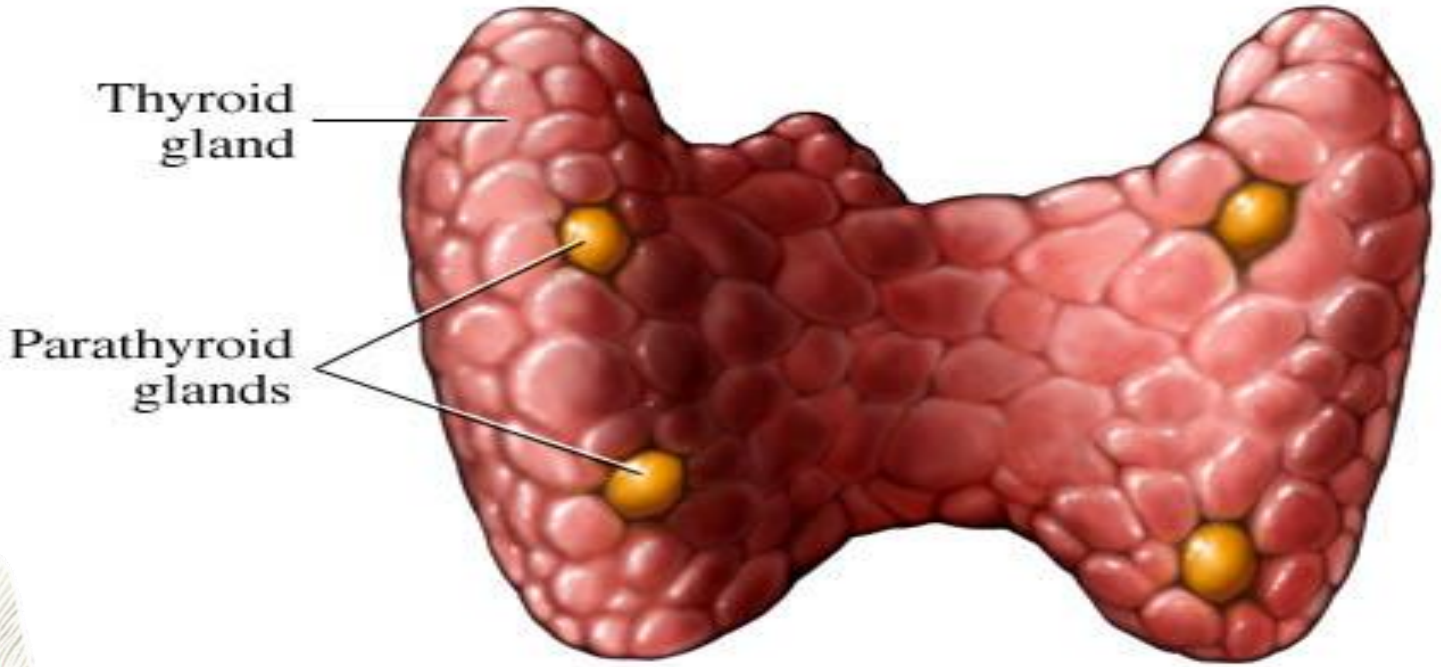
Not Given :|

# Parathyroid Glands

- Four glands located on the posterior surface of the thyroid gland.
- Secrete the polypeptide hormone PTH.
- **Decreased blood level of Ca++ → stimulates the Parathyroids to secrete PTH**.




Very Helpful Video

# Regulation of PTH secretions

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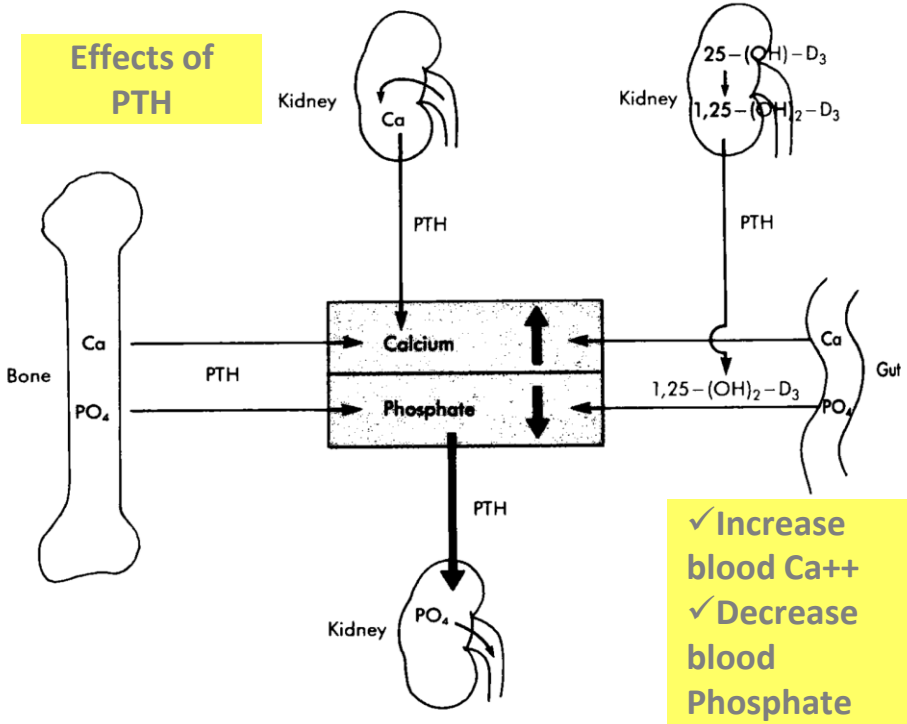
- **Secretion of PTH is inversely related to plasma [Ca2+]** because → **Plasma Ca2+ level is the dominant regulator of PTH secretion** :
  - ✓ Plasma Ca2+ level **< 3.5 mg/dL** → **stimulates** PTH secretion.
  - ✓ Plasma Ca2+ level **> 5.5 mg/dL** → **inhibits** PTH secretion.

  Normal range : 10 mg/dl

**Effects of PTH**




✓Increase blood Ca++
✓Decrease blood Phosphate

PT glands release PTH when detect low Ca++ in blood.

**PTH will:**

- ↑Bone resorption of $Ca^{2+}$
- ↑Kidney reabsorption of $Ca^{2+}$ (or decrease Ca excretion )
- ↓Kidney reabsorption of Phosphate (or increase excretion >> phosphaturia )
- ↑Intestine $Ca^{2+}$ absorption.
- ( Indirectly by increase synthesis of vit D which will increase Ca absorption )

# Regulation of PTH secretions

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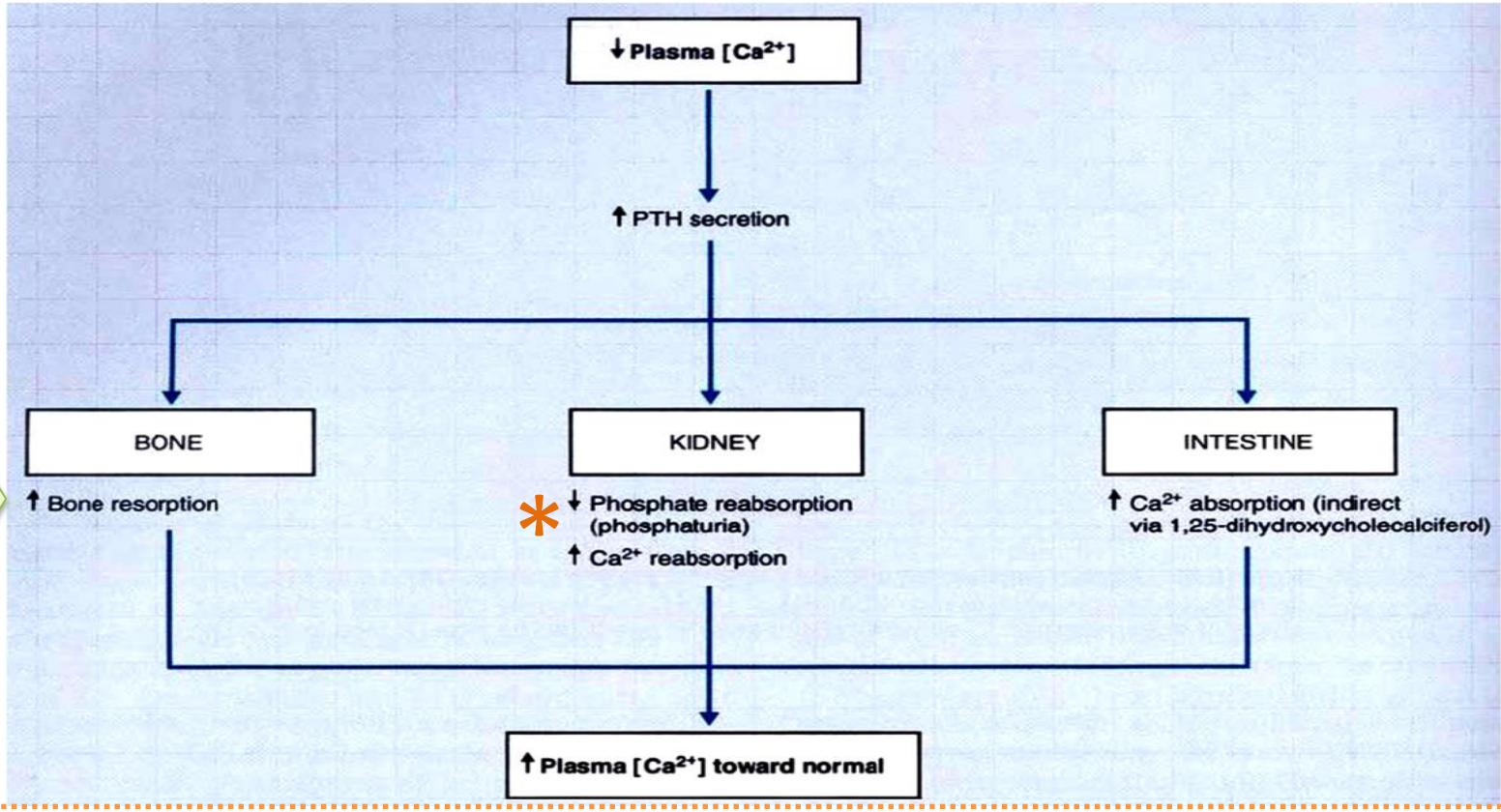
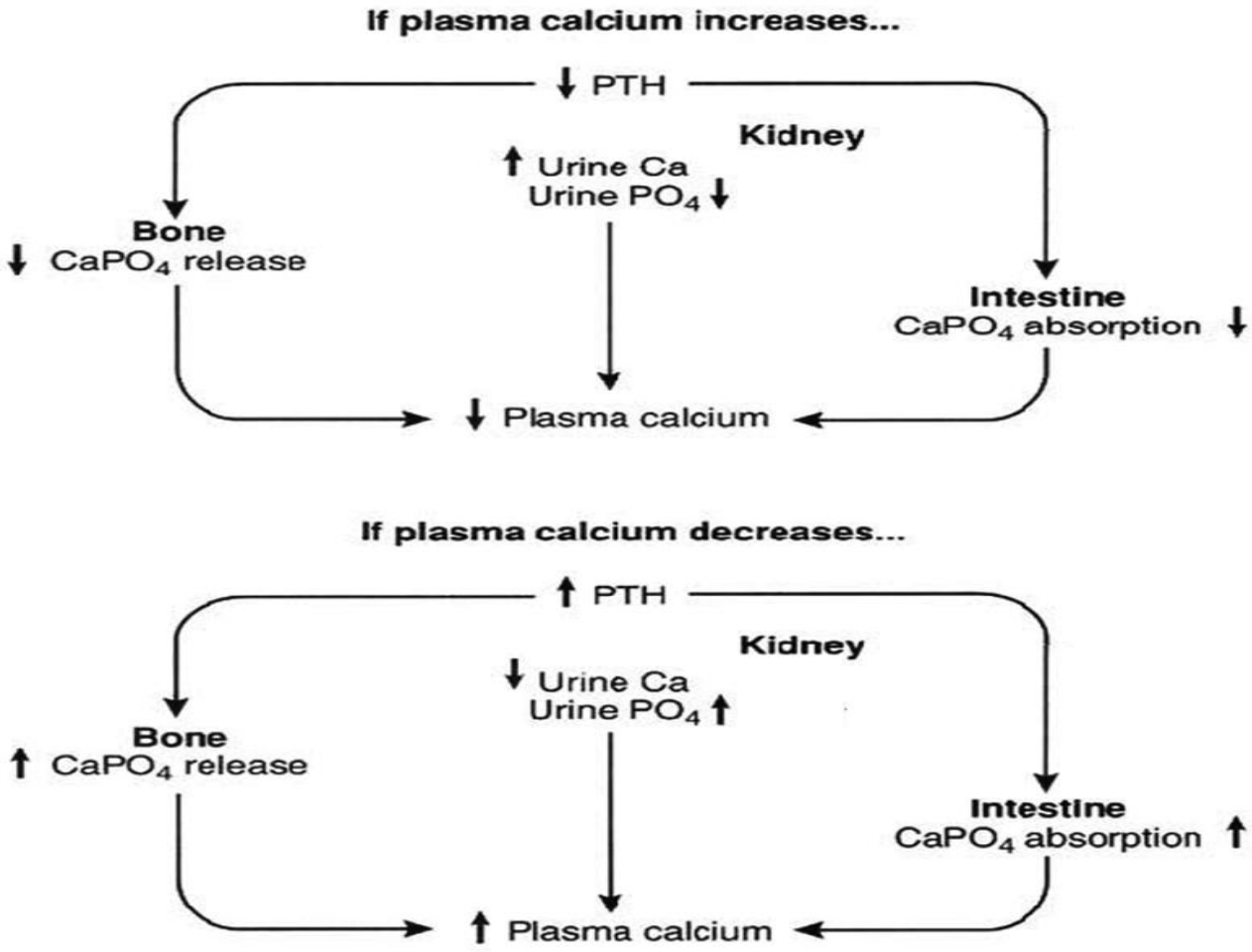



Decrease bone formation by osteoblast and increase bone resorption by osteoclast

* The phosphaturic action of PTH is critical because the phosphate that was resorbed from the bone together with Ca ,, must be excreted in the urine . Otherwise . Phosphate releas from bone will complex with Ca in ECF and limit the level of the the Ca.so , phosphate excretion allow Ca level to increase !

# Regulation of PTH secretions



# Hypo & Hyper -Parathyroidism :

Important

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| | Hypo-ParaThyroidism | Hyper-ParaThyroidism |
|---|---|---|
| **Causes** | **(1) Abnormal parathyroid gland** → Reduced or absent synthesis of PTH<br><br>**(2) Inadvertent** (by mistake) **removal of parathyroid gland** during thyroid surgery | **Adenoma ( tumor ) of parathyroid gland** → excessive PTH secretion |
| **Comes with it** | **Hypocalcemia** (hypocalcemia also accompany vit. D deficiency) | **Hypercalcemia** results from:<br>(1) bone resorption.<br>(2) intestinal and renal calcium absorption. |
| **Signs & Symptoms** | •**Positive Chvostek's** (facial muscle twitch) sign<br>•**Positive Trousseau's** (carpal spasm) sign<br>•**Delayed cardiac repolarization** with prolongation of the QT interval<br>•**Paresthesia**<br>•**Tetany** (increased excitability & hypersensitivity of nerves and muscles) | •**Kidney:** polyuria , polydipsia , renal stones.<br>•**Bones:** Rickets or osteomalacia , osteitis fibrosa cystica (soft bones with cyst formation)<br>•**GIT:** nausea , vomiting , indigestion , constipation , peptic ulcer , pancreatitis.<br>•**Musculoskeletal:** proximal muscle weakness<br>•**CNS:** depression, memory loss, psychosis, coma |

# Hypo & Hyper -Parathyroidism signs:

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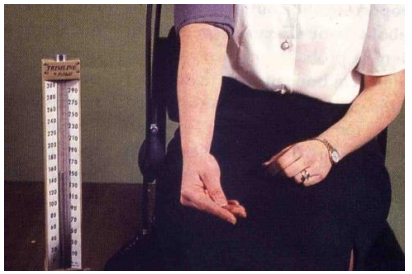
## Hypo-Parathyroidism signs:

Tetany can be overt or latent can be tested by :

**Chvostek's sign:** Tapping the facial nerve as it emerge from the parotid gland in front of the ear → causes contraction of facial muscles.

**Trousseau's sign :**

Arresting (stopping ) blood flow to the forearm for for minutes ( e.g., by sphygmomanometer ) → causes flexion at the wrist, thumb and metacarpophalangeal joints.

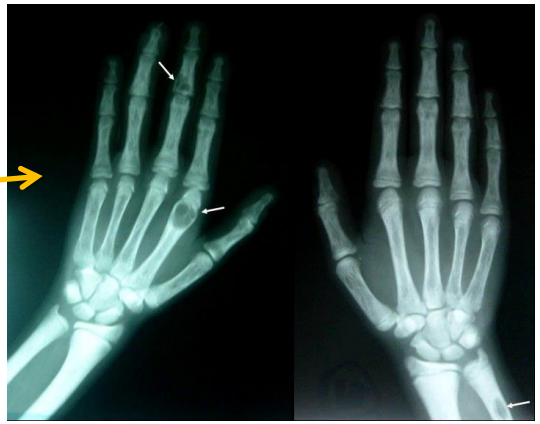


**Carpopedal spasm**

spasm of feet and hand as a sign of tetany

## Hyper-Parathyroidism signs:

fibrosa cystica (soft bones with cyst formation)



# SUMMARY

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- Decreased blood level of Ca++ stimulates the Parathyroids to secrete PTH.
- **Plasma Ca2+ level is the dominant regulator of PTH secretion.**

- Hyperparathyroidism comes with Hypercalcemia (causing muscle weakness+fibrosa cystica), while Hypoparathyroidism comes with Hypocalcemia (causing tetany)

- The main diagnostic signs of Hypoparathroidism are Chvostek's sign + Trousseau's sign.


HYPO-PARATHYROIDISM


HYPER-PARATHYROIDISM

# QUESTIONS

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**1. How many are the parathyroid glands:**

A) 2
B) 3
C) 4
D) 5

**2. What does parathyroid hormone do:**

A) Lower calcium levels in blood.
B) Raise glucose levels in blood.
C) Raise calcium levels in blood.
D) Lower glucose levels in blood.

**3. Essential hormone that regulate the calcium levels in blood is:**

A) Parathyroid hormone (PTH).
B) Growth hormone (GH).
C) Adrenocorticotropic hormone (ACTH).
D) Thyriod stimulating hormone (PSH).

**4. Insufficient PTH is produced, the blood calcium level drops, resulting in**

A) Reduced growth in childhood.
B) Tetany.
C) Osteoporosis.
D) Exophthalmic goiter.

**5. Hypercalcemia accompany which one of these:**

A) Hypoparathyroidism
B) Hyperparathyroidism

**6. Chvostek's sign indicateds which of these :**

A) Hypoparathyroidism
B) Hyperparathyroidism

| | |
|---|---|
| 1 | C |
| 2 | C |
| 3 | A |
| 4 | B |
| 5 | B |
| 6 | A |

# THE END

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If there are any Problems or Suggestions,
Feel free to contact us:


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## THANK YOU

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