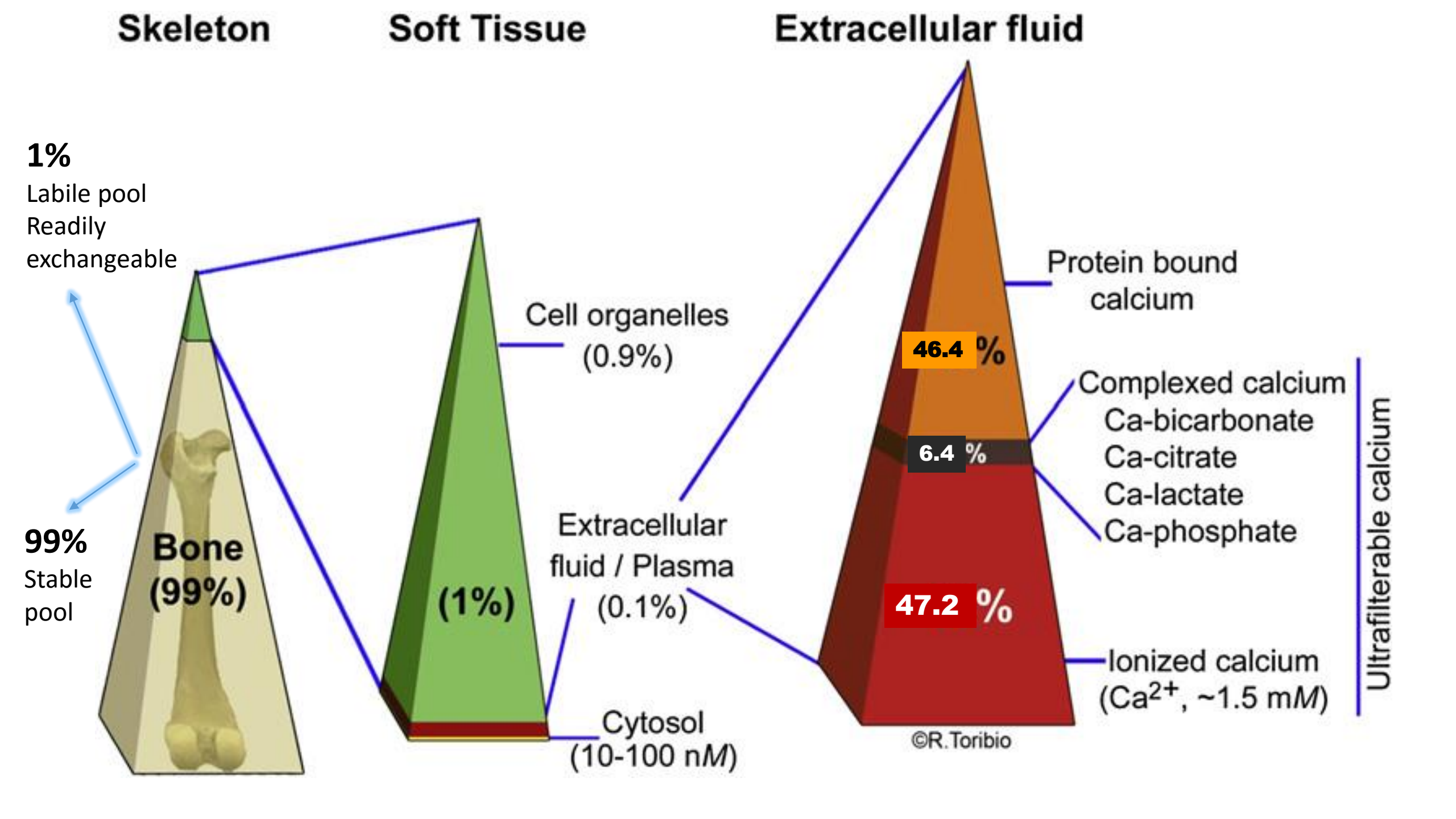

calcium


Skeleton
Soft Tissue
Extracellular fluid
1%
Labile pool
Readily exchangeable
99%
Stable pool
Bone (99%)
(1%)
Cell organelles (0.9%)
Extracellular fluid / Plasma (0.1%)
Cytosol (10-100 nM)
Protein bound calcium
46.4 %
Complexed calcium
Ca-bicarbonate
Ca-citrate
Ca-lactate
Ca-phosphate
6.4 %
47.2 %
Ionized calcium (Ca^{2+}, ~1.5 mM)
Ultrafilterable calcium
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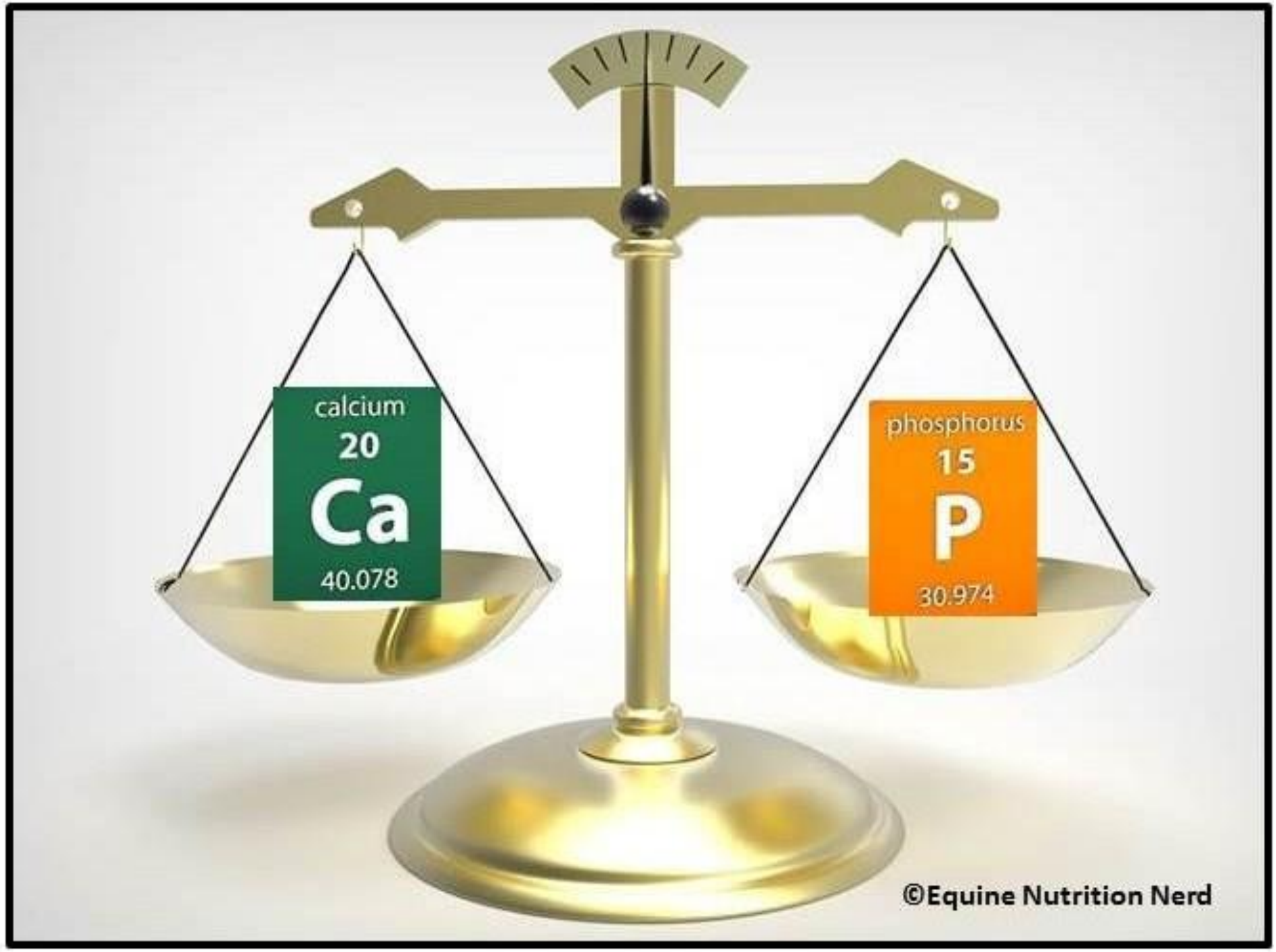
calcium
20
Ca
40.078
phosphorus
15
P
30.974
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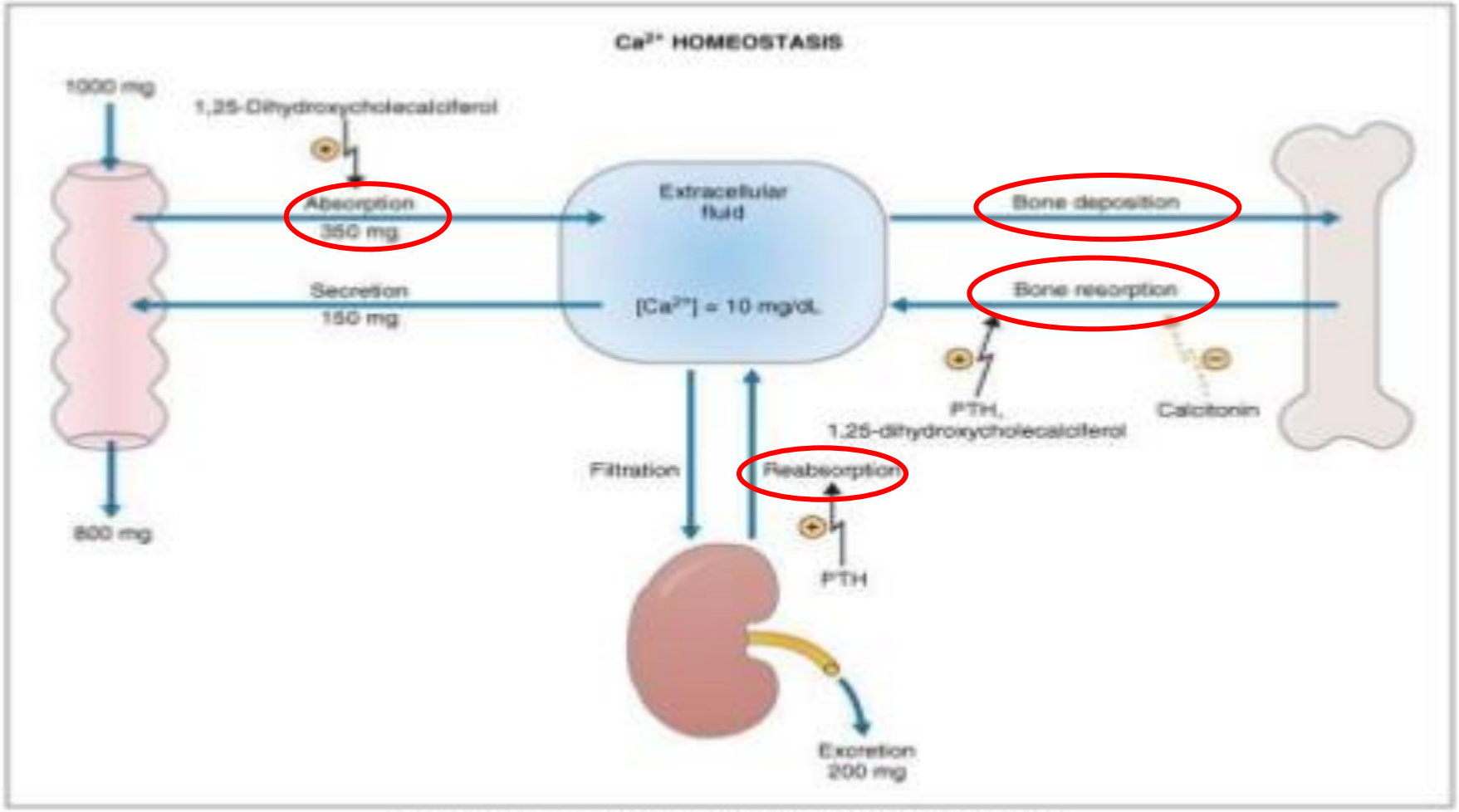
Calcium Homeostasis

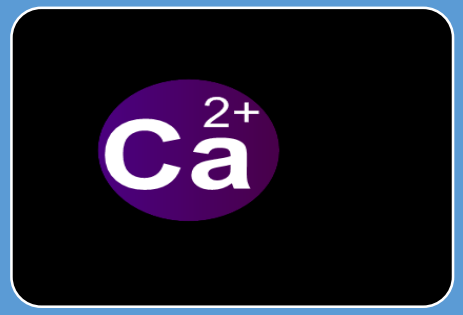
3 organs

- Intestine
- Kidney
- bone

3 hormones

- PTH
- 1,25 $(OH)_2$ D_3
- Calcitonin





PTH

- **Kidney**: ++ Ca , --PO4 reabsorption
- **Bone**: osteoclastic activity
- **Intestine:** ++Ca &PO4 absorption ??

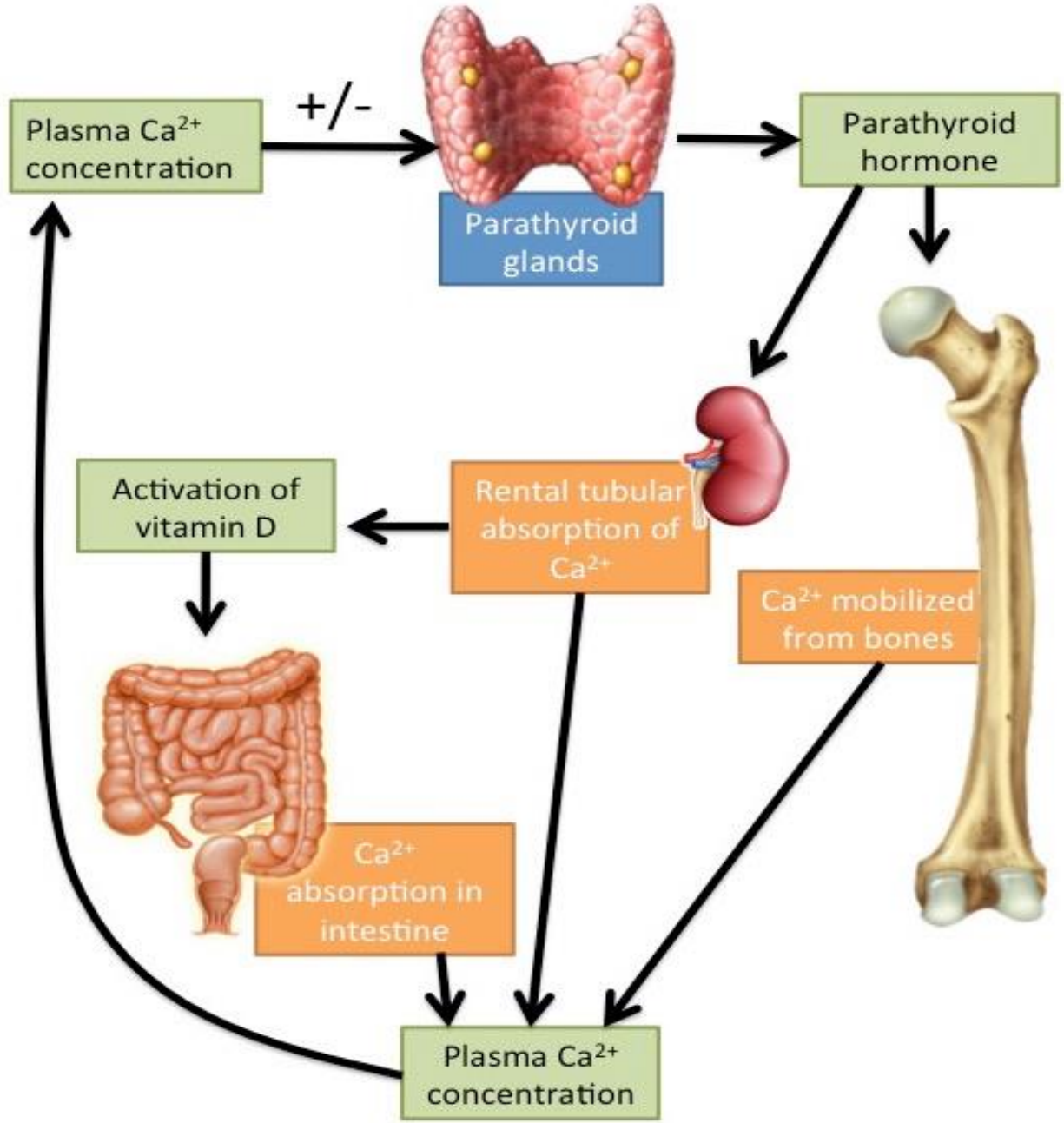
1,25 dihydroxycolecalciferol

- **Kidney:** ++ Ca & PO4 reabsorption
- **Intestine**: ++Ca &PO4 absorption
- **Bone:** ??

Calcitonin

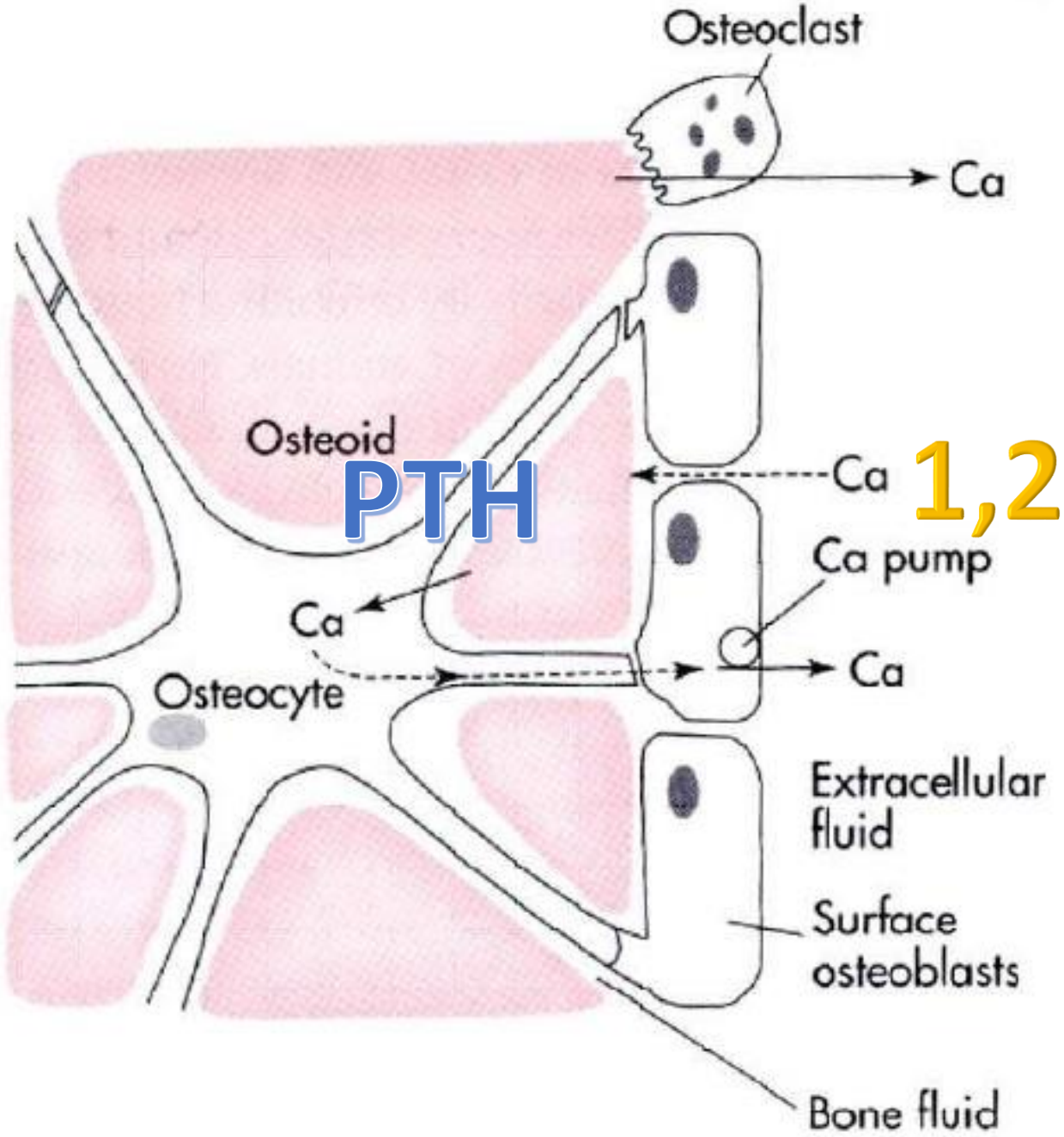
- **Kidney:** -- Ca & PO4 reabsorption
- **Bone:** -- osteoclastic activity ++ osteoblastic activity

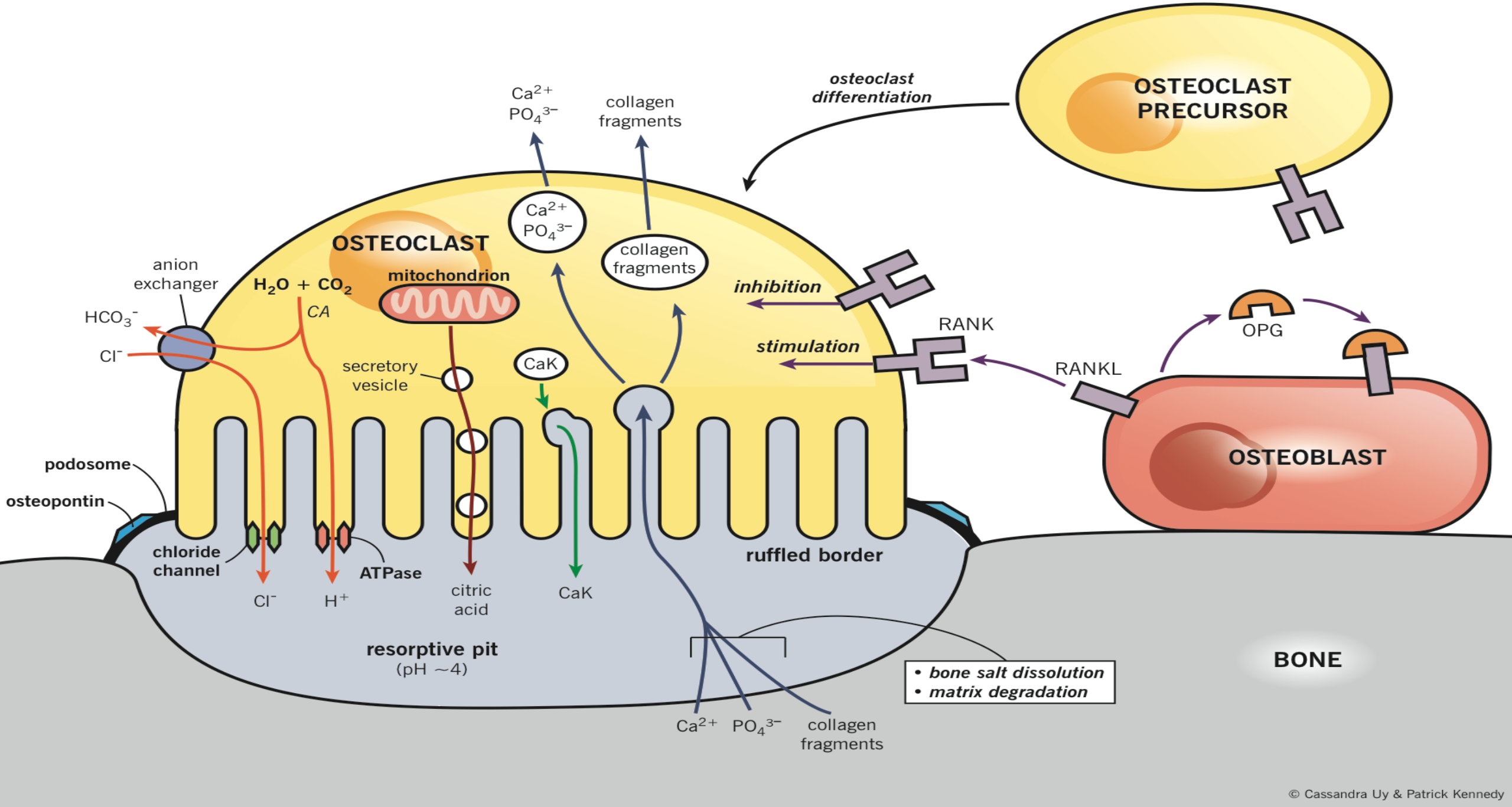
Maintaining Calcium Balance

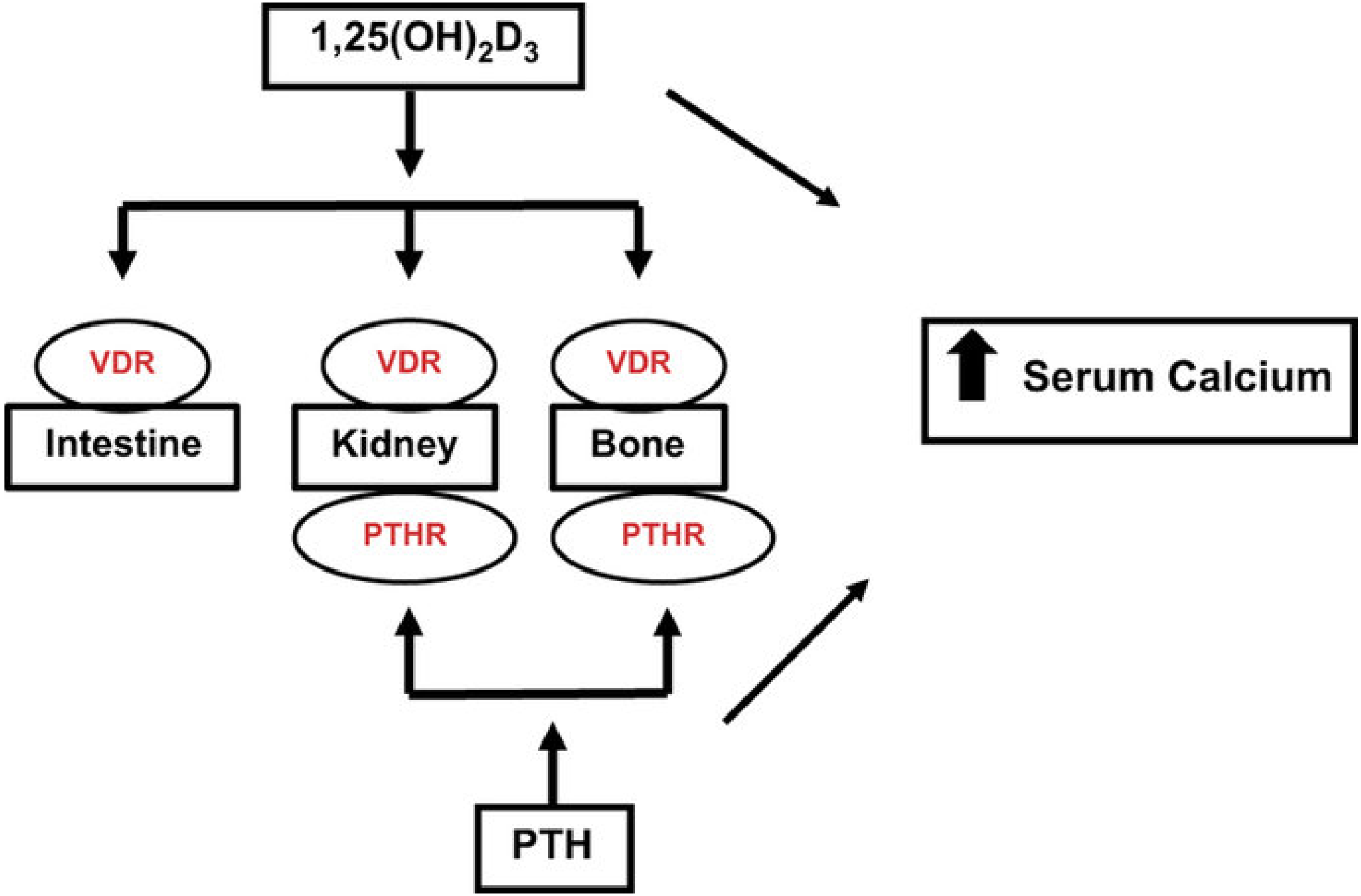


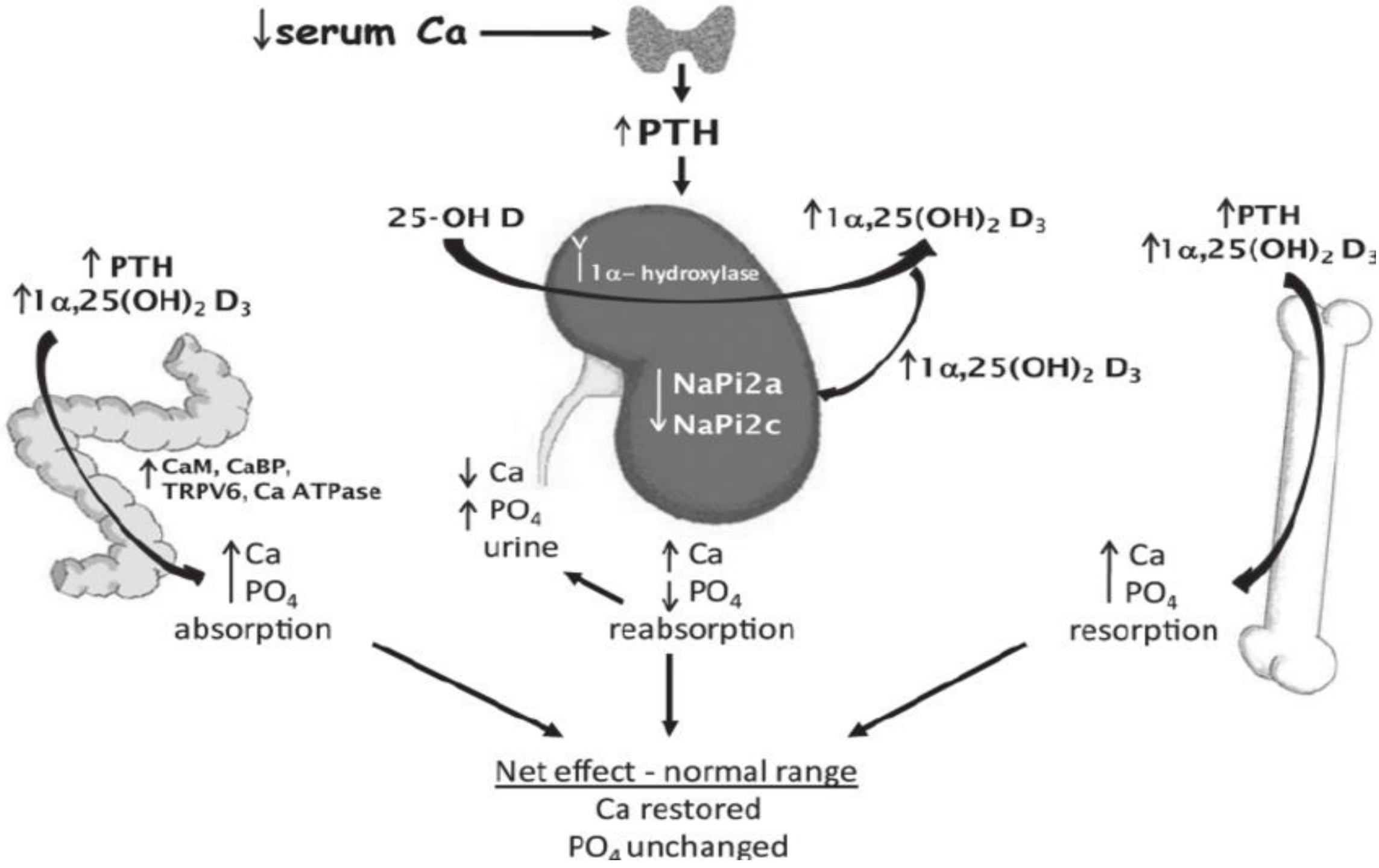
Rapid phase:
Osteolysis
Minutes to hours

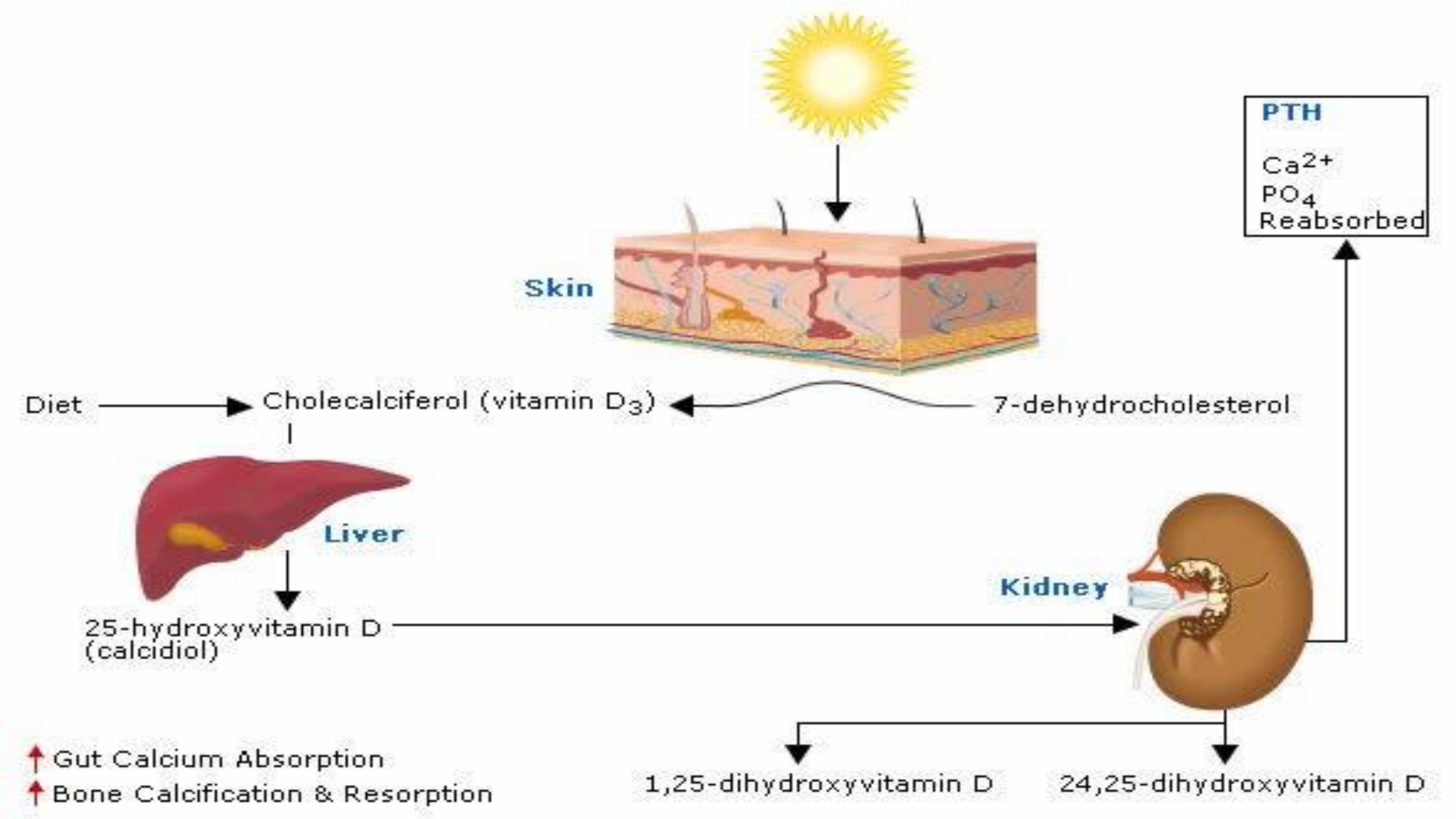
Slow phase:
Osteoclastic activity
Days or weeks


Osteoclast
Ca
Osteoid
PTH
Ca
1,25(OH)2D3
Ca pump
Ca
Osteocyte
Ca
Extracellular fluid
Surface osteoblasts
Bone fluid




1,25(OH)2D3
VDR
Intestine
VDR
Kidney
VDR
Bone
PTHR
PTHR
PTH
Serum Calcium


↓serum Ca
↑PTH
25-OH D
↑1α,25(OH)2 D3
1α– hydroxylase
NaPi2a
NaPi2c
↑1α,25(OH)2 D3
↑PTH
↑1α,25(OH)2 D3
↑ PTH
↑1α,25(OH)2 D3
↑CaM, CaBP,
TRPV6, Ca ATPase
↓ Ca
↑ PO4
urine
↑Ca
PO4
absorption
↑ Ca
↓ PO4
reabsorption
↑Ca
PO4
resorption
Net effect - normal range
Ca restored
PO4 unchanged


PTH
Ca^{2+}
PO_4
Reabsorbed
Skin
Diet
Cholecalciferol (vitamin D_3)
7-dehydrocholesterol
Liver
Kidney
25-hydroxyvitamin D
(calcidiol)
Gut Calcium Absorption
Bone Calcification & Resorption
1,25-dihydroxyvitamin D
24,25-dihydroxyvitamin D

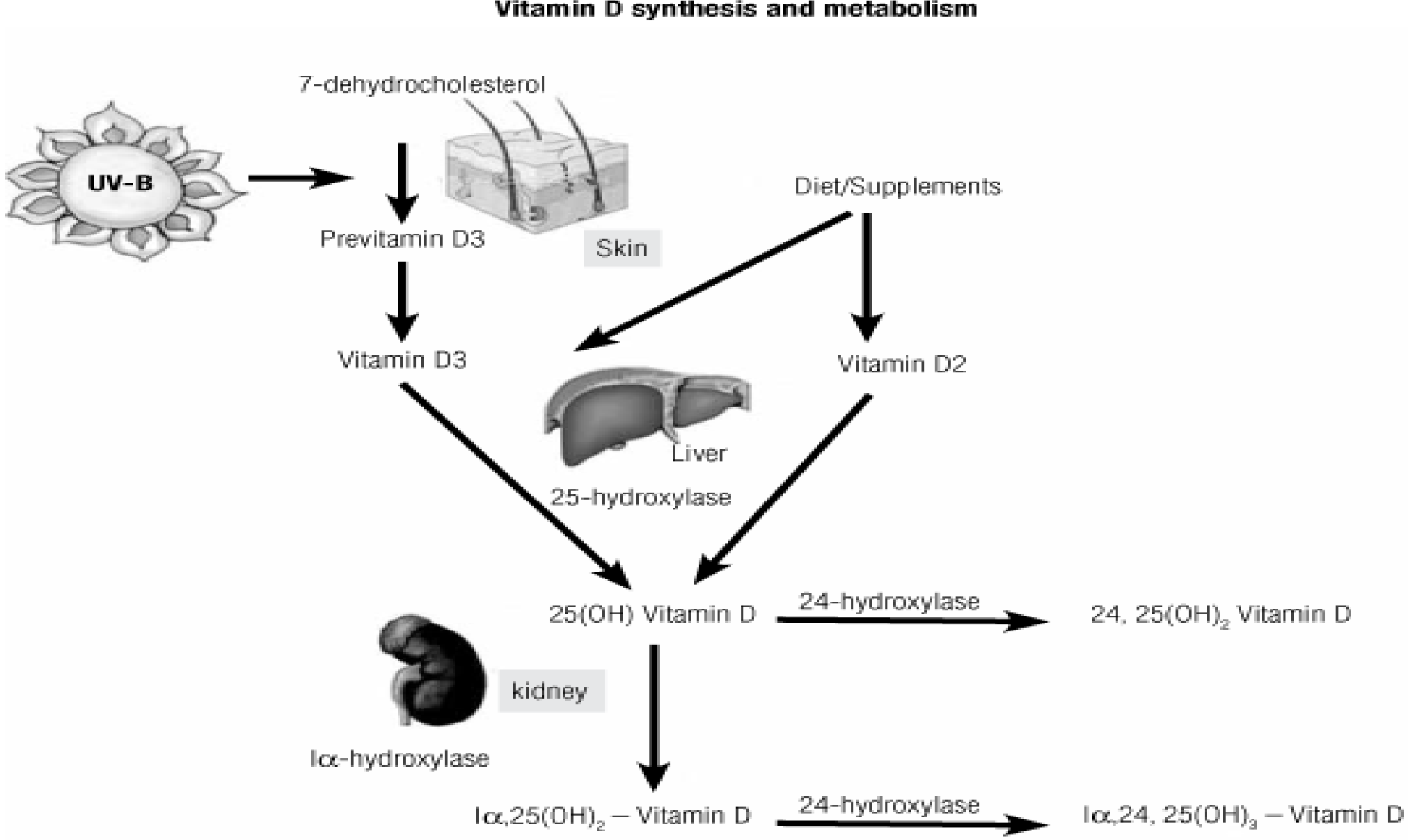
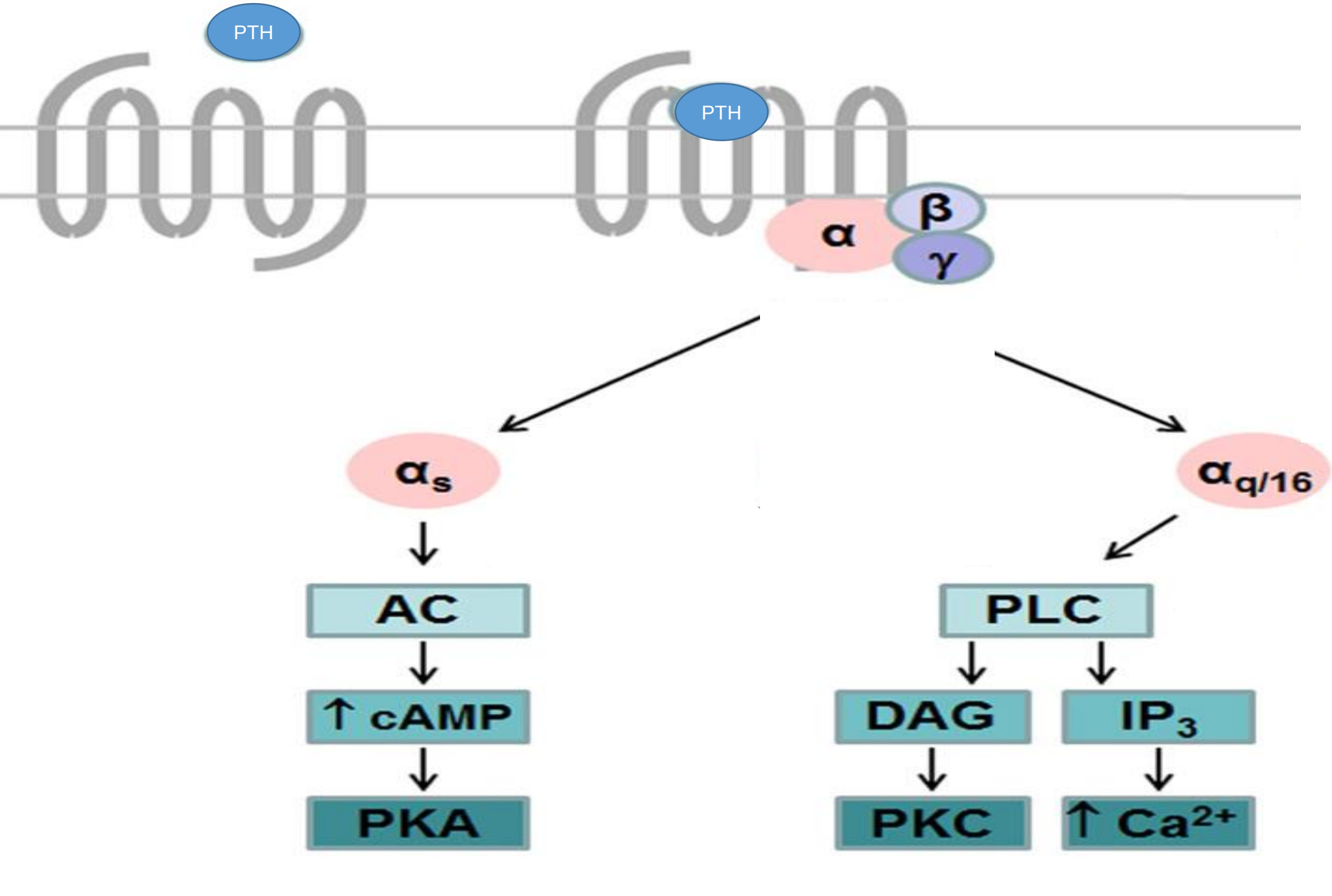
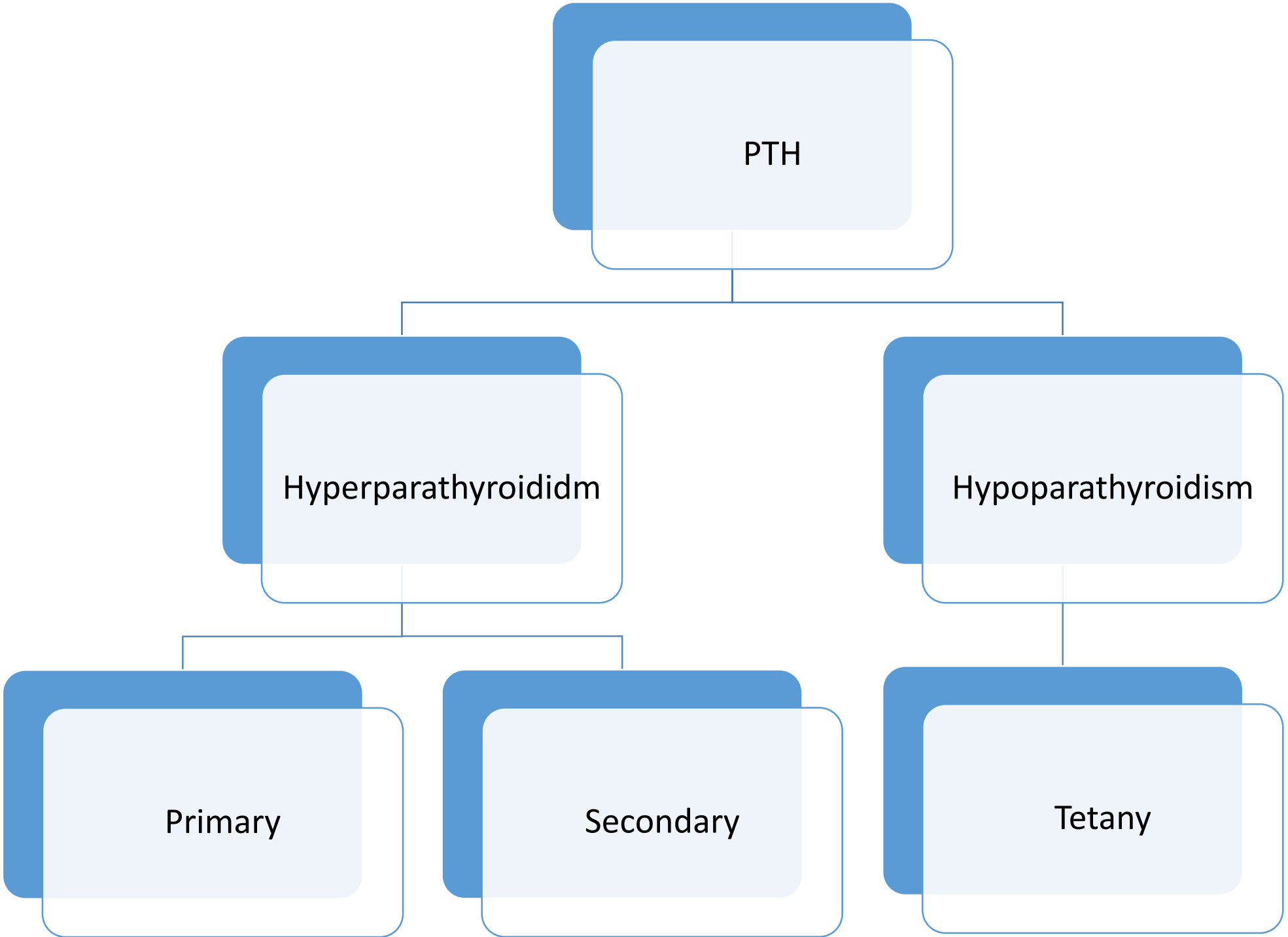


Figure 1. 7-Dehydrocholesterol (pro-vitamin D3) during sun exposure (UVB), in the skin, is converted to previtamin D_3. Vitamins D_3 (cholecalciferol) and D_2 (ergosterol) are both metabolized in the liver to 25-hydroxicholecalciferol [(25(OH)D] and are transformed in the kidneys into its active form, 1,25 dihydroxyvitamin D [$1,25(OH)_2D$]. Inactivation of vitamin D metabolites occurs mainly by renal 24-hydroxylation.

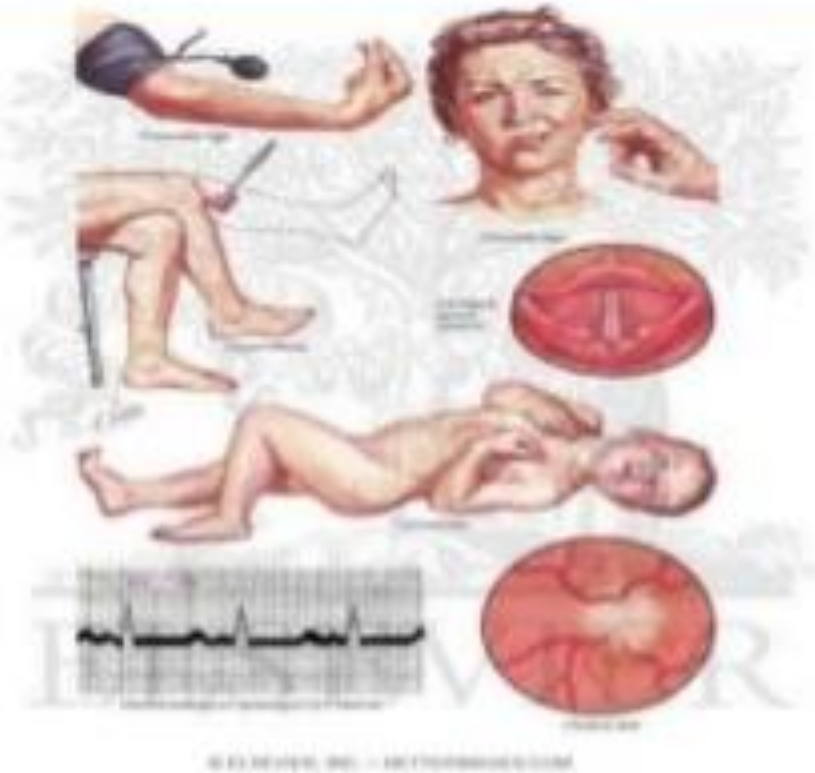

PTH
PTH
α
β
γ
α_s
$\alpha_{q/16}$
AC
↑ cAMP
PKA
PLC
DAG
IP_3
PKC
↑ Ca^{2+}

Regulation of secretion:

PTH	1,25(OH)2D3 Formation	Calcitonin
• Ca • Po4 • B adrenergic • 1,25(OH)2D3	• Ca • PTH	• Ca • B adrenergic agonist, • Estrogen, prolactin • Gastrin, CCK


PTH
Hyperparathyroididm
Hypoparathyroidism
Primary
Secondary
Tetany

HYPOCALCEMIC TETANY



by G.NAGARJUNA GOUD

Causes:

- Hypoparathyroidism
- Decrease intake or absorption
- Alkalosis
- Phosphate retention!!!

Types:

- Latent: 7-9.4 mg/dl
- Manifest : less than 7 mg/dl

Treatment:

- IV Ca gluconate !!!
- Diet Ca &Vit D
- Treatment of the cause

Thank you