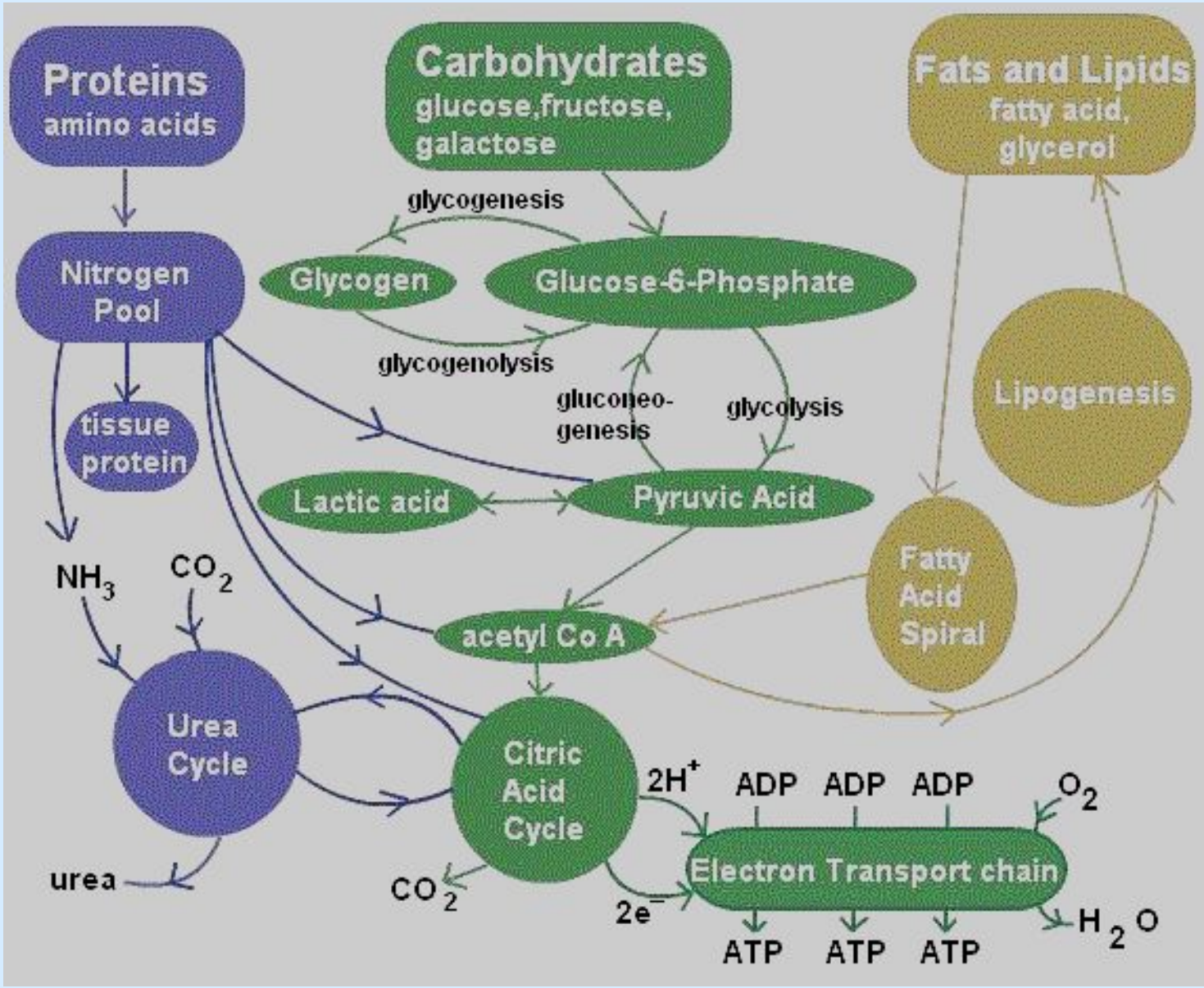
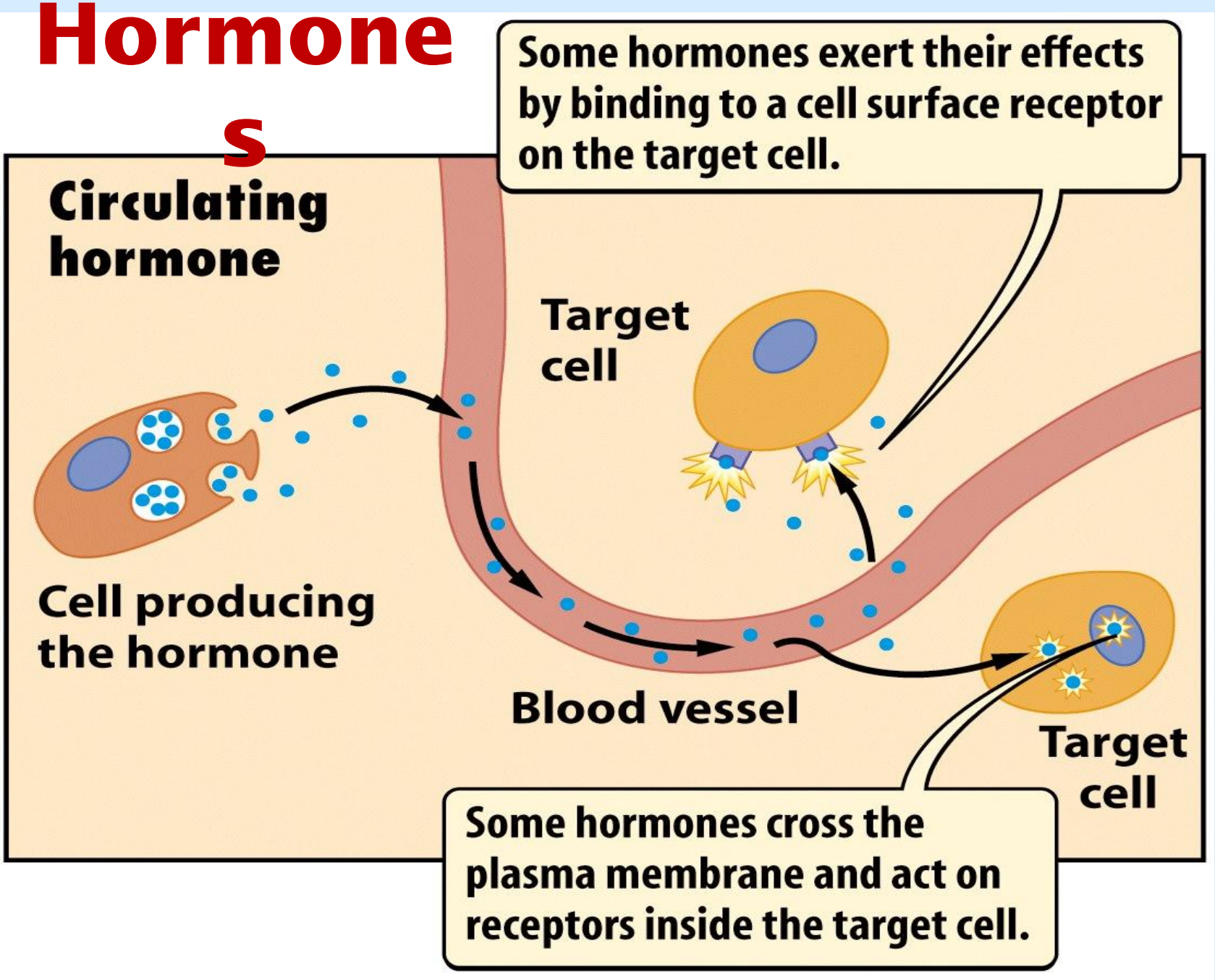
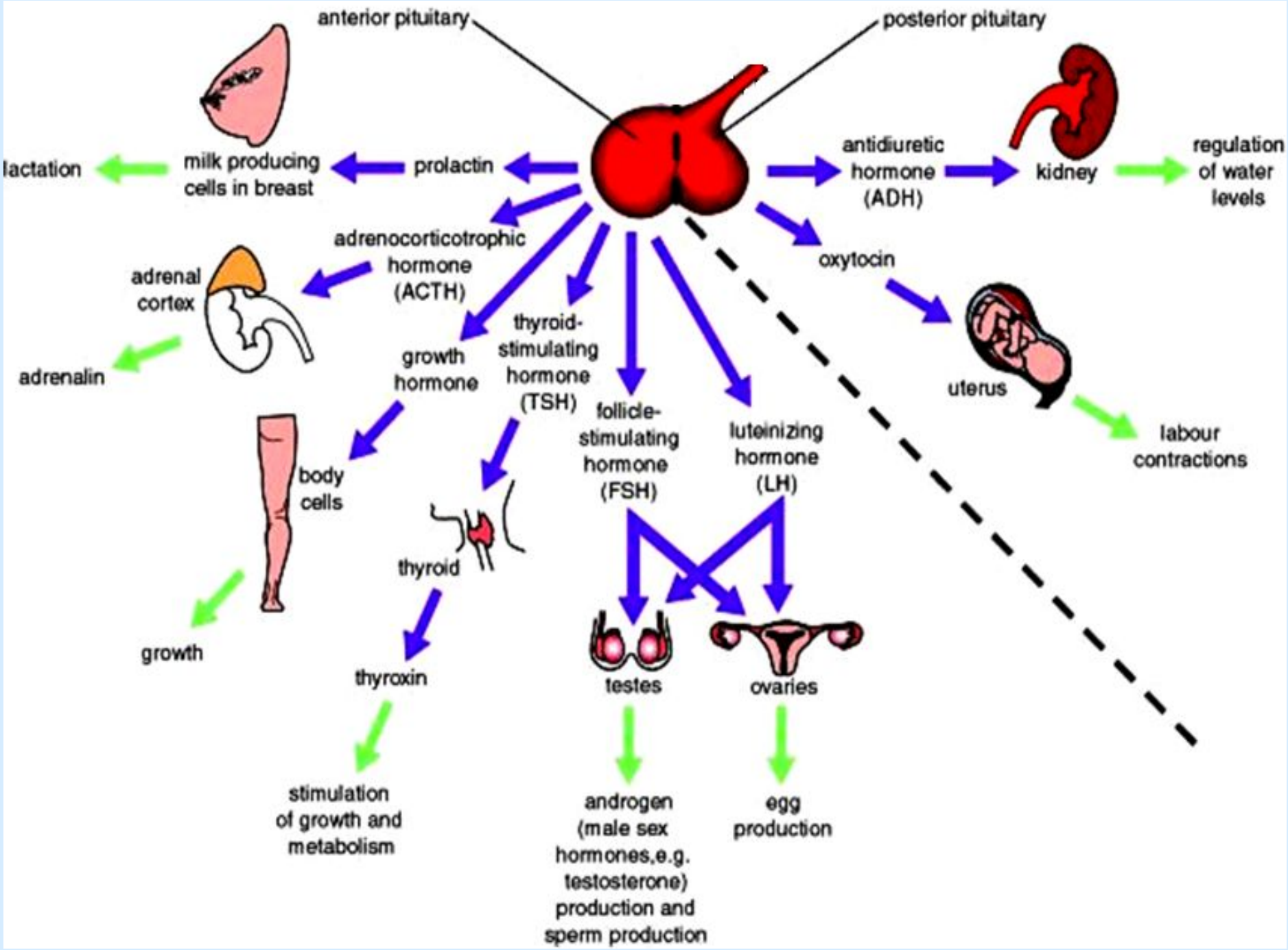
REGULATION OF METABOLISM

Metabolism

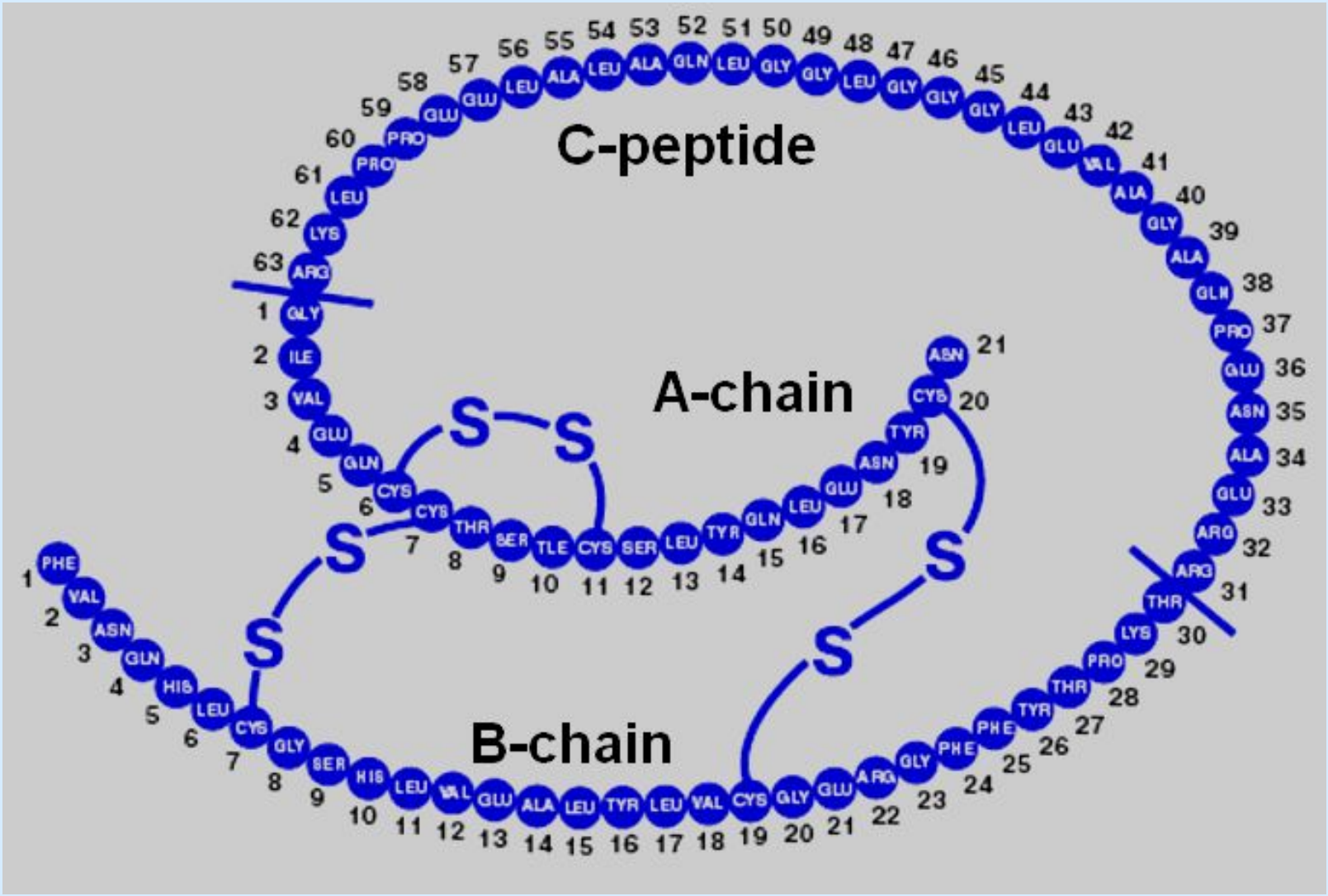

Proteins
amino acids
Carbohydrates
glucose,fructose,
galactose
Fats and Lipids
fatty acid,
glycerol
glycogenesis
Nitrogen
Pool
Glycogen
Glucose-6-Phosphate
glycogenolysis
gluconeo-
genesis
glycolysis
Lipogenesis
tissue
protein
Lactic acid
Pyruvic Acid
NH_3
CO_2
Fatty
Acid
Spiral
acetyl Co A
Urea
Cycle
Citric
Acid
Cycle
$2H^+$
ADP ADP ADP
O_2
Electron Transport chain
urea
CO_2
$2e^-$
H_2O
ATP ATP ATP

Hormones

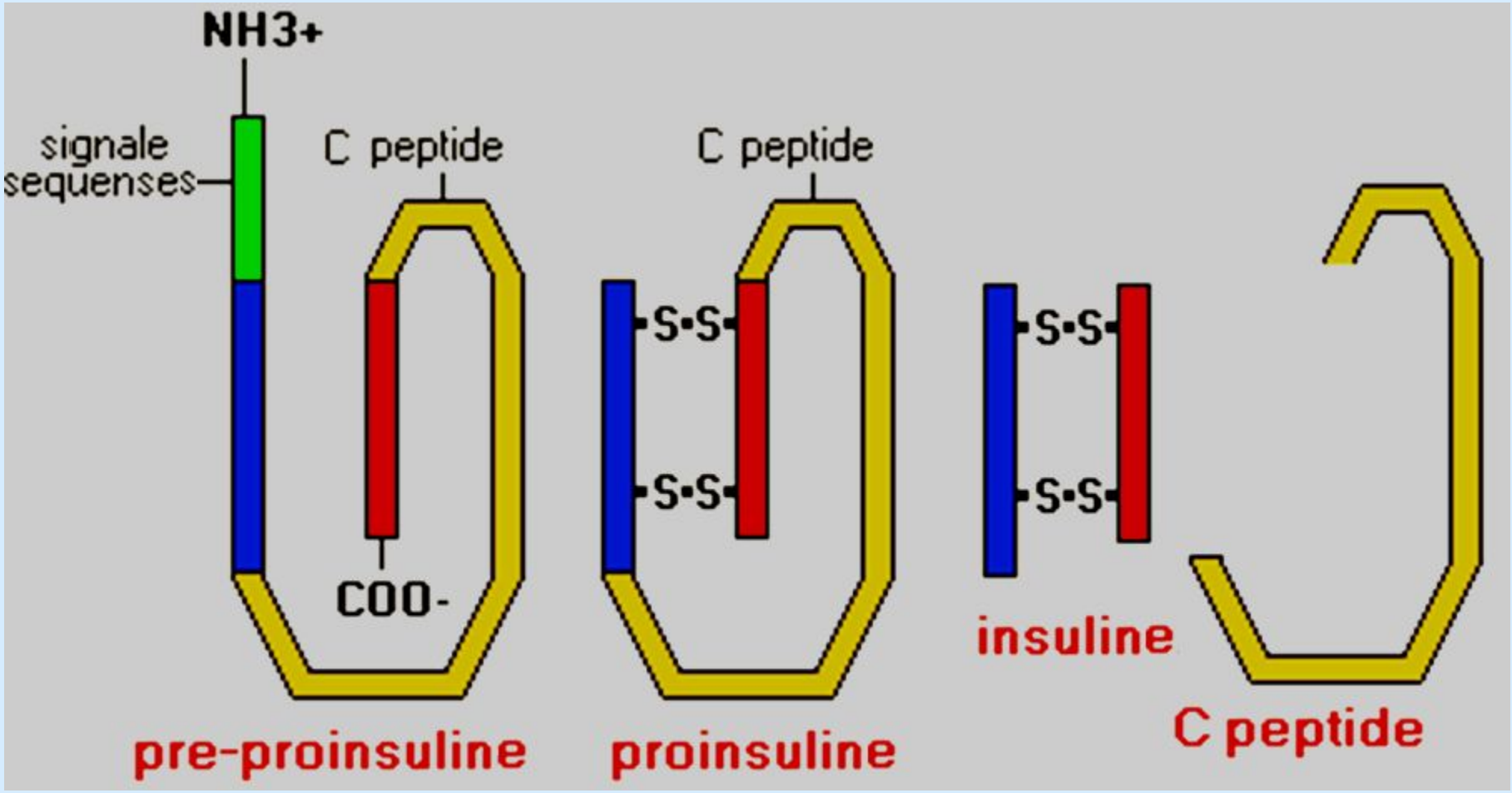

Some hormones exert their effects by binding to a cell surface receptor on the target cell.
Circulating hormone
Target cell
Cell producing the hormone
Blood vessel
Target cell
Some hormones cross the plasma membrane and act on receptors inside the target cell.


anterior pituitary
posterior pituitary
lactation
milk producing cells in breast
prolactin
antidiuretic hormone (ADH)
kidney
regulation of water levels
adrenocorticotrophic hormone (ACTH)
adrenal cortex
adrenalin
oxytocin
uterus
labour contractions
growth hormone
thyroid-stimulating hormone (TSH)
follicle-stimulating hormone (FSH)
luteinizing hormone (LH)
body cells
growth
thyroid
thyroxin
stimulation of growth and metabolism
testes
ovaries
androgen (male sex hormones,e.g. testosterone) production and sperm production
egg production

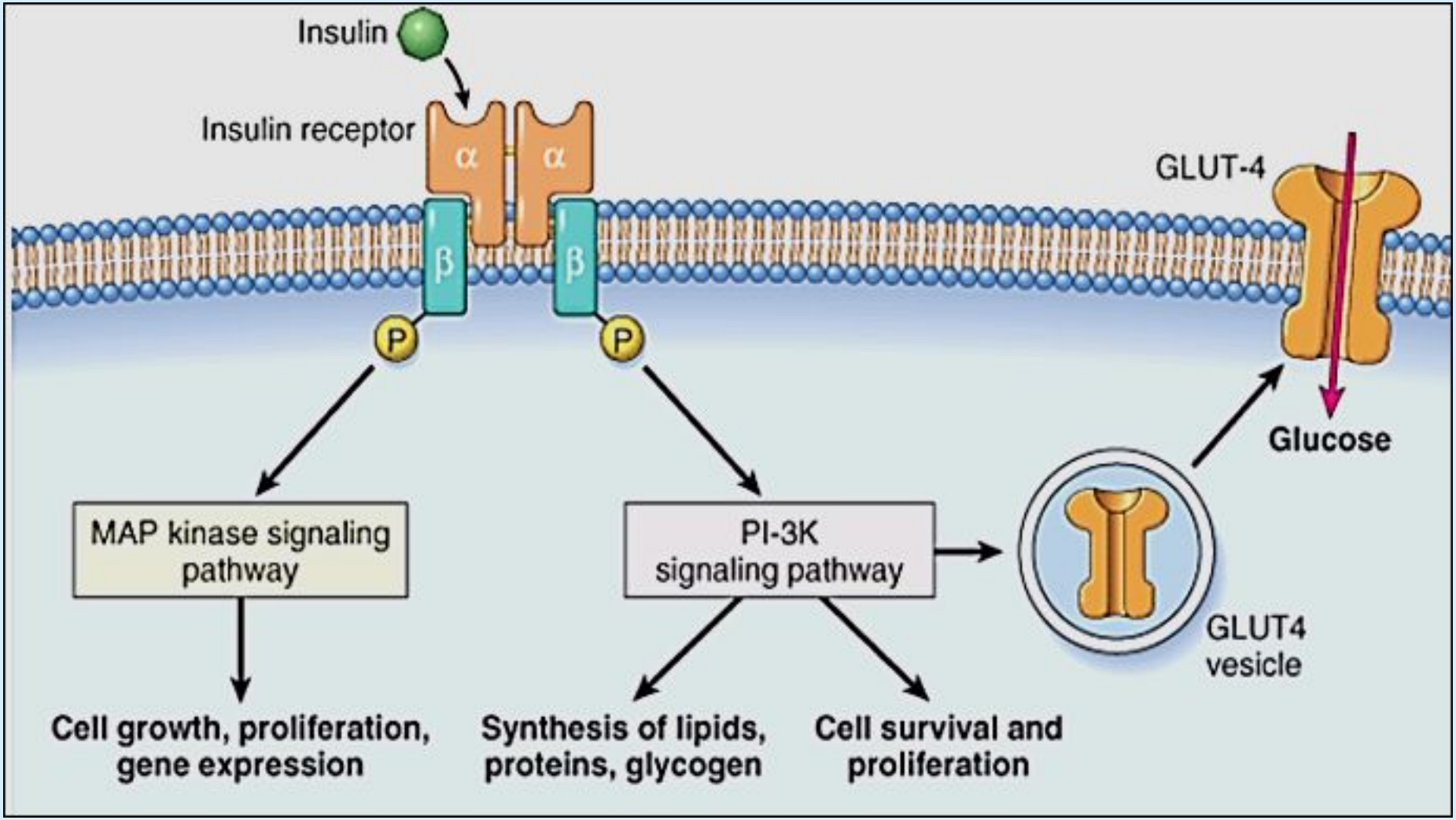
Insuline



The formation of active insulin



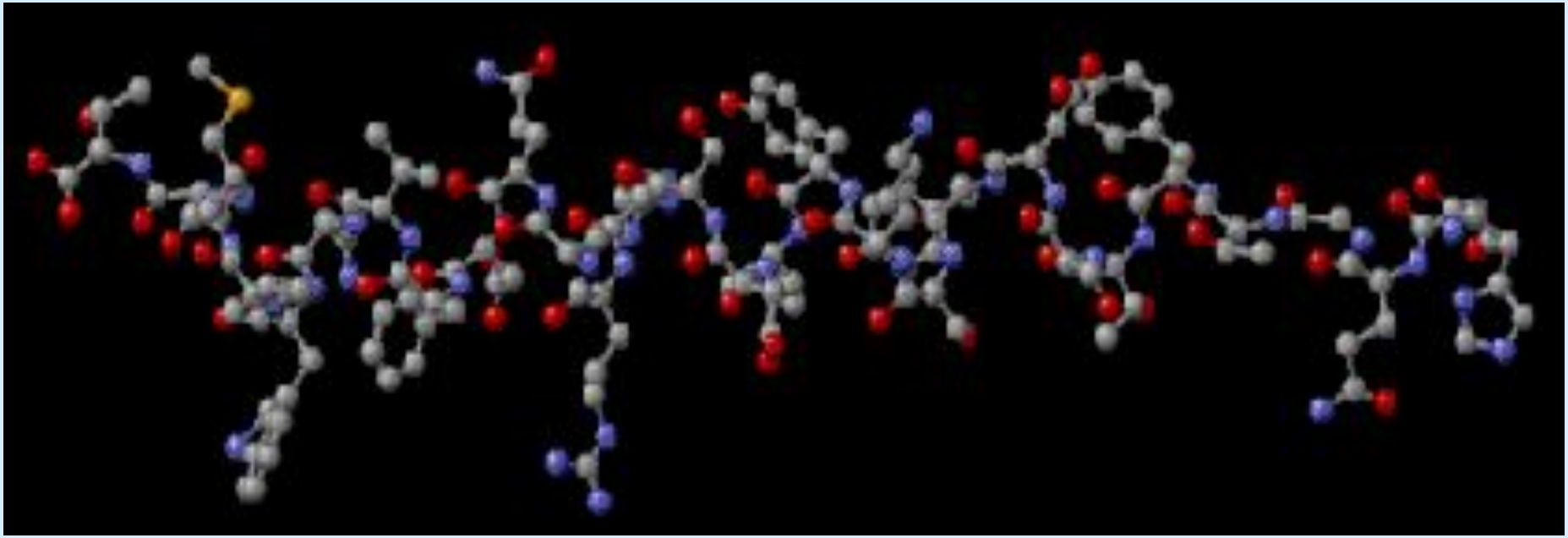
Insulin receptor



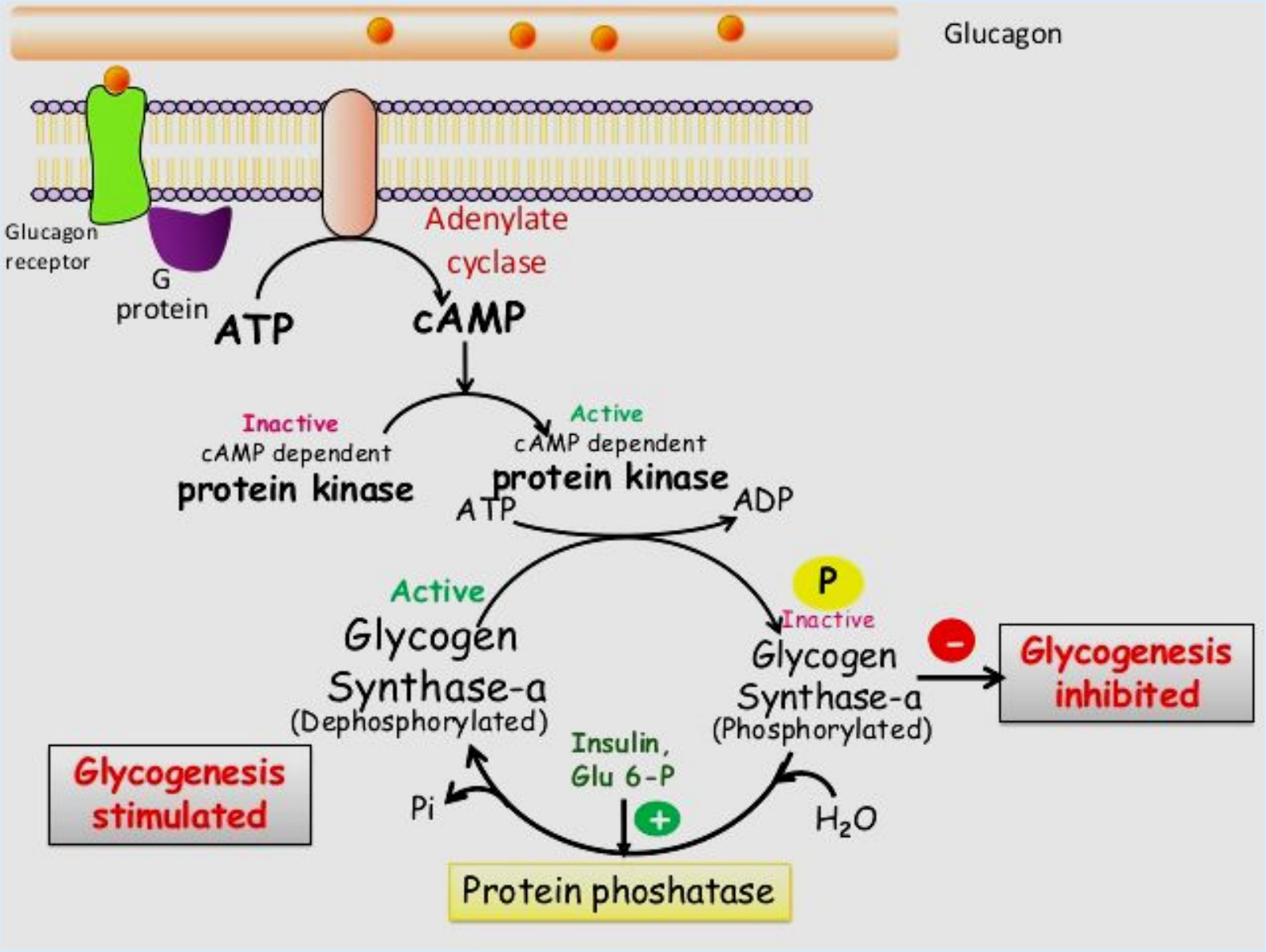
Insulin

The signal for secretion	Target organs	Changes in metabolism in target cells
Increasing the concentration of glucose in the blood	Liver	1. The acceleration of glycogen synthesis
		2. The acceleration of protein synthesis
		3. Inhibition of gluconeogenesis
	Muscles	1. The acceleration of glycogen synthesis
		2. The acceleration of protein synthesis
		3. The acceleration of glucose transport into the cell
	Adipose tissue	1. The acceleration of fat synthesis from glucose
		2. The acceleration of glucose

Glucagon



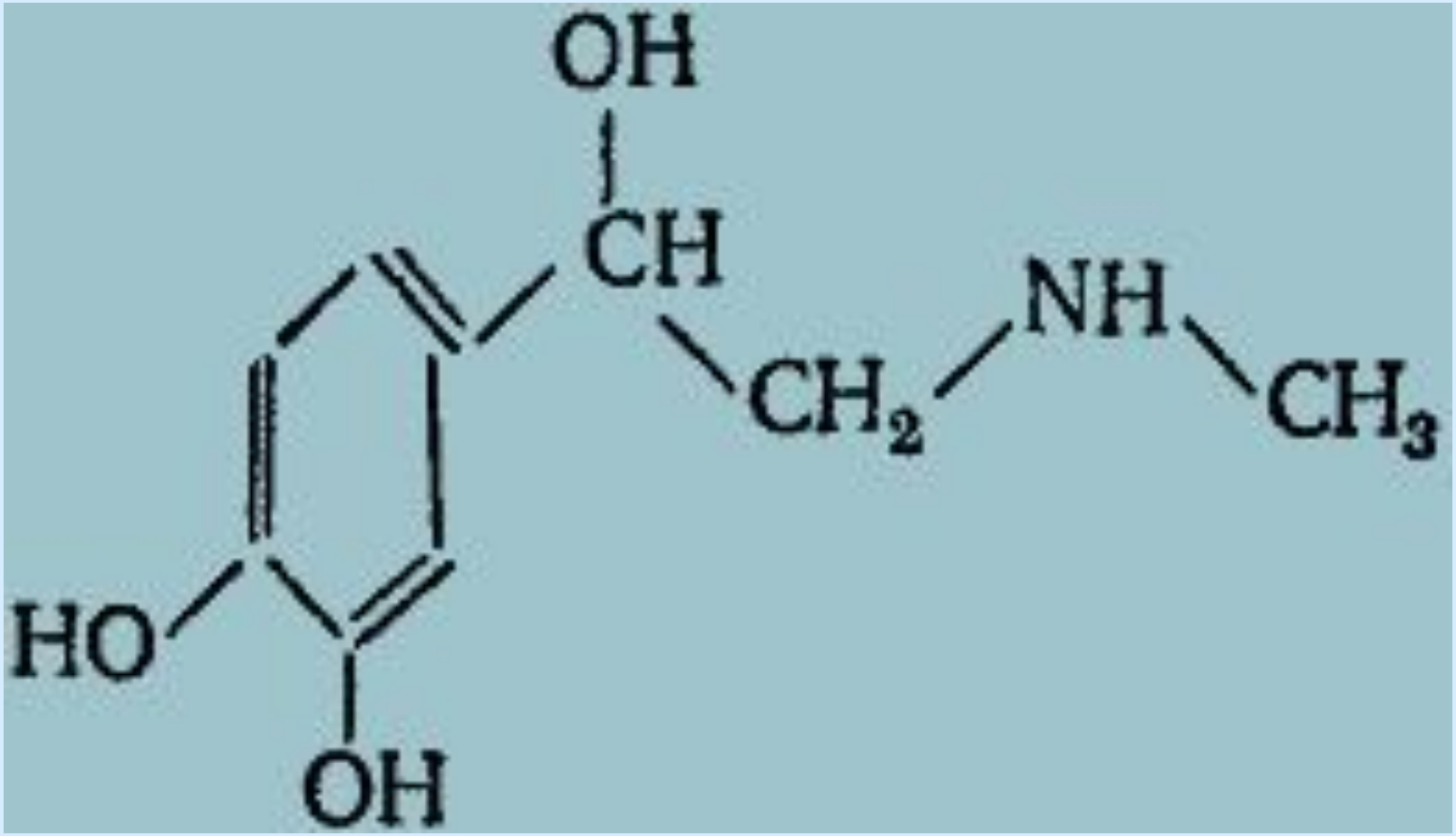
Glucagon receptor



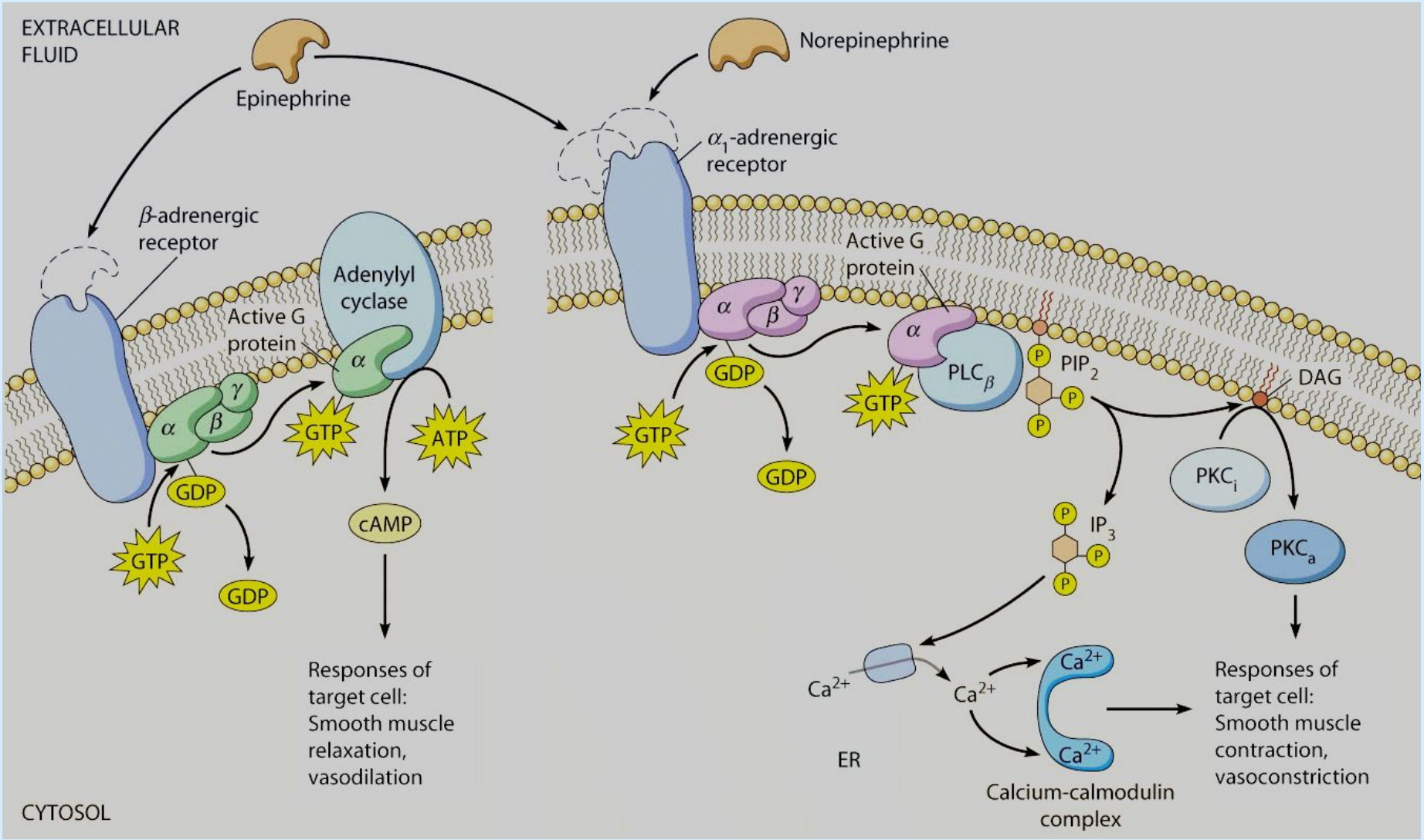
Glucagon

The signal for secretion	Target organs	Changes in metabolism in target cells
Lowering blood glucose levels	Liver	1. The acceleration of glycogen breakdown 2. The acceleration of gluconeogenesis
	Adipose tissue	The acceleration of lipolysis

Adrenaline



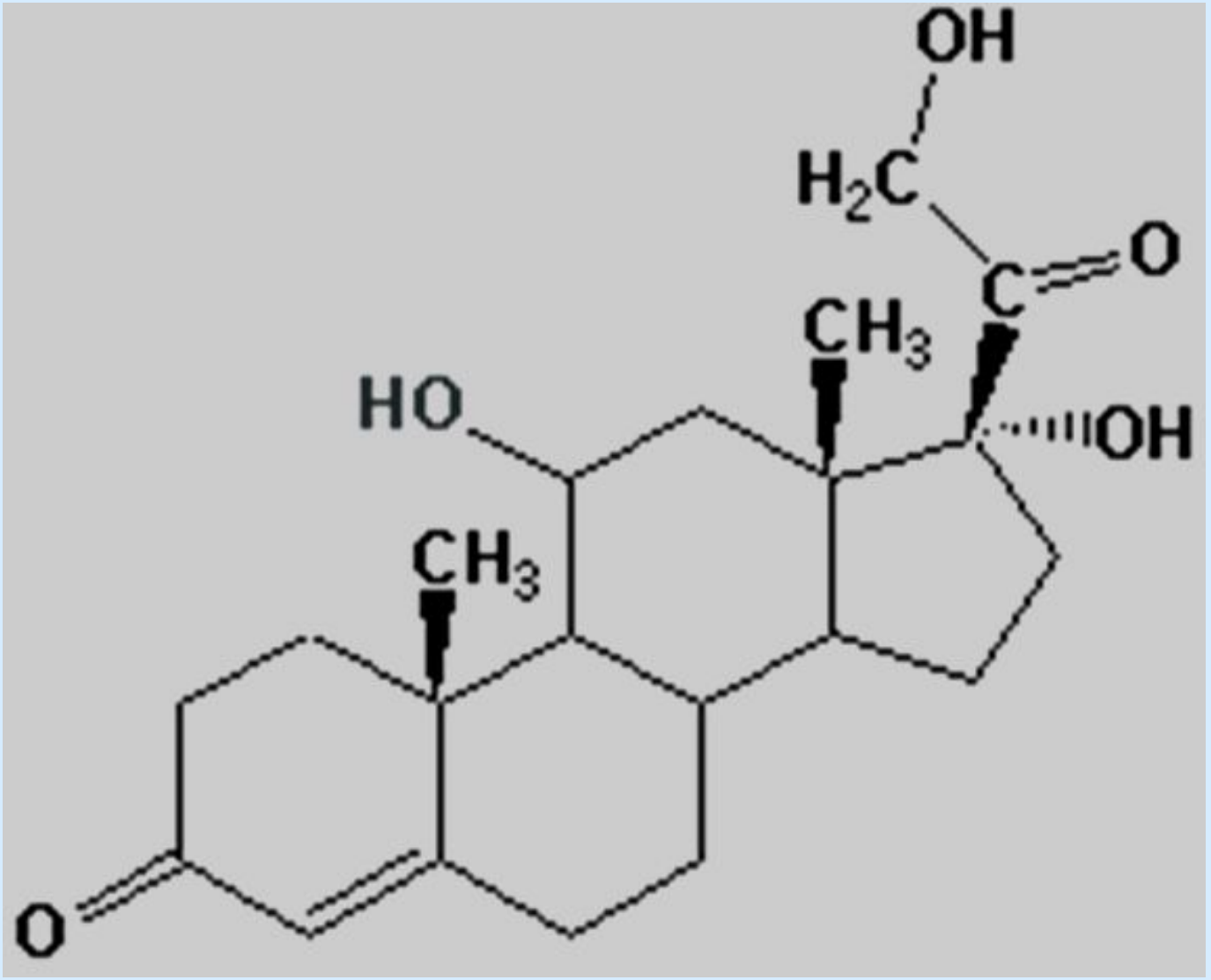
Adrenaline recertors



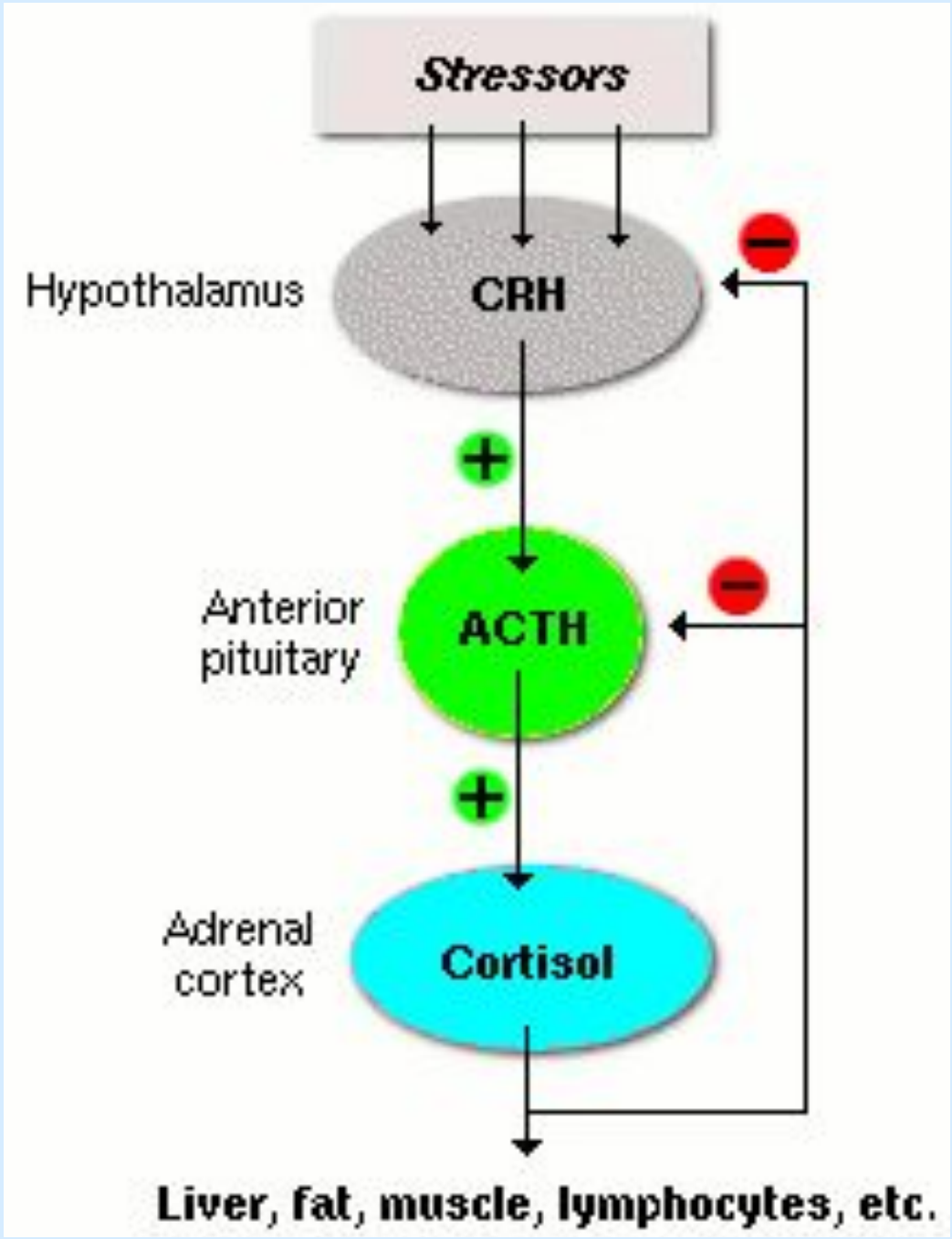
Adrenaline

The signal for secretion	Target organs	Changes in metabolism in target cells
Signal of CNS	Liver	The acceleration of glycogen breakdown
	Muscles	The acceleration of glycogen breakdown
	Adipose tissue	The acceleration of lipolysis

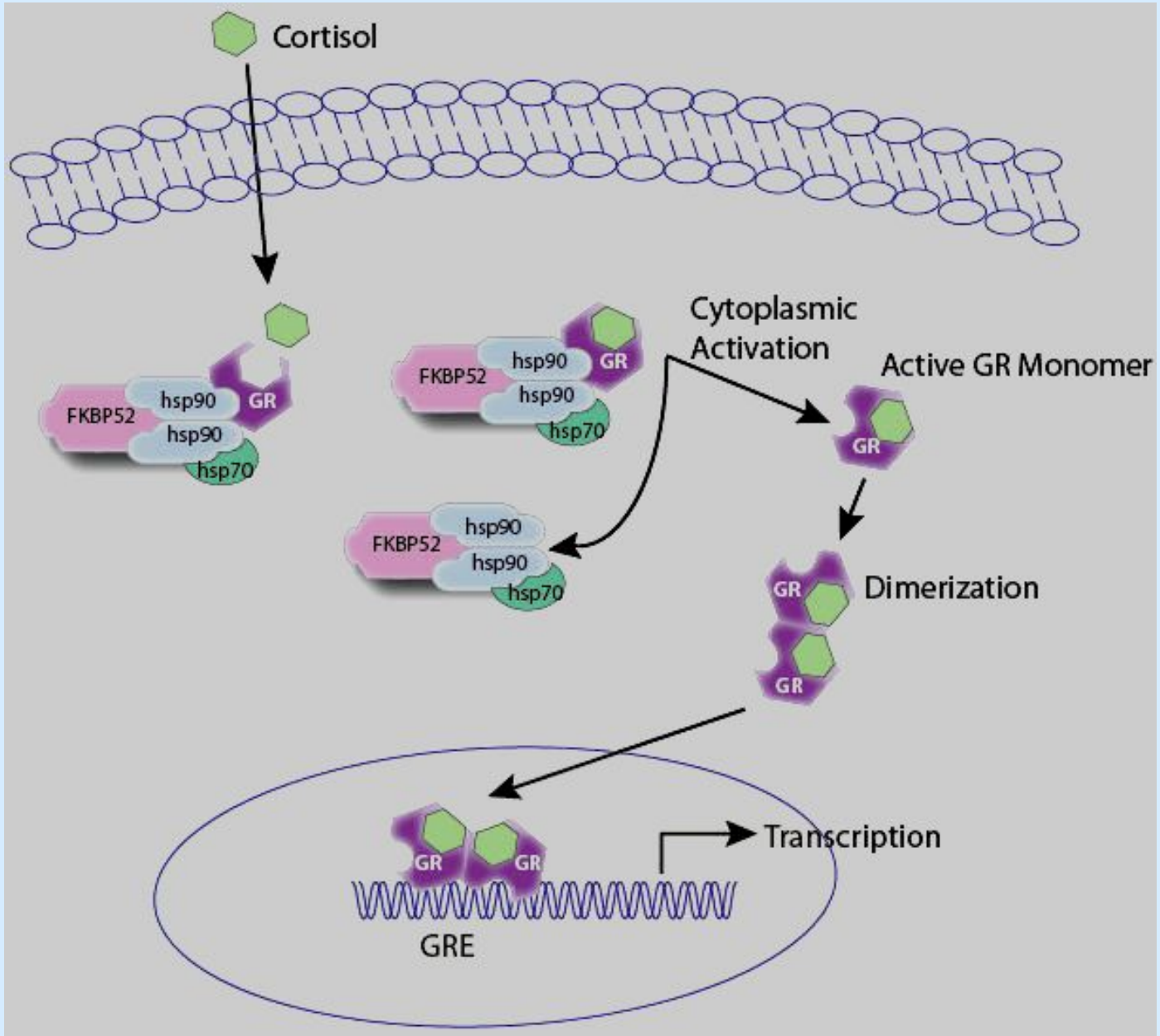
Cortisol



The regulation of cortisol synthesis



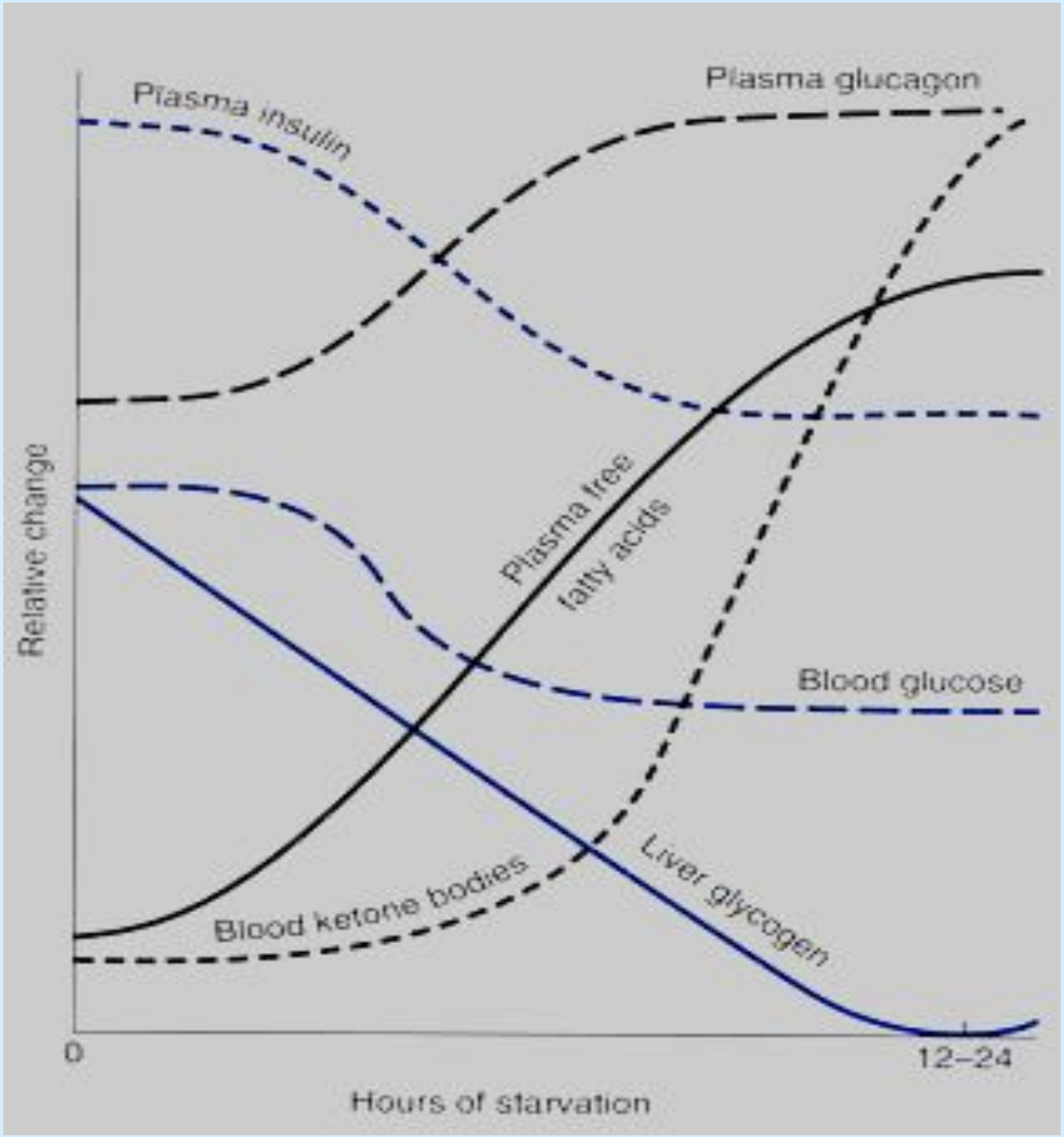
Cortisol receptor



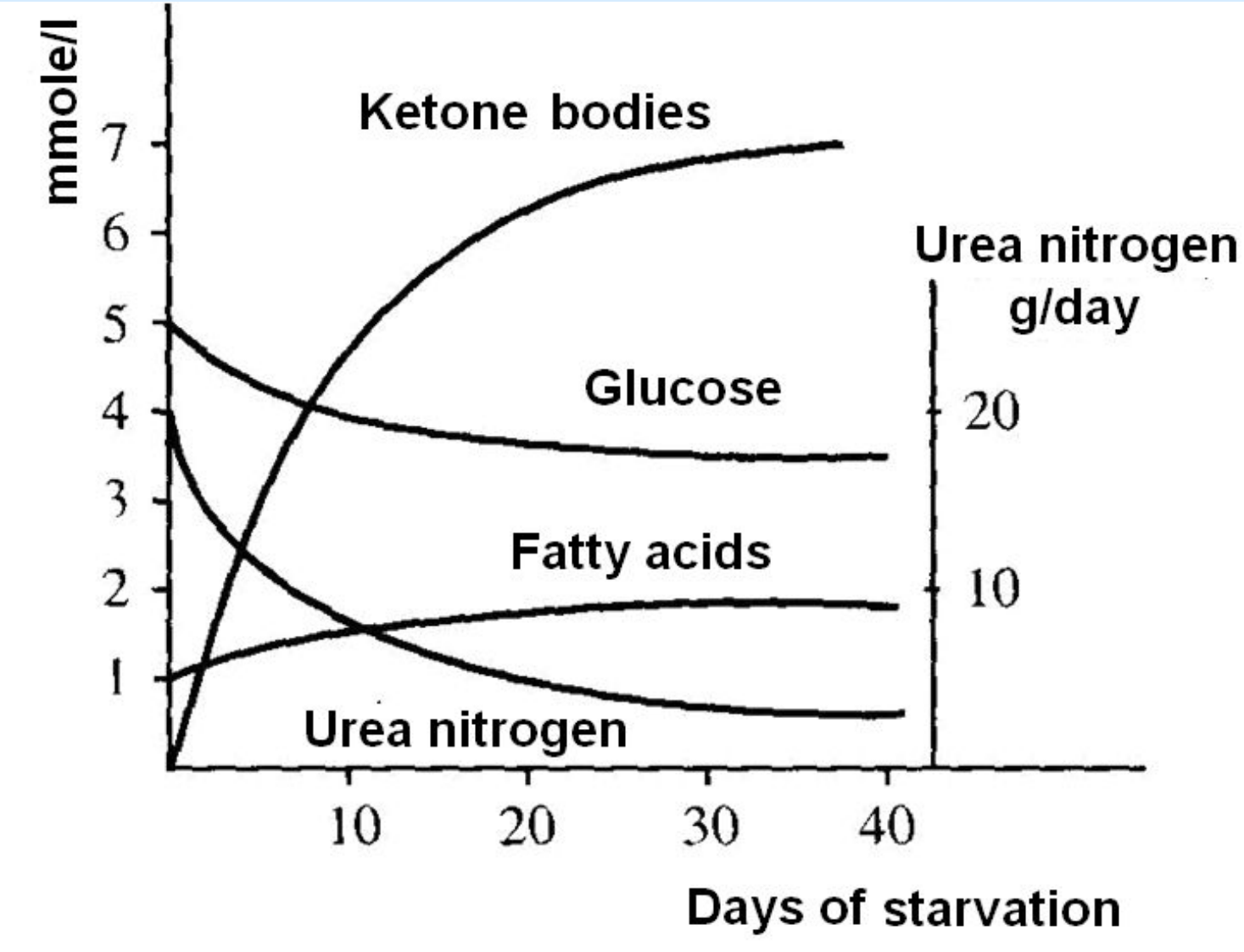
Cortisol

The signal for secretion	Target organs	Changes in metabolism in target cells
The concentration of glucose in the blood mediated by corticotropin	Liver	1. Acceleration of gluconeogenesis
		2. Induction of synthesis of the enzymes of gluconeogenesis and amino acids catabolism
	Muscles	1. The acceleration of the amino acids catabolism
		2. Reducing the rate of the amino acids transport

Changes in metabolism in starvation



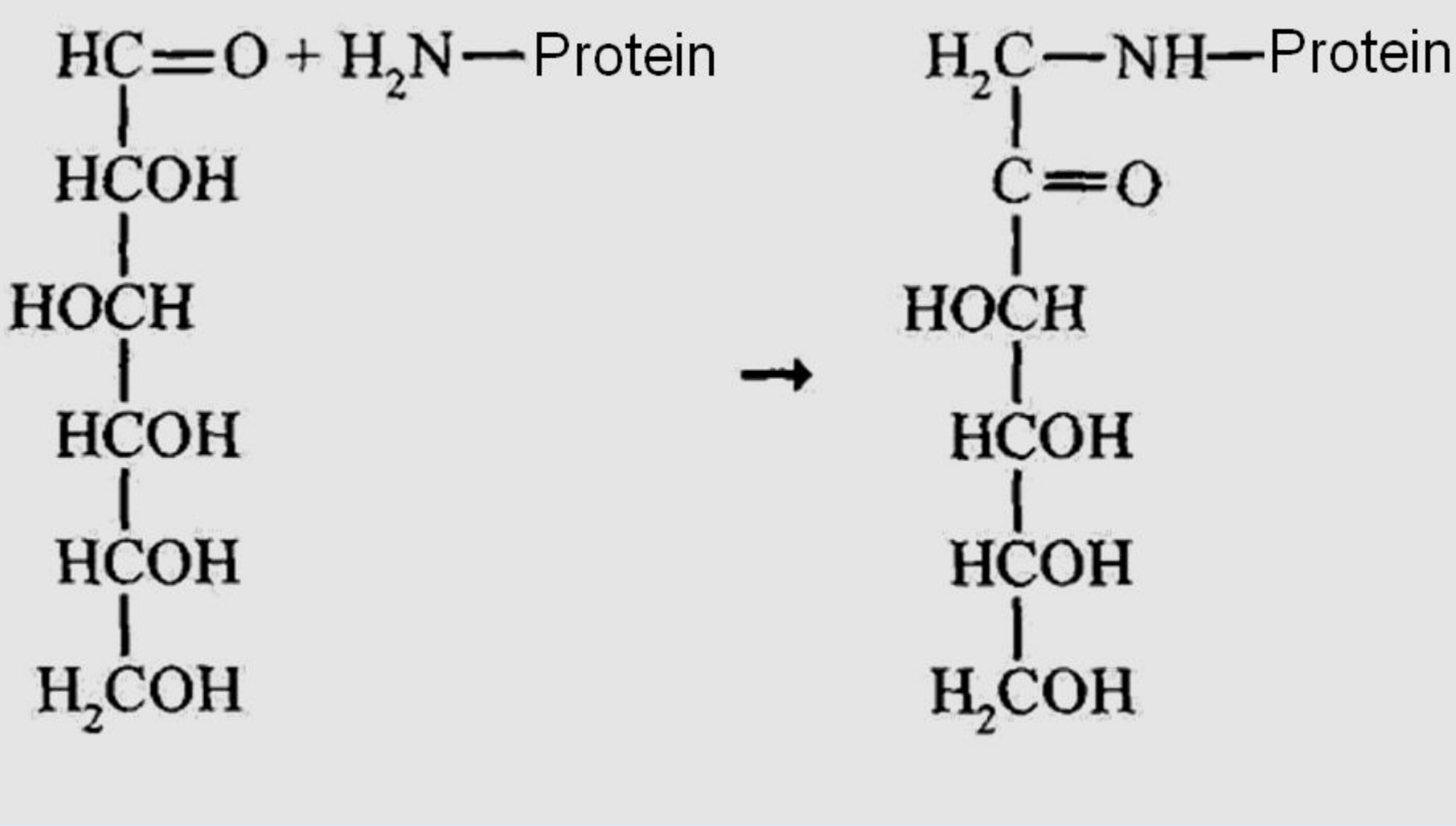
Changes in metabolism in starvation



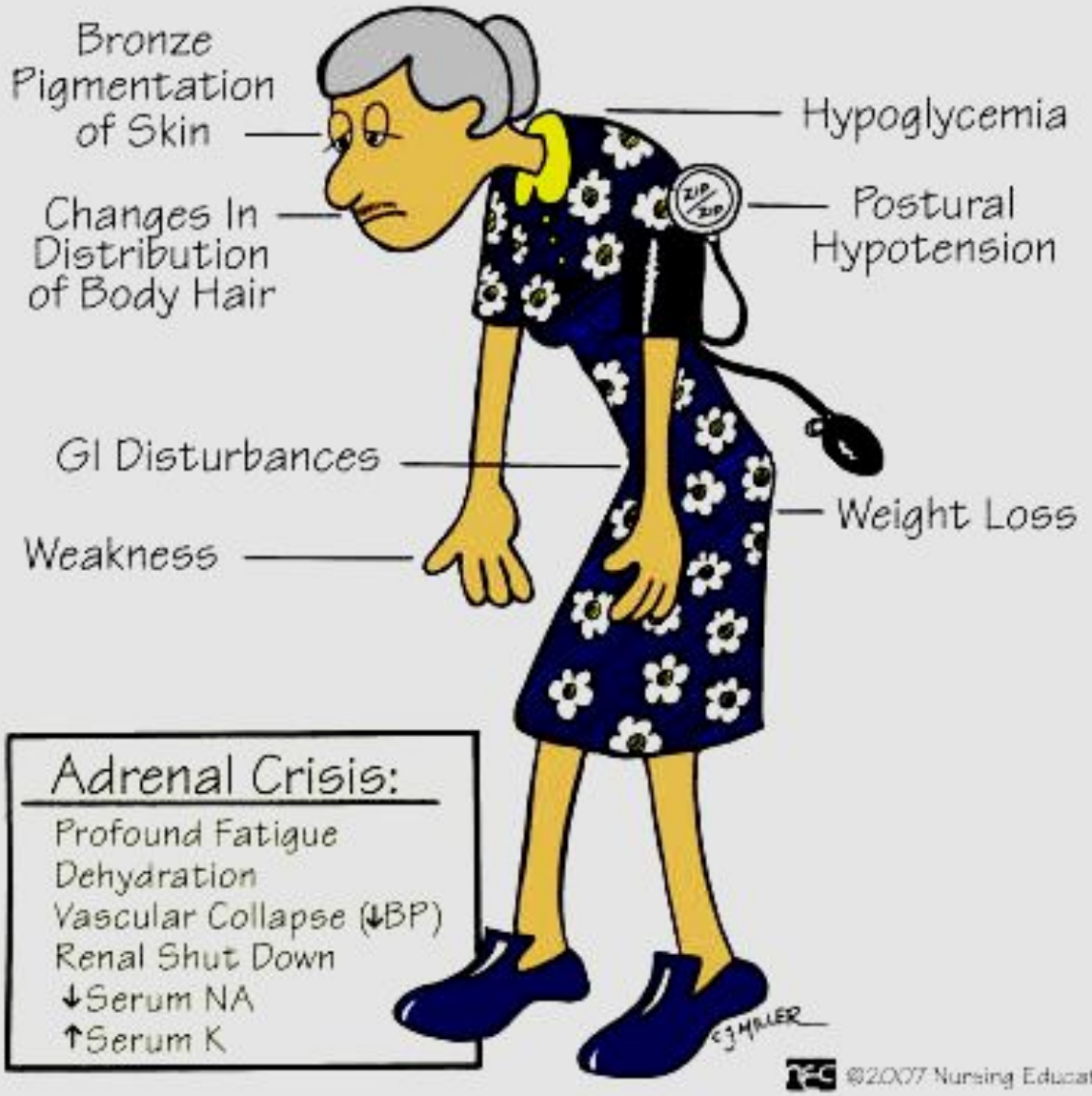
The main manifestations of diabetes

- Decreased synthesis and deposition of glycogen and fat
- Hyperglycemia
- Hyperlipoproteinemia
- Ketonemia
- Azotemia and azoturia
- Polyuria and polydipsia

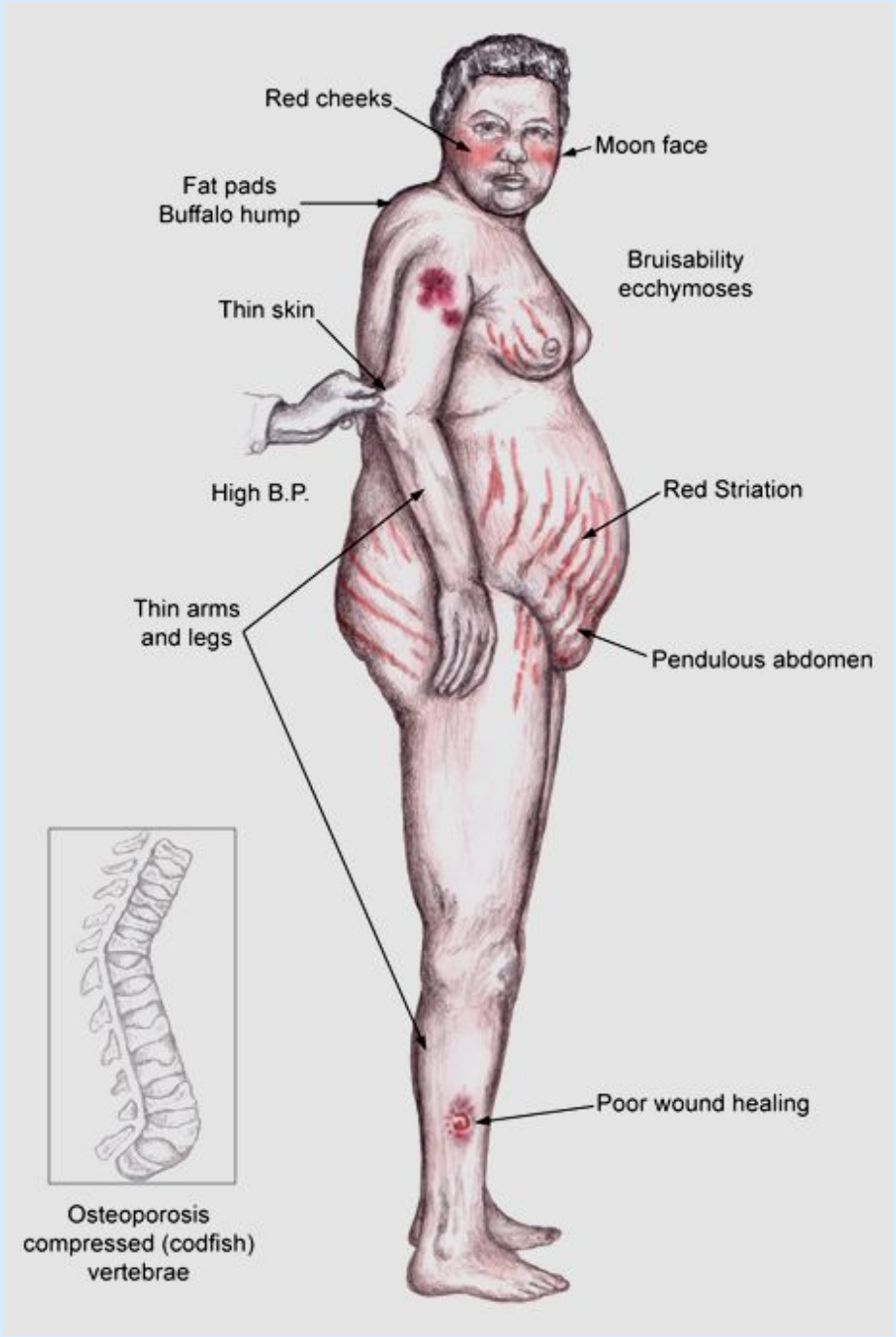
Protein glycosylation



ADDISON'S DISEASE

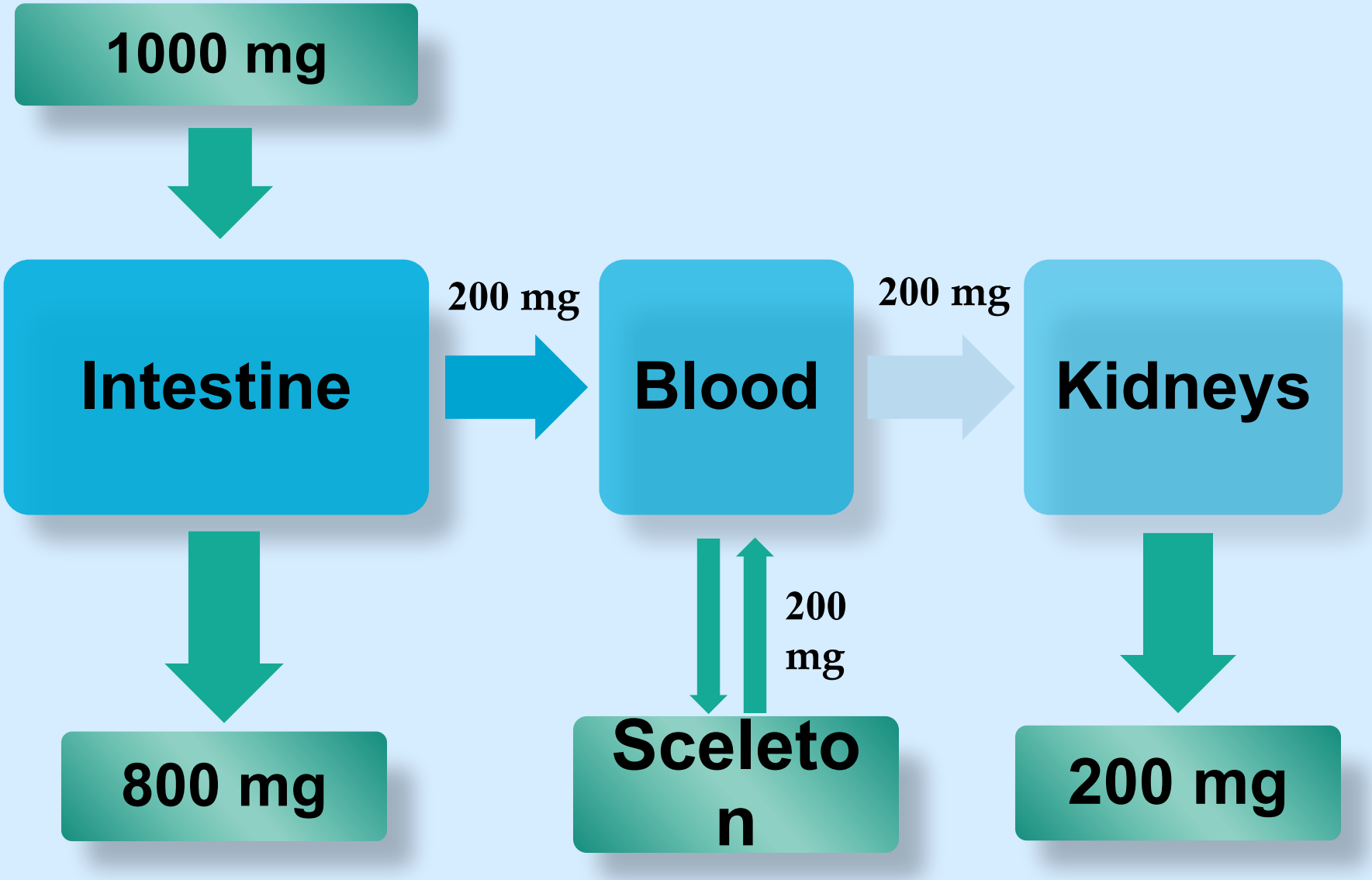


Cushing's disease

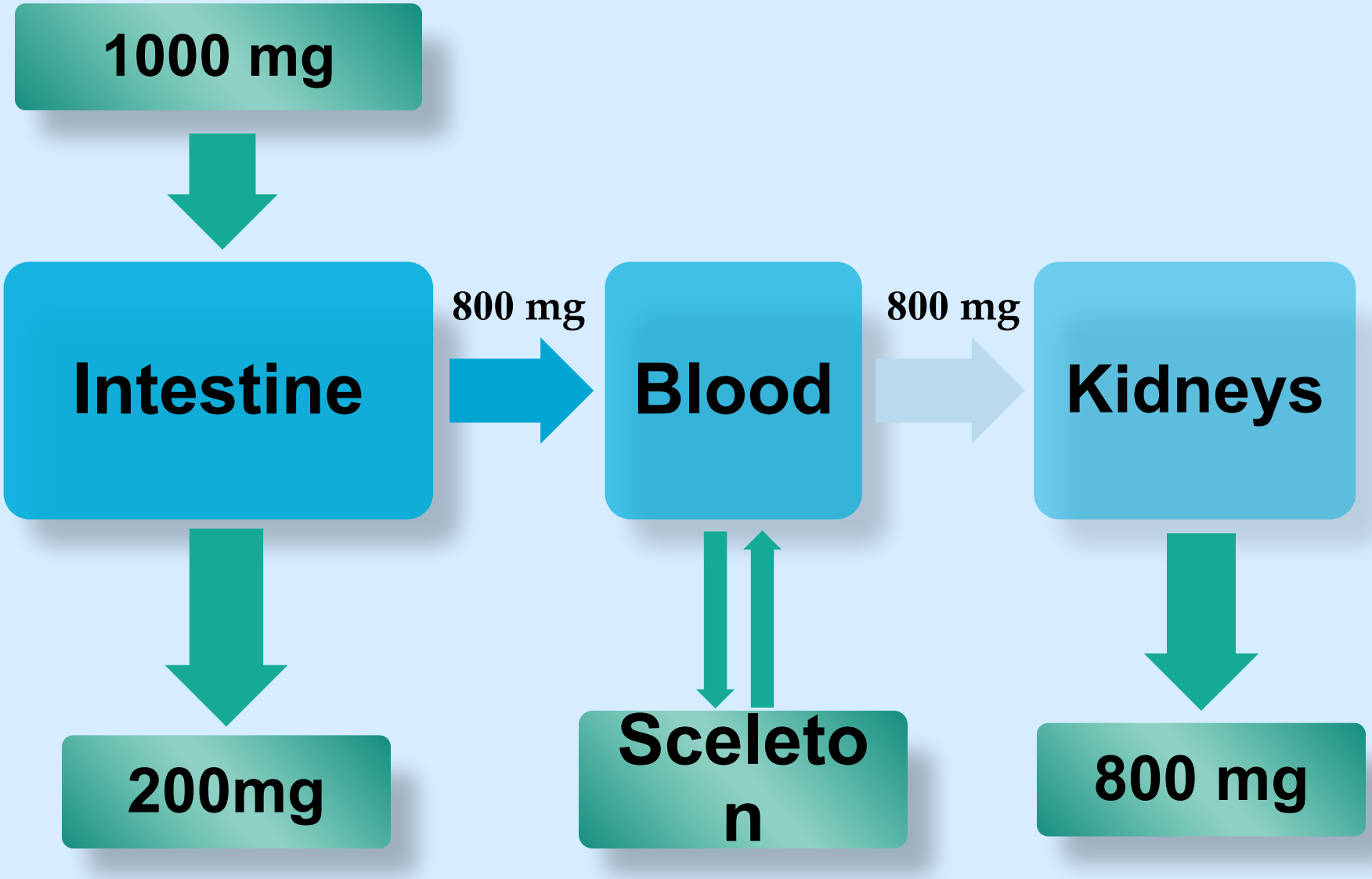


REGULATION OF PHOSPHORUS AND CALCIUM METABOLISM

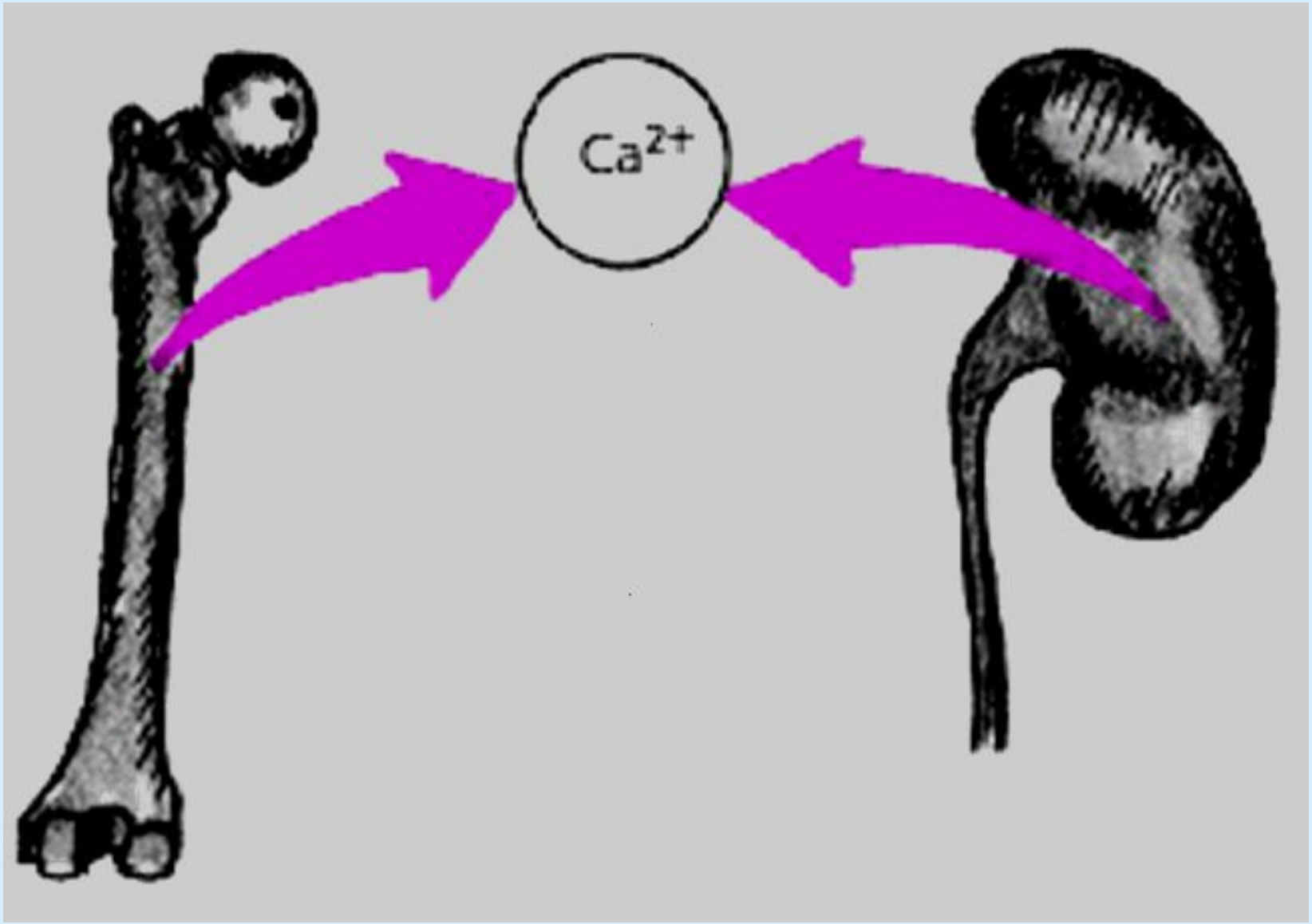
Calcium metabolism



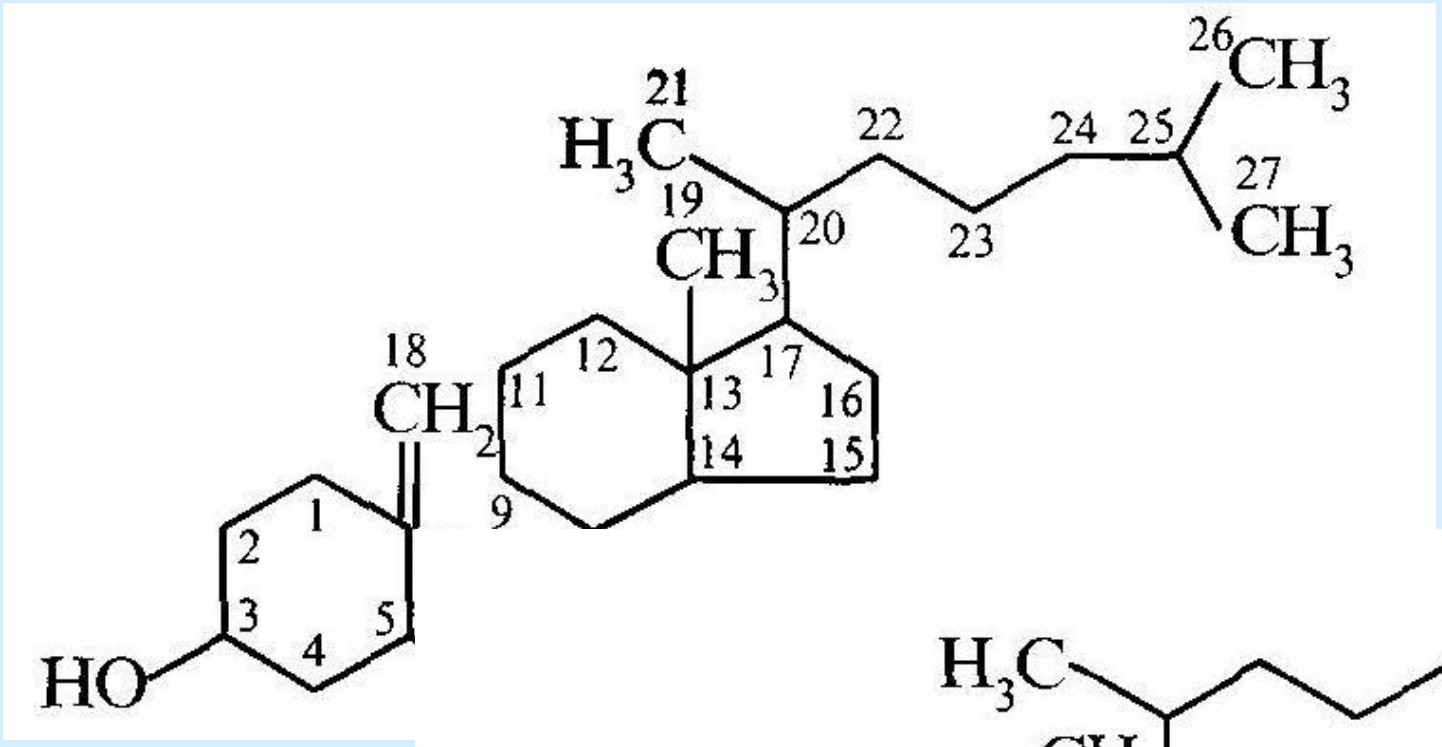
Phosphorus metabolism

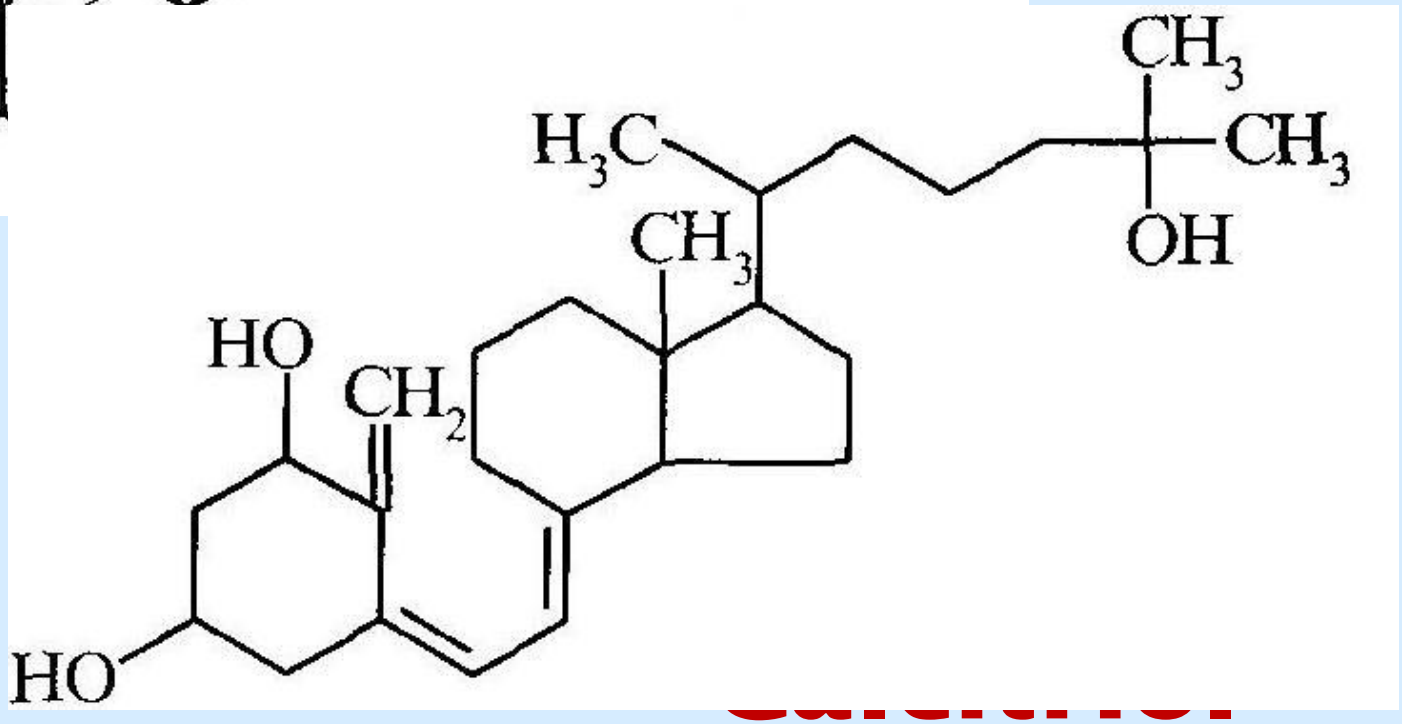


Parathyroid hormone

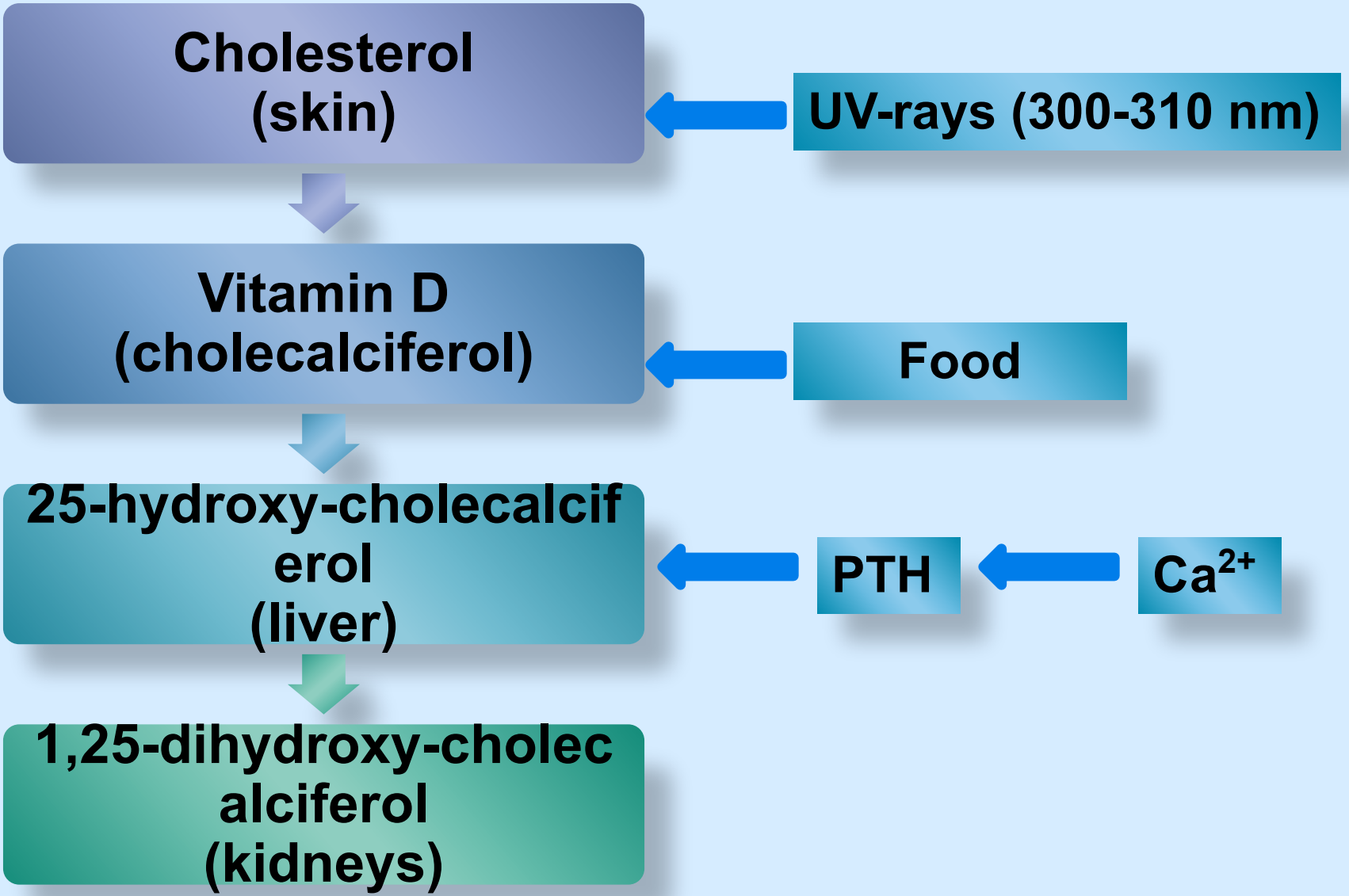


Vitamin

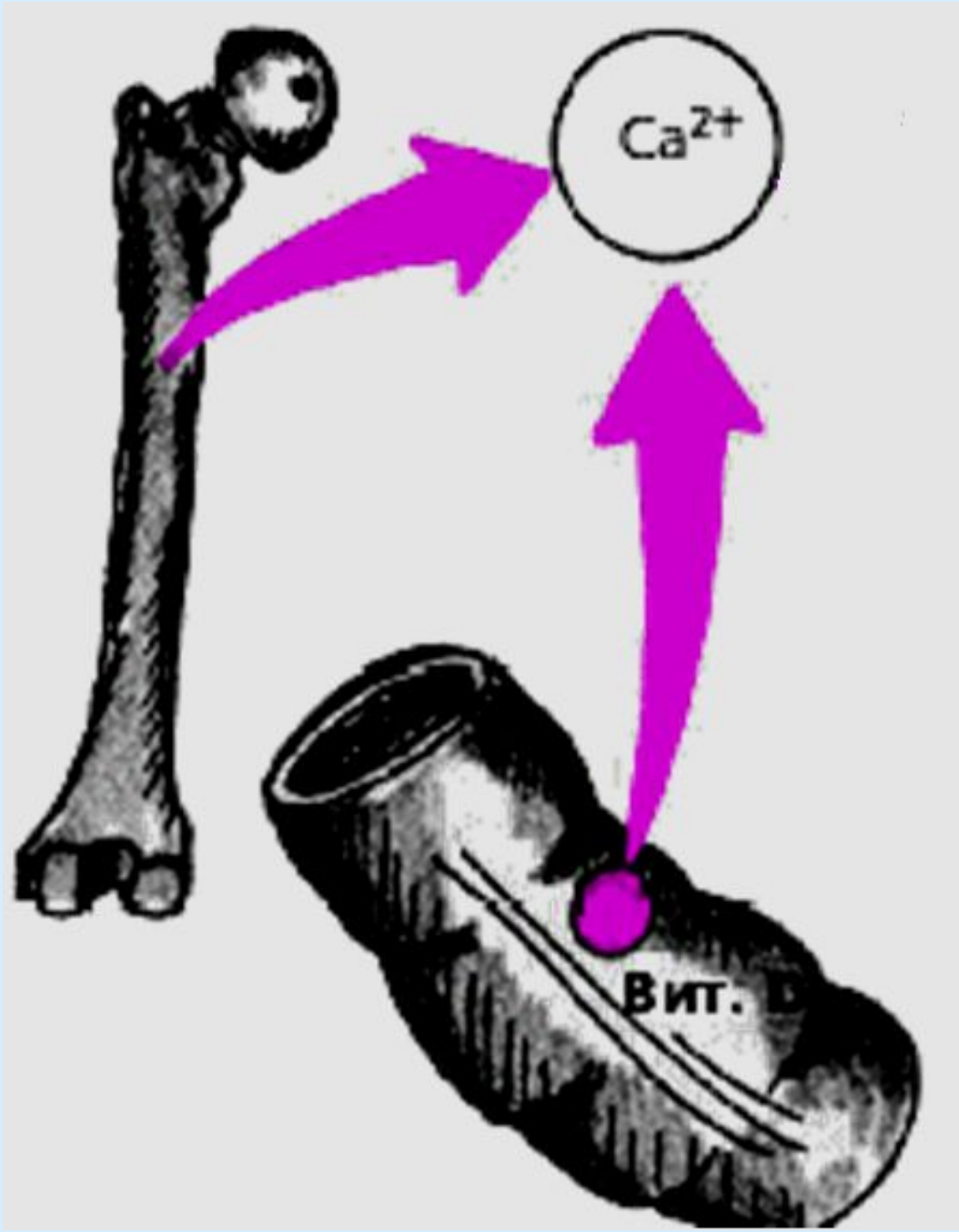

HO
CH2
18
1
2
3
4
5
9
11
12
13
14
15
16
17
20
21
H3C
19
CH3
22
23
24
25
26
CH3
27
CH3


HO
HO
CH2
H3C
CH3
CH3
CH3
OH

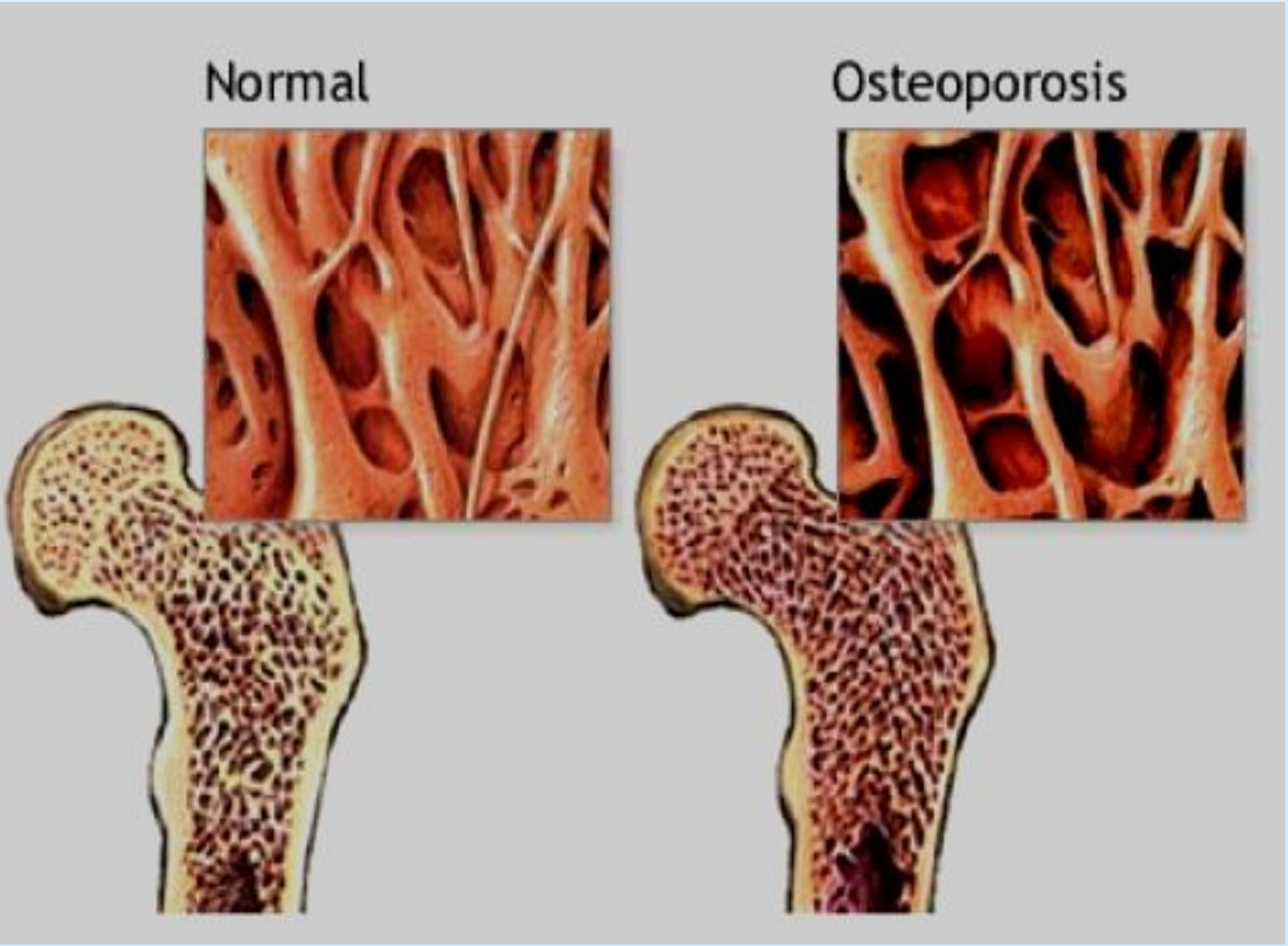
Vitamin D_3 activation



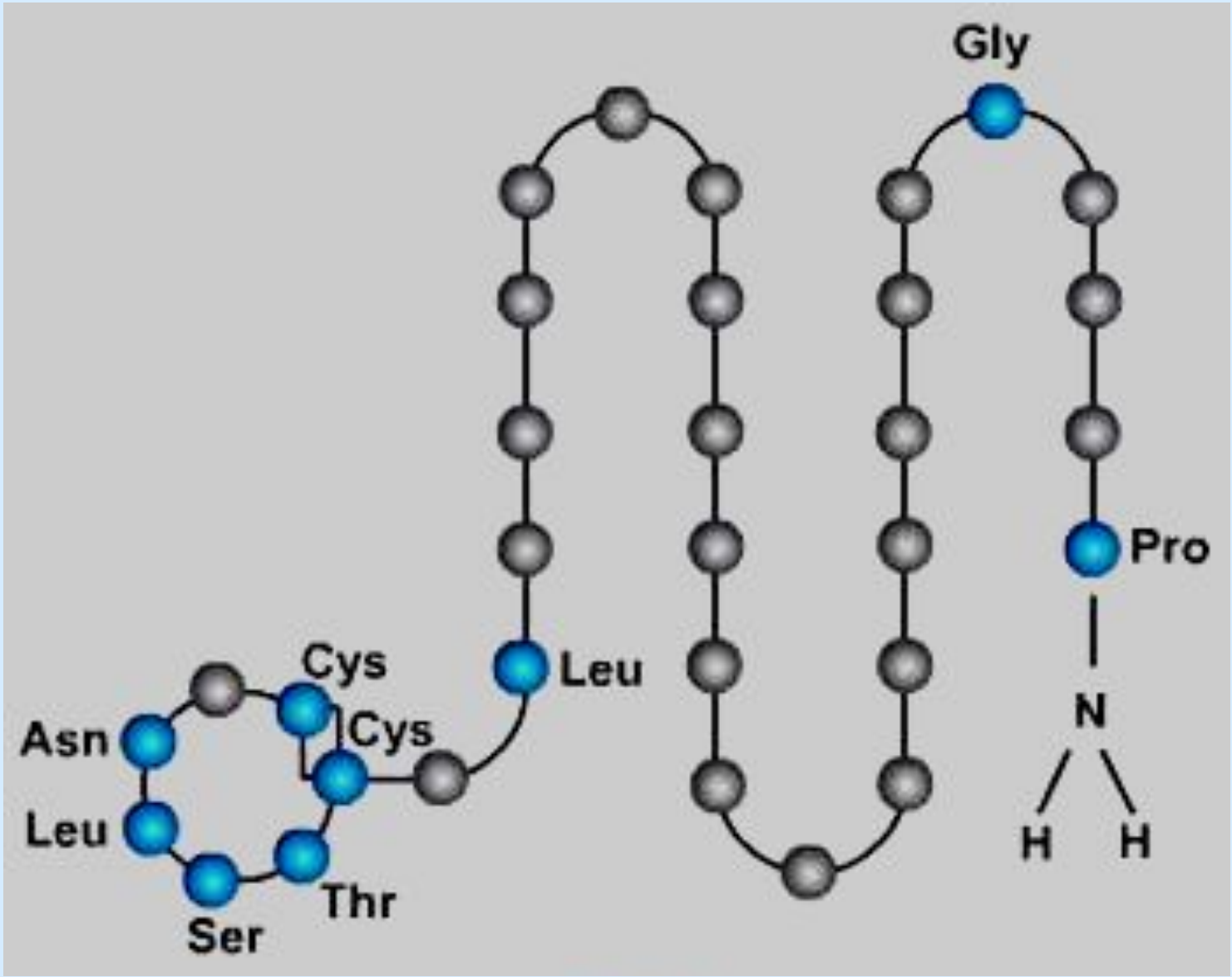
Calcitriol



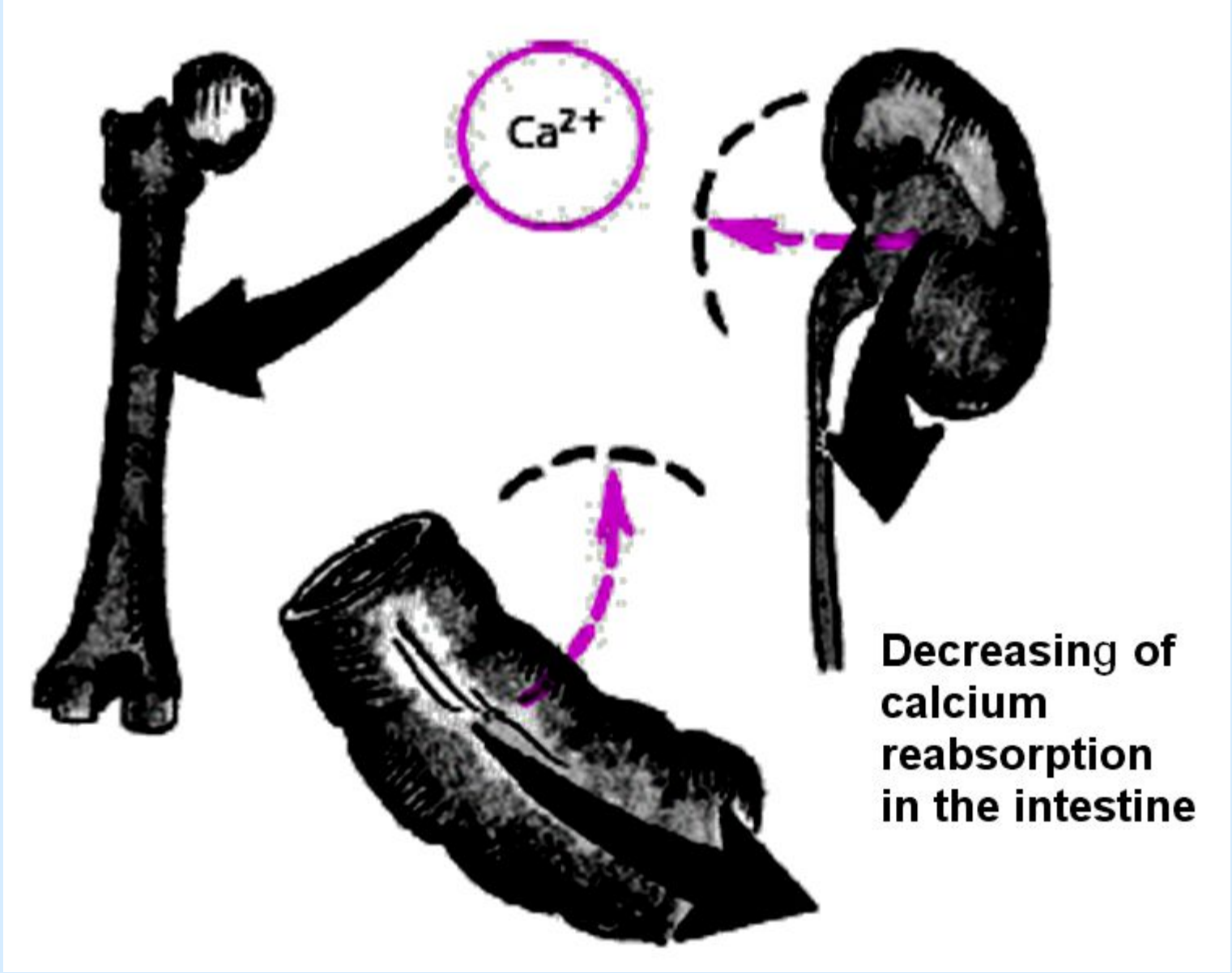
Rickets


Normal
Osteoporosis

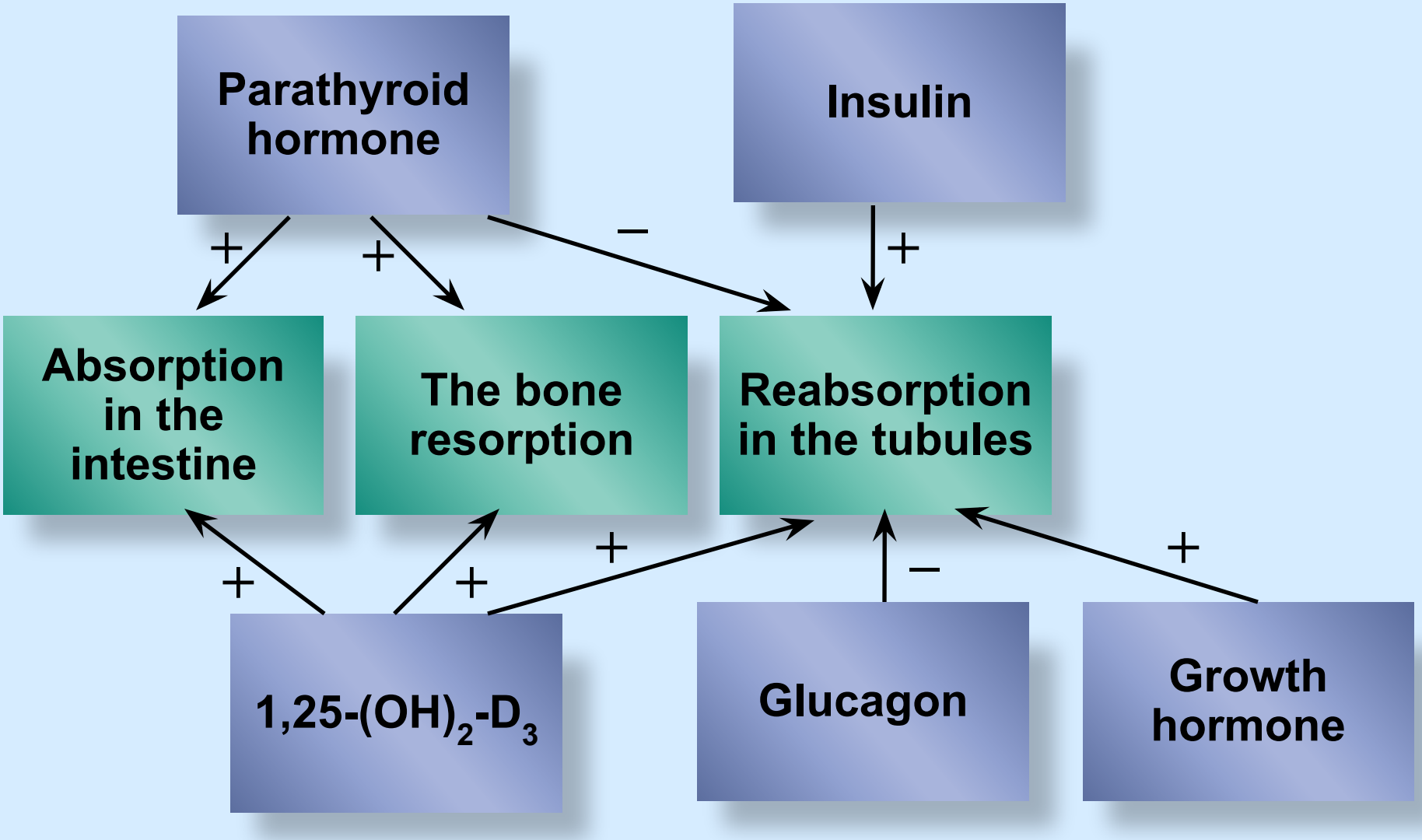
Calcitonin



Calcitonin



Hormonal regulation of phosphates transport

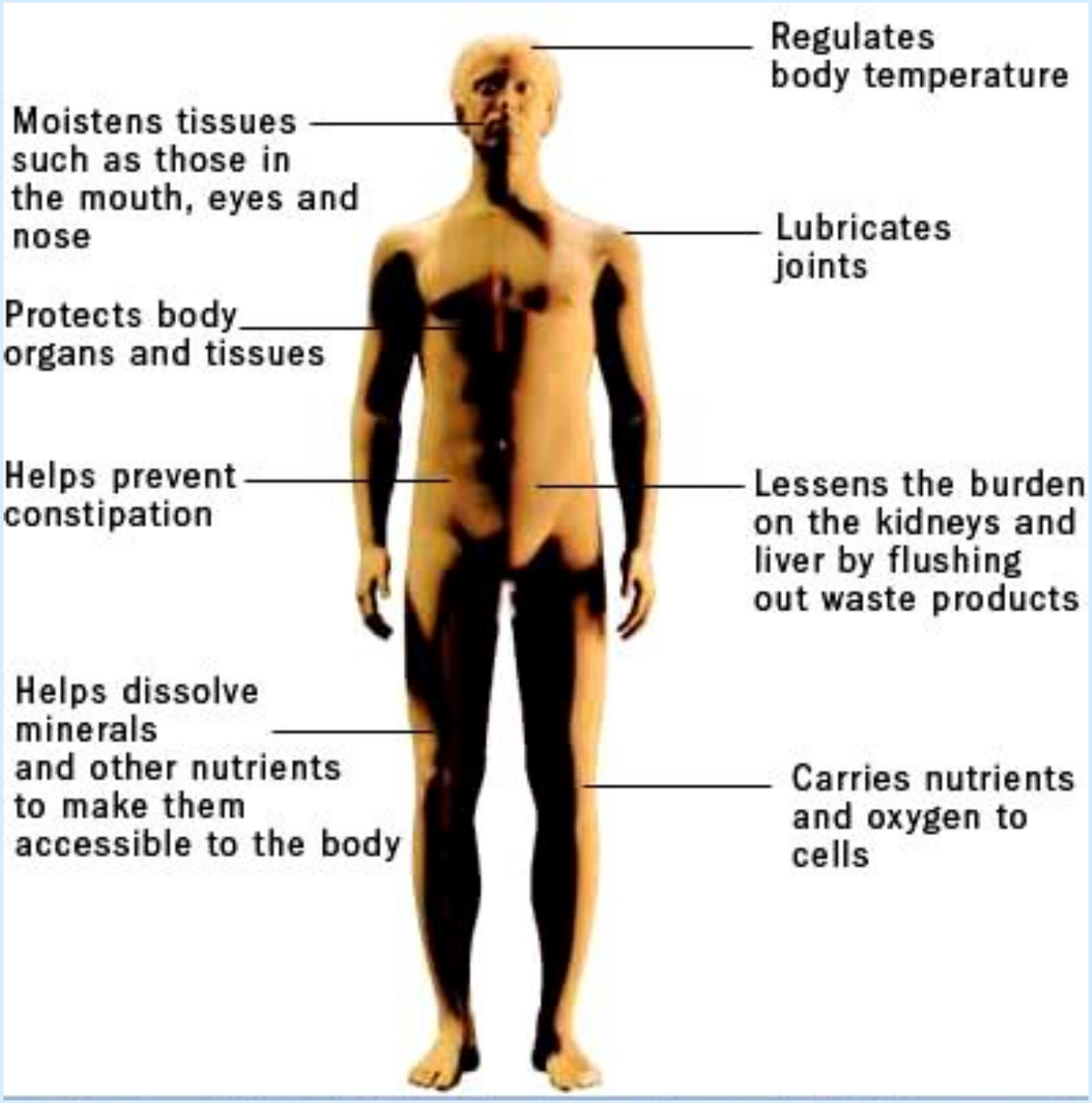


The influence of biologically active substances on the phosphates excretion

Substanse	Phosphates excretion
Glucagon	↓
Glucocorticoids	↓
Thyroxine	↓
Growth hormone	↓
Insulin	↓
Serotonin	↓
Catecholamines	↓

WATER AND SALT METABOLISM RENAL BIOCHEMISTRY

Water functions



Urinalysis


Urine
0.05% Ammonia
0.18% Sulphate
0.12% Phosphate
0.6% Chloride
0.01% Magnesium
0.015% Calcium
0.6% Potassium
0.1% Sodium
0.1% Creatinine
0.03% Uric acid
2% Urea
95% Water

Specific Gravity Densidad Densidade 60 sec/seg.	1.000	1.005	1.010	1.015	1.020	1.025	1.030	
pH 60 sec/seg.	5.0	6.0	6.5	7.0	8.0	9.0		
Leukocytes Leucocitos 60–120 sec/seg.	neg.	ca. 15	ca. 75	ca. 125	ca. 500	Leuko/µL		
Blood/Hemoglobin/ Sang(re)(ue)/Hemoglobina 60 sec/seg.	neg.	ca. 5-10	ca. 10	ca. 25	ca. 25	ca. 50	ca. 50	ca. 250 Ery/µL
Nitrite/Nitrito/Nitritos 60 sec/seg.	neg.	+	++					
Ketones/ C.Cetónicos 60 sec/seg.	neg.	5 (0.5)	15 (1.5)	50 (5)	150 (15)	mg/dL (mmoL/L)		
Bilirubin/Bilirrubina/ 60 sec/seg.	neg.	+	++	+++				
Urobilinogen(o)/ Urobilinogênio 60 sec/seg.	normal	1 (17)	4 (70)	8 (140)	12 (200)	mg/dL (µmol/L)		
Protein/Proteinas/ Proteínas 60 sec/seg.	neg.	15 (0.15)	30 (0.3)	100 (1)	300 (3)	1000 (10)	mg/dL (g/L)	
Glucose/Glucosa/ Glicose 60 sec/seg.	normal	100 (5.5)	300 (17)	1000 (55)	mg/dL (mmol/L)			

IVD

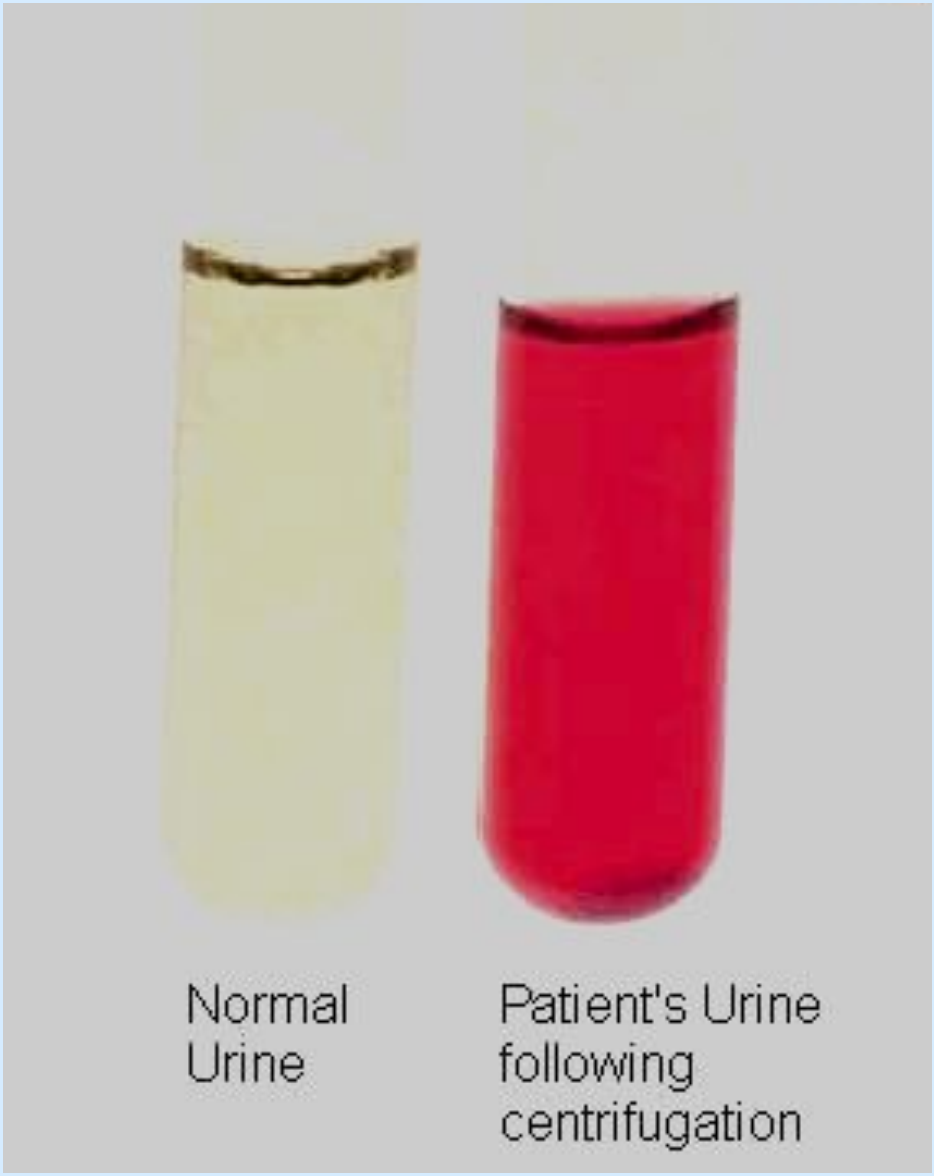
+30°C
+2°C

2011-02

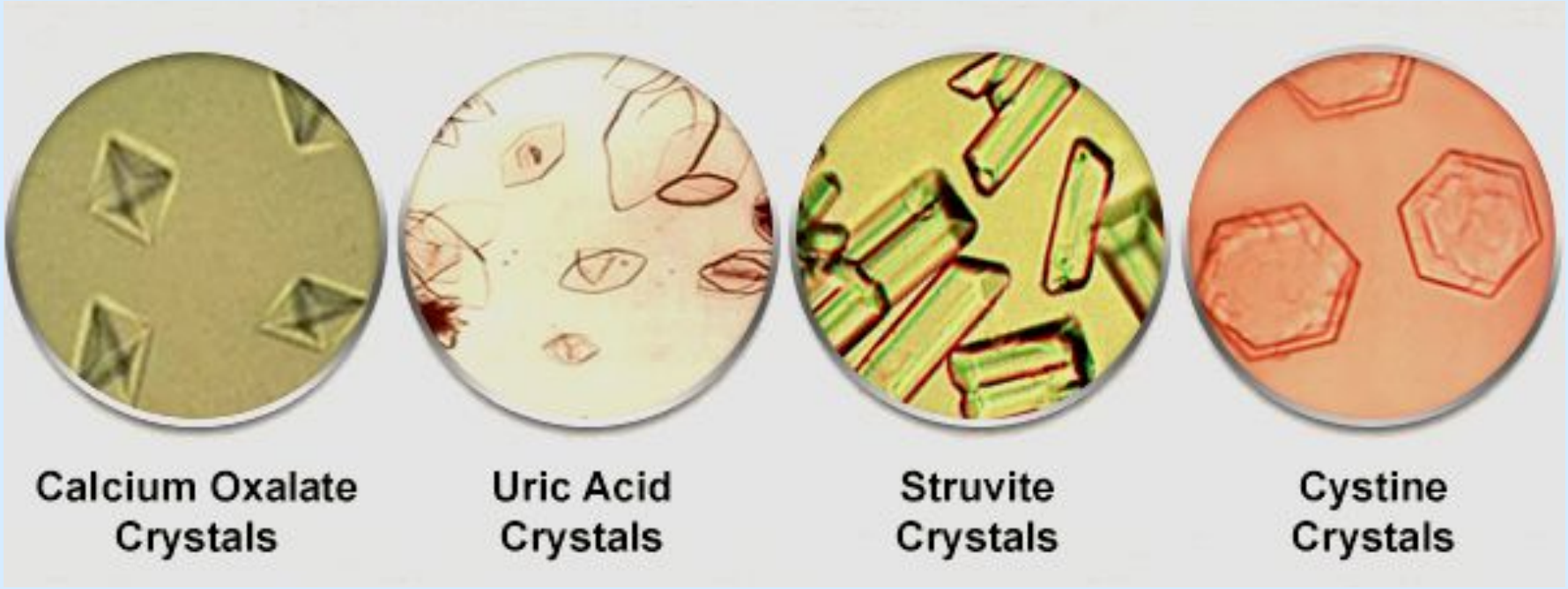
23054941

LOT

Hematuria

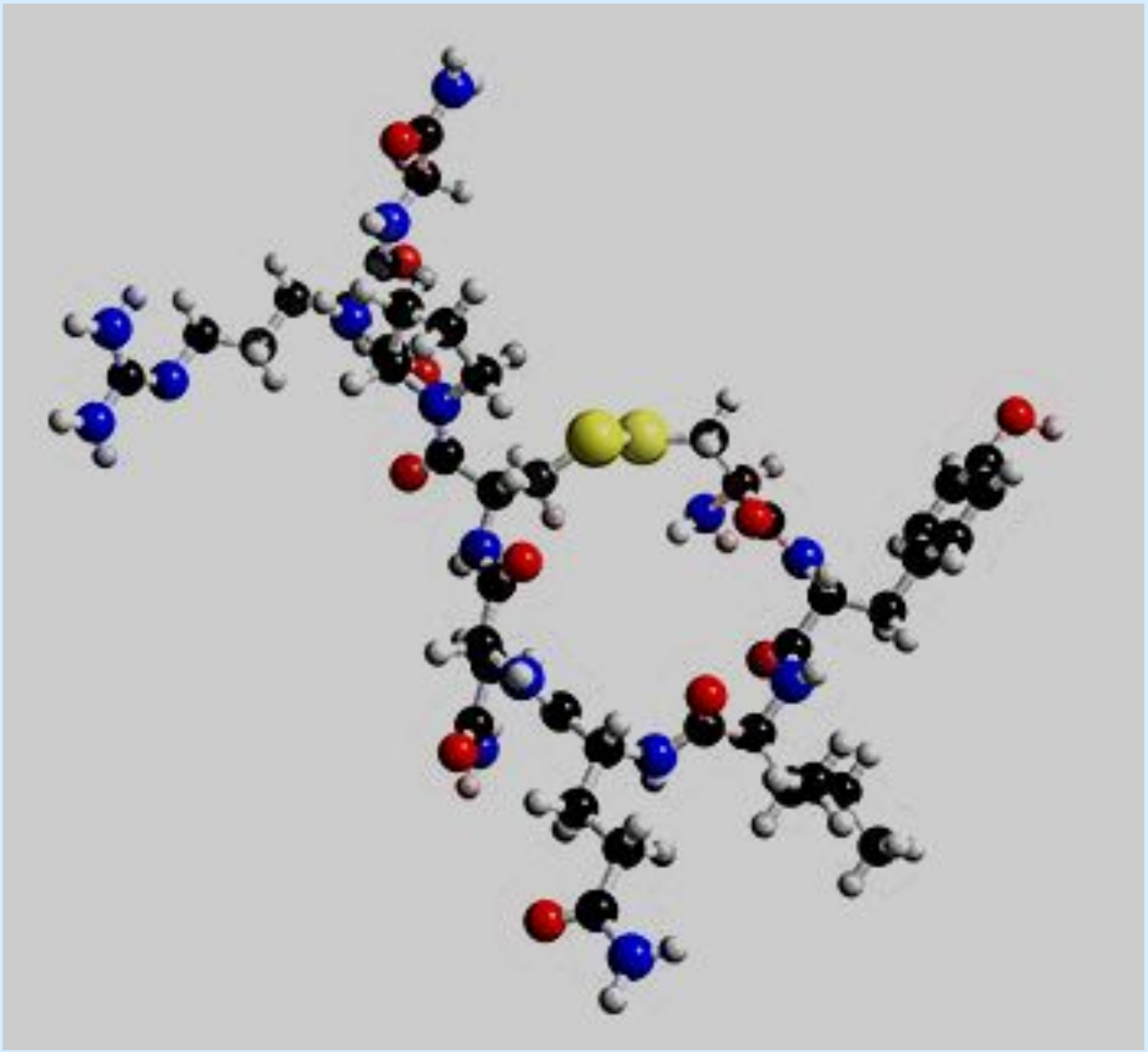


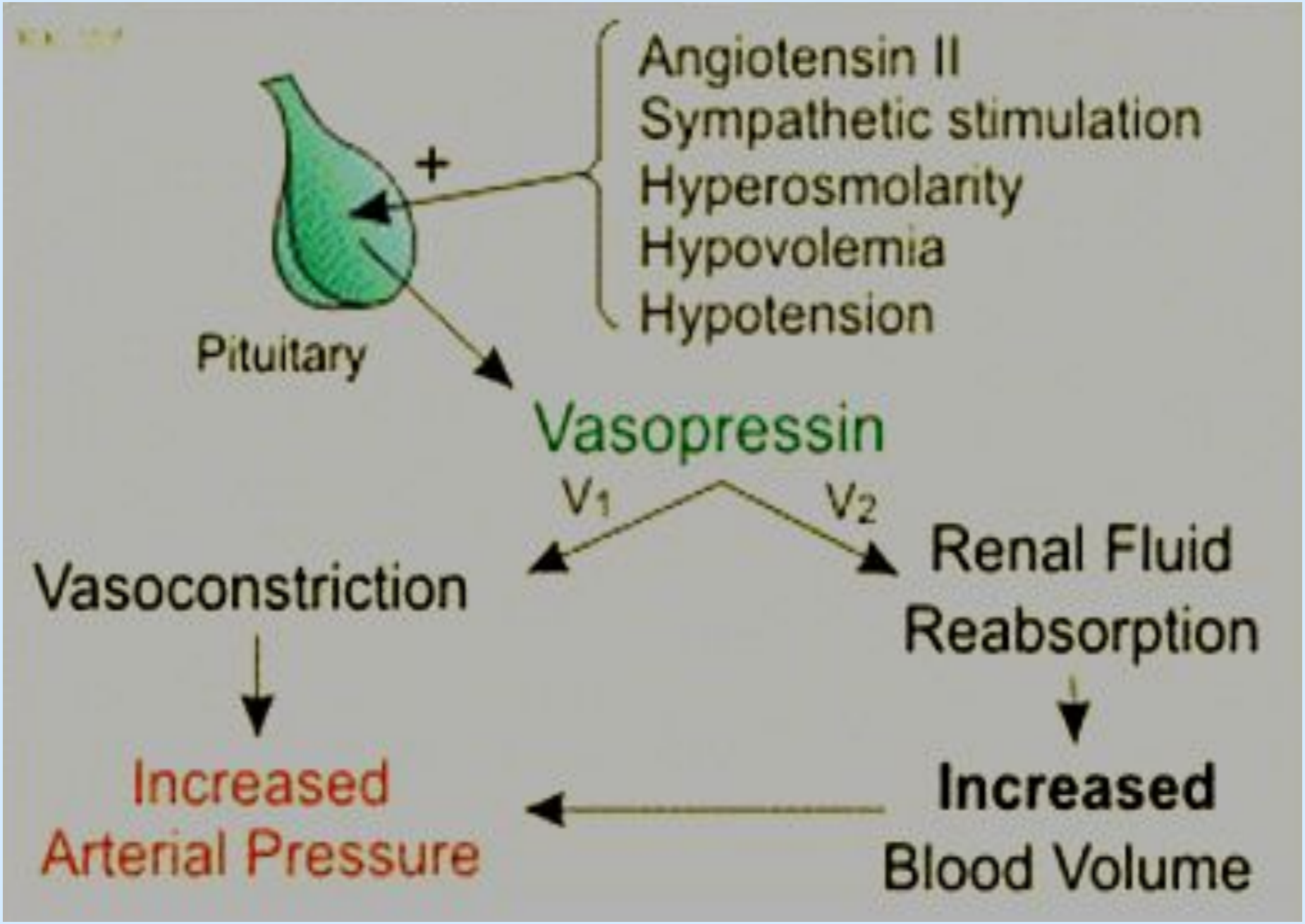
Hemoglobinuria



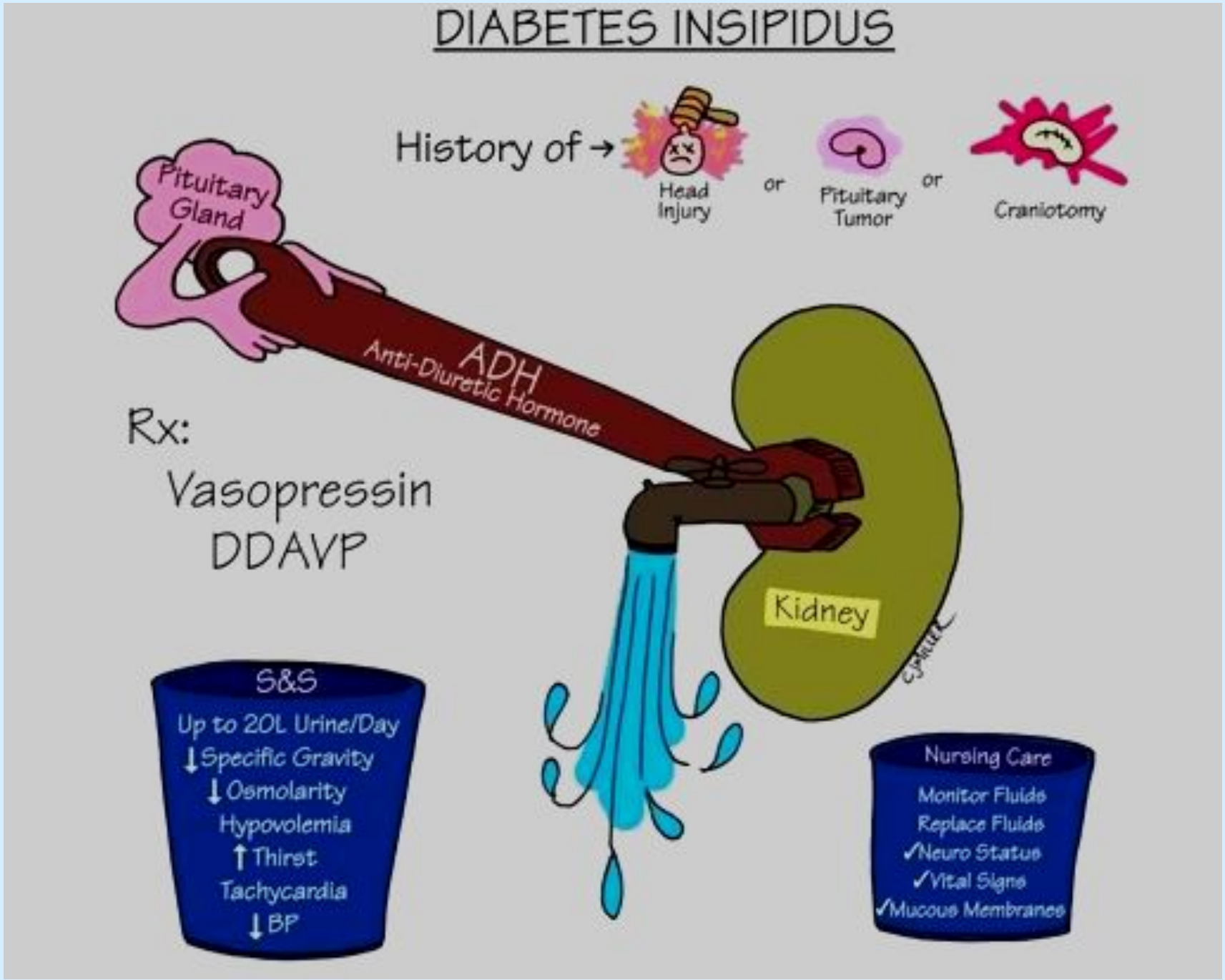
Urinary stones

Vasopressin

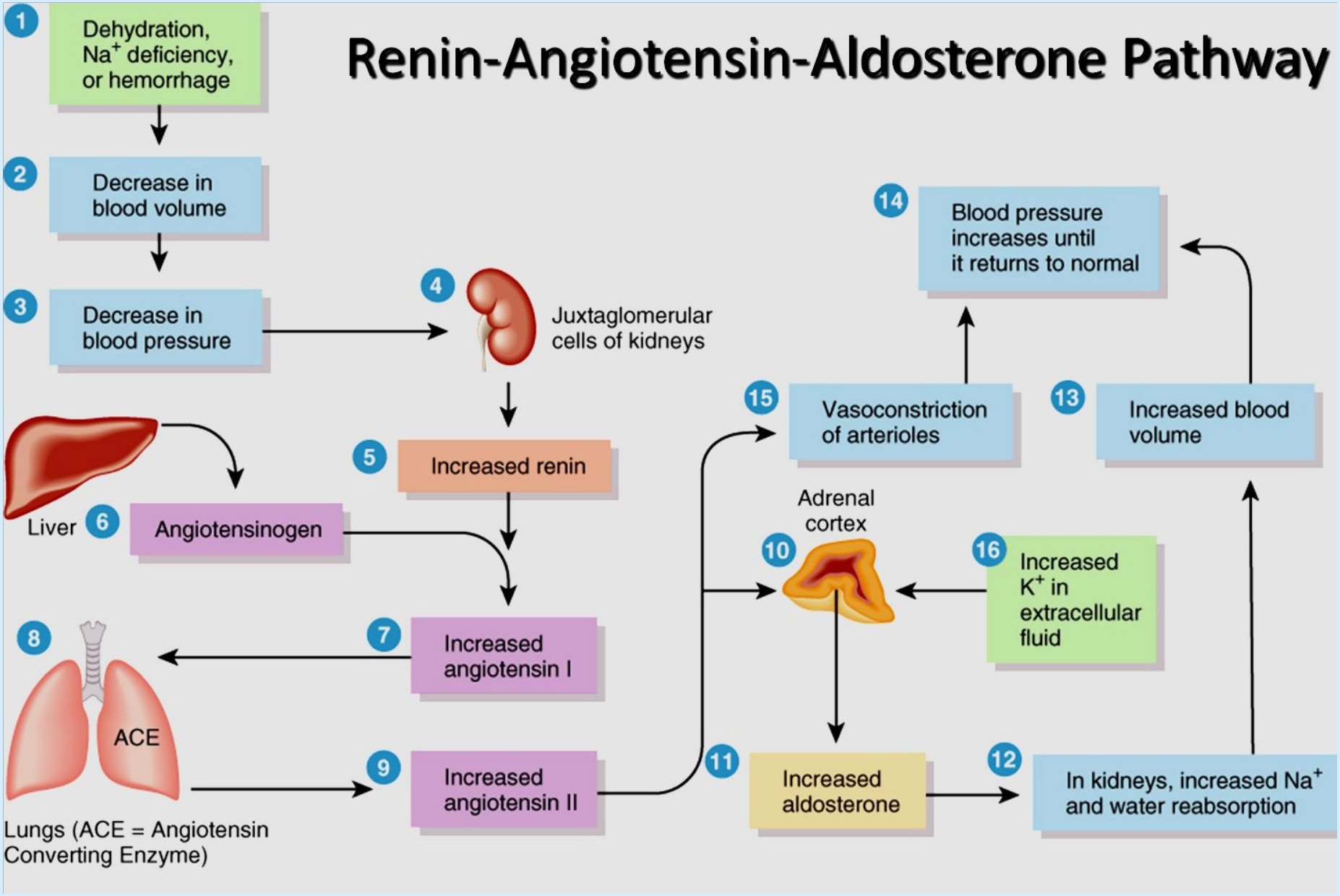



Angiotensin II
Sympathetic stimulation
Hyperosmolarity
Hypovolemia
Hypotension
+
Pituitary
Vasopressin
V1
V2
Vasoconstriction
Renal Fluid
Reabsorption
Increased
Arterial Pressure
Increased
Blood Volume

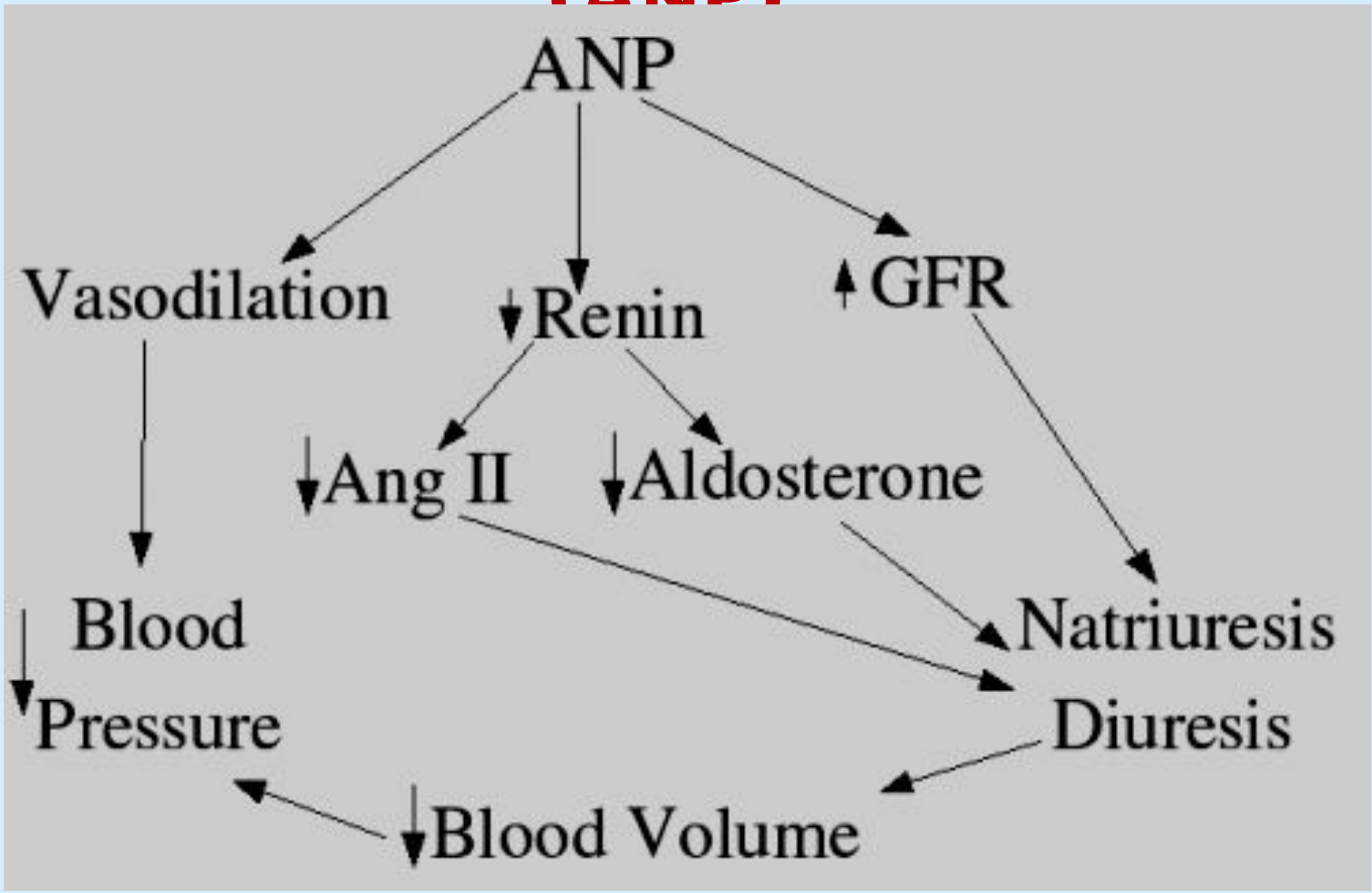
DIABETES INSIPIDUS



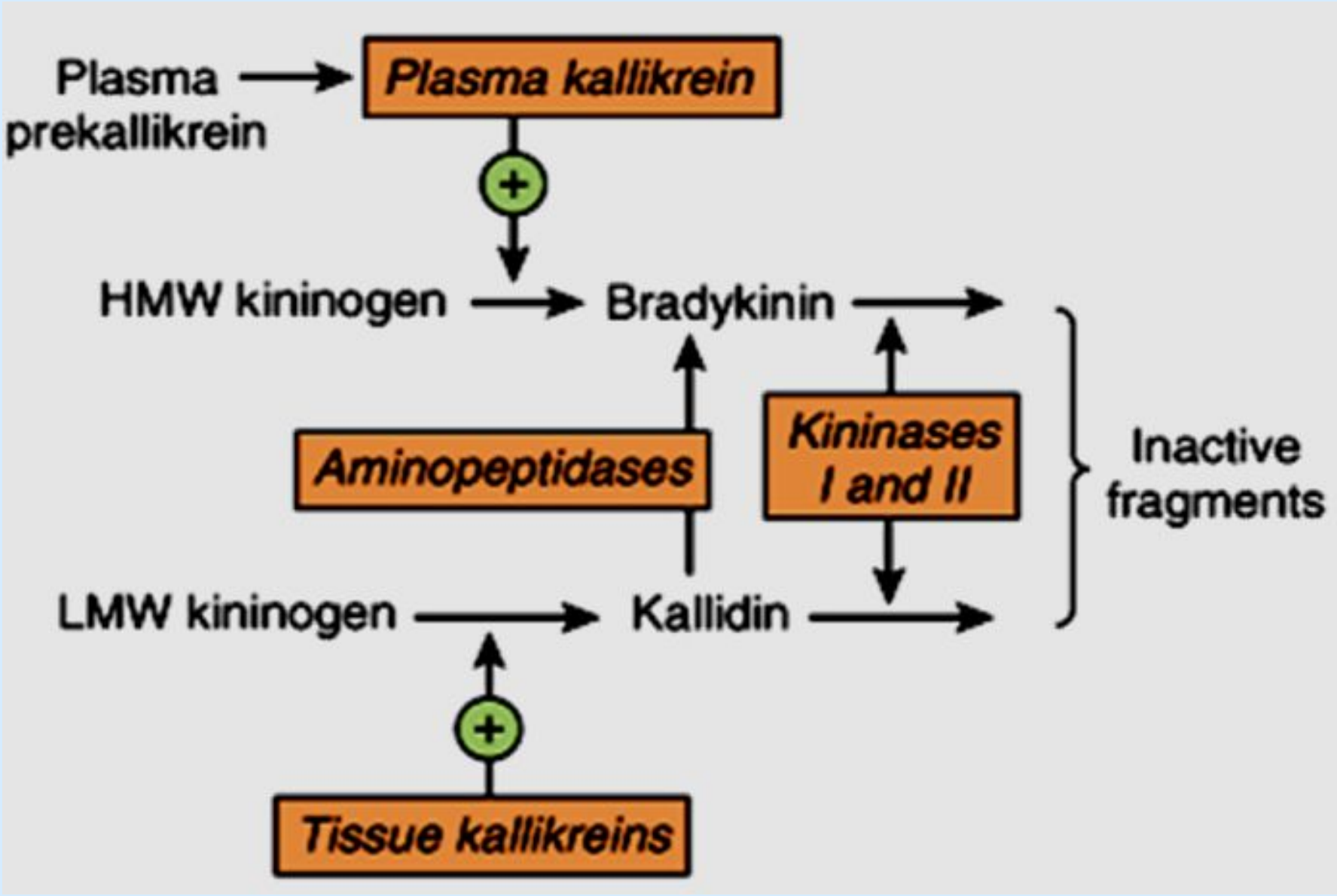
Renin-Angiotensin-Aldosterone Pathway

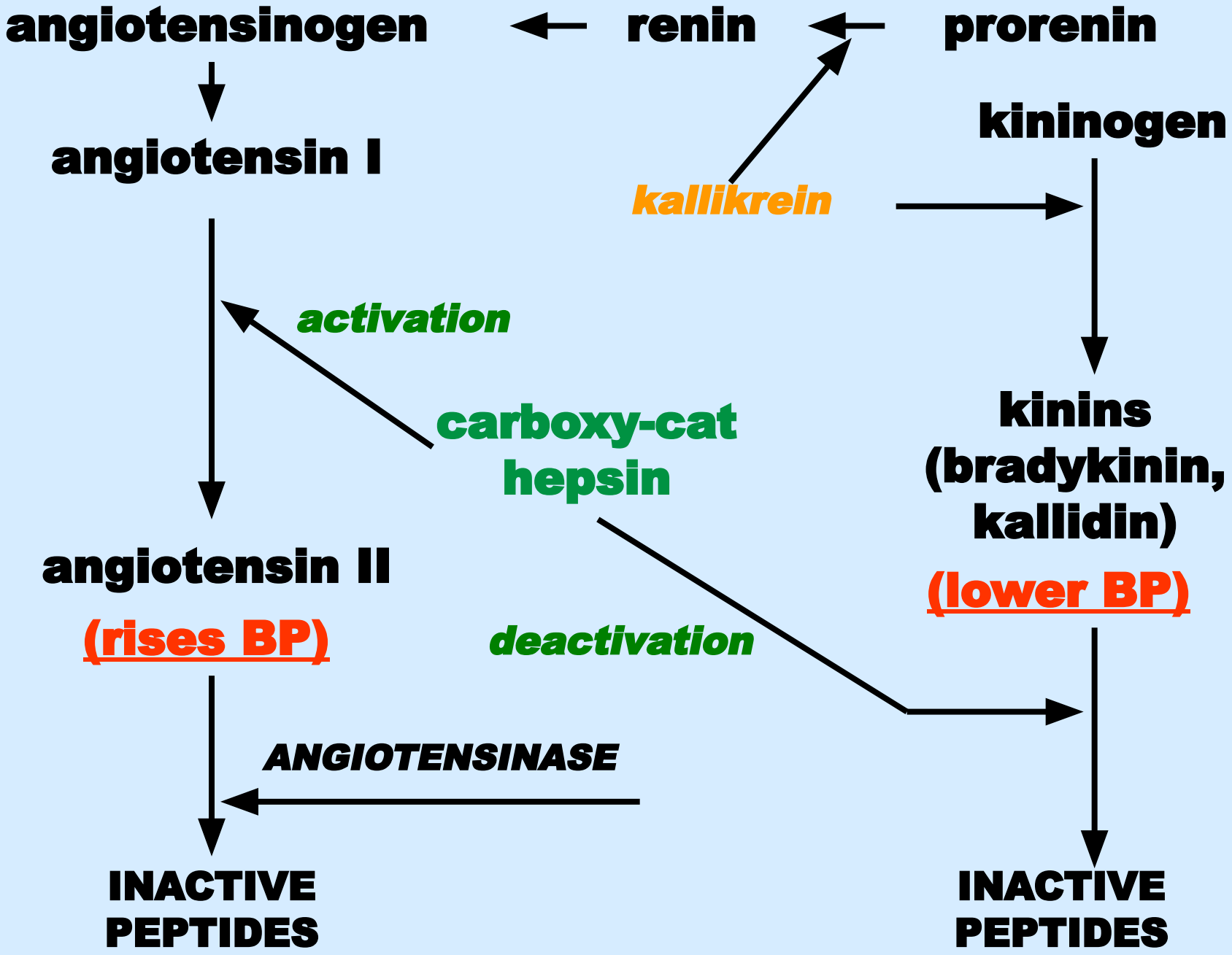


Atrial natriuretic peptide (ANP)



Kallikrein-kinin system




angiotensinogen
renin
prorenin
angiotensin I
kallikrein
kininogen
activation
carboxy-cat
hepsin
kinins
(bradykinin,
kallidin)
angiotensin II
(rises BP)
(lower BP)
deactivation
ANGIOTENSINASE
INACTIVE
PEPTIDES
INACTIVE
PEPTIDES