

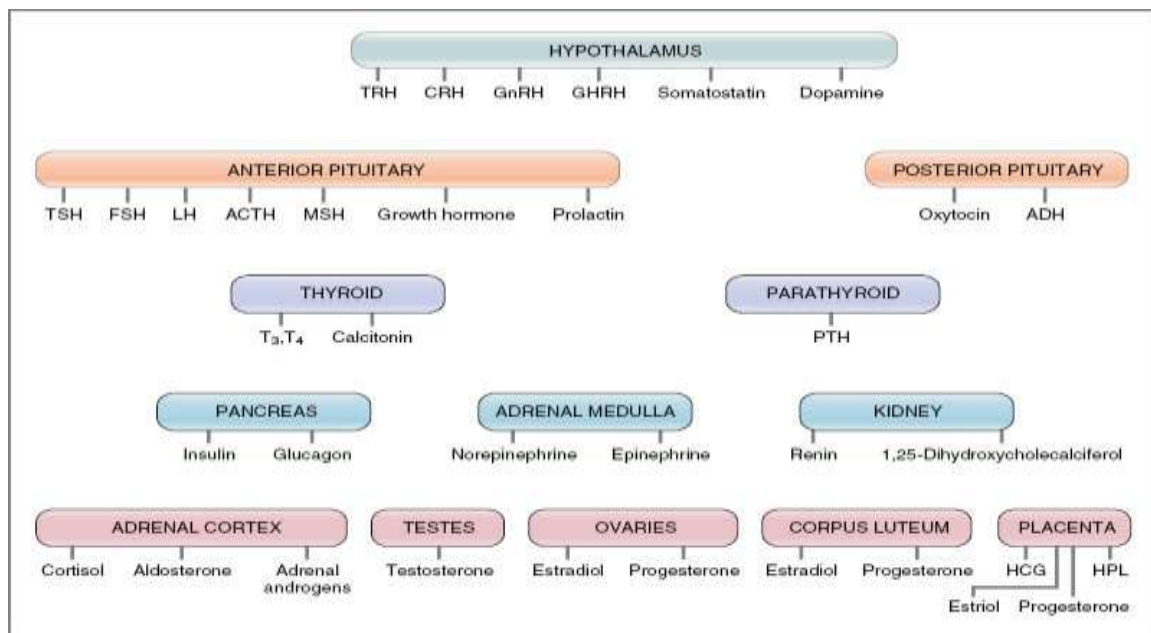
## ENDOCRINE PHYSIOLOGY

DR. ABDULMAJEED AL-DREES

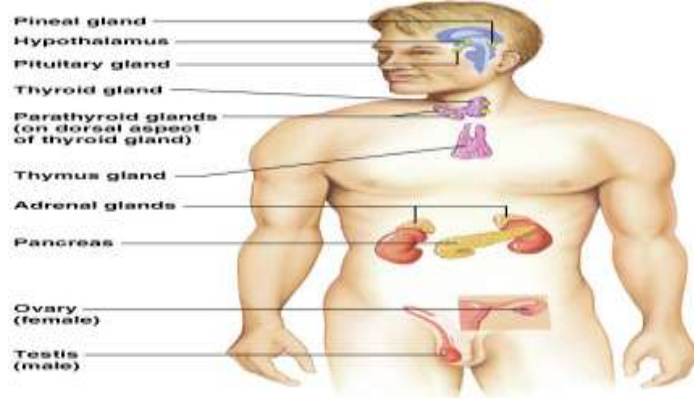
### GLANDS

- Exocrine gland.
- Endocrine gland.

### ENDOCRINE GLANDS



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- **Definition of hormone.**
- **Local secretion.**
- **General secretion.**
- **Target tissue.**
- **What is hormone?.**
- **Chemical substance secreted in a small amount from endocrine gland directly to the blood stream in response to stimulus to cause physiological responses at the target tissues.**

**Table 9-1** Commonly Used Abbreviations in Endocrine Physiology

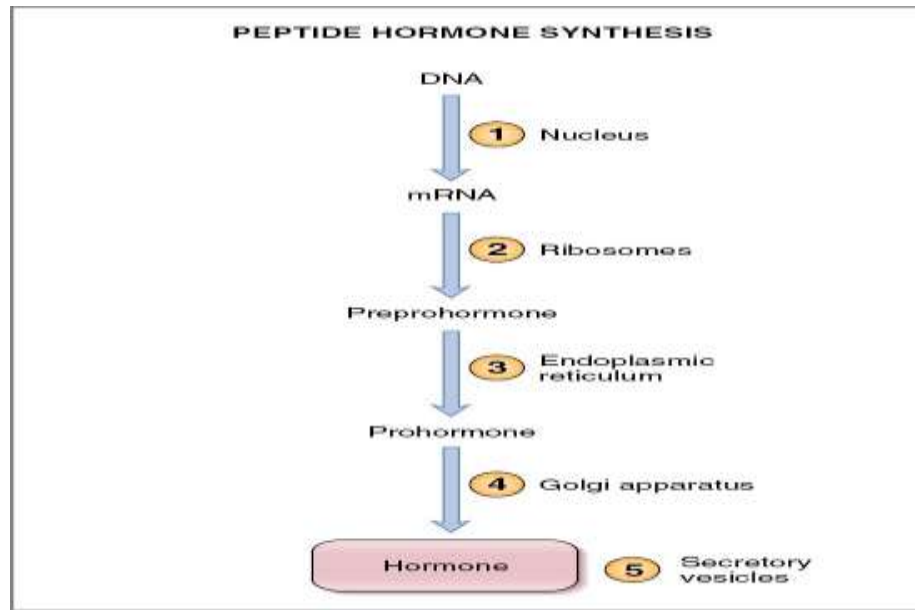
Abbreviation	Hormone	Abbreviation	Hormone
ACTH	Adrenocorticotrophic hormone	LH	Luteinizing hormone
ADH	Antidiuretic hormone	MIT	Monoiodotyrosine
CRH	Corticotropin-releasing hormone	MSH	Melanocyte-stimulating hormone
DHEA	Dehydroepiandrosterone	PIF	Prolactin-inhibiting factor
DIT	Diiodotyrosine	POMC	Pro-opiomelanocortin
DOC	11-Deoxycorticosterone	PTH	Parathyroid hormone
FSH	Follicle-stimulating hormone	PTU	Propylthiouracil
GHRH	Growth hormone-releasing hormone	SRIF	Somatotropin release-inhibiting factor
GnRH	Gonadotropin-releasing hormone	T <sub>3</sub>	Triiodothyronine
HCG	Human chorionic gonadotropin	T <sub>4</sub>	Thyroxine
HGH	Human growth hormone	TBG	Thyroxine-binding globulin
HPL	Human placental lactogen	TRH	Thyrotropin-releasing hormone
IGF	Insulin-like growth factor	TSH	Thyroid-stimulating hormone

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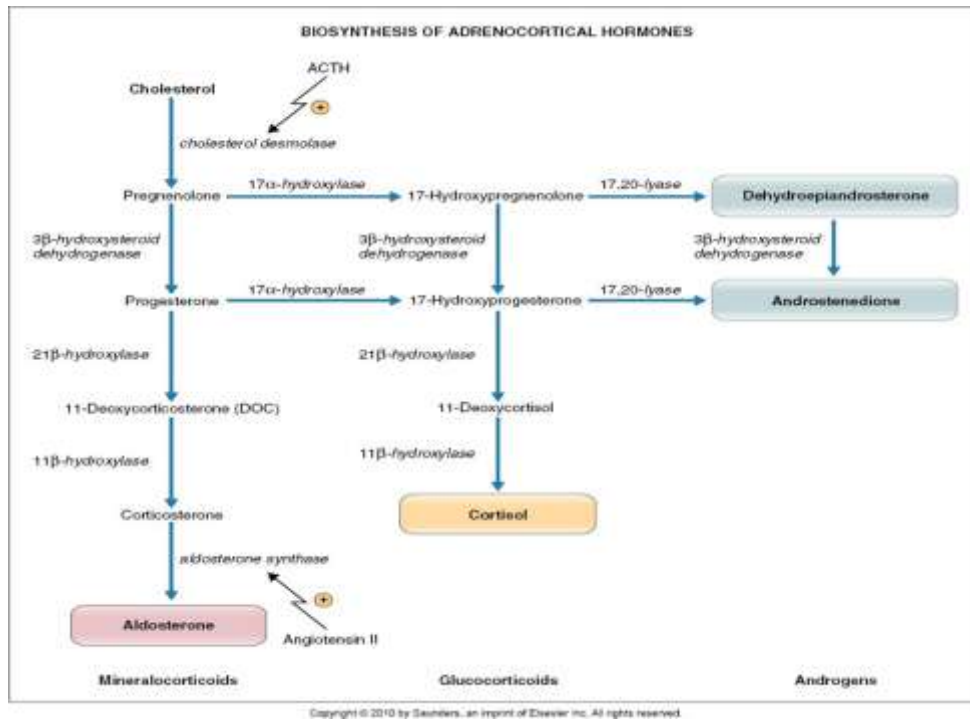
## CHEMICAL CLASSIFICATION OF HORMONES

- **Peptides or proteins hormones.**
- **Steroid hormones.**
- **Amine hormones.**

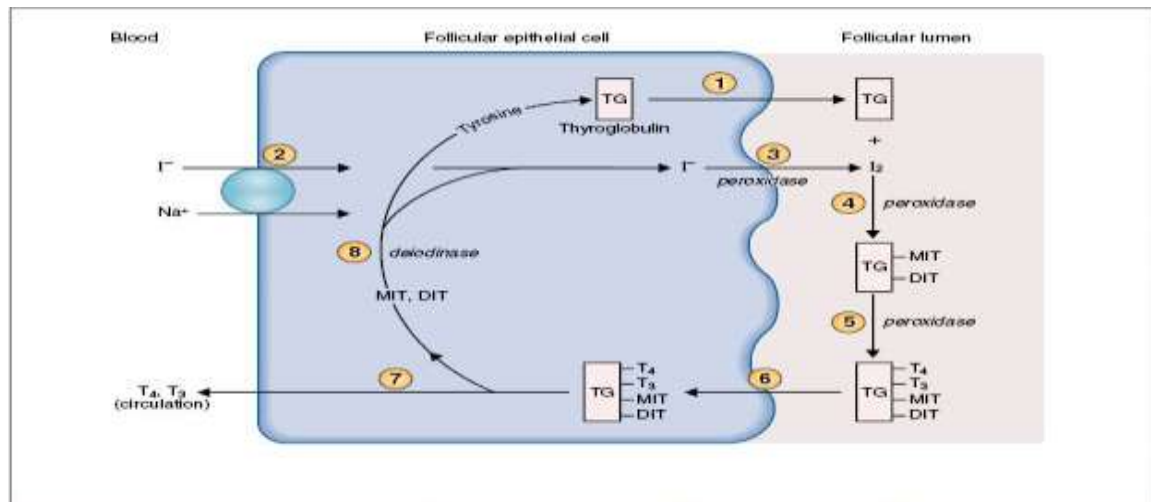
## HORMONES SYNTHESIS



## STERIODS HORMONES

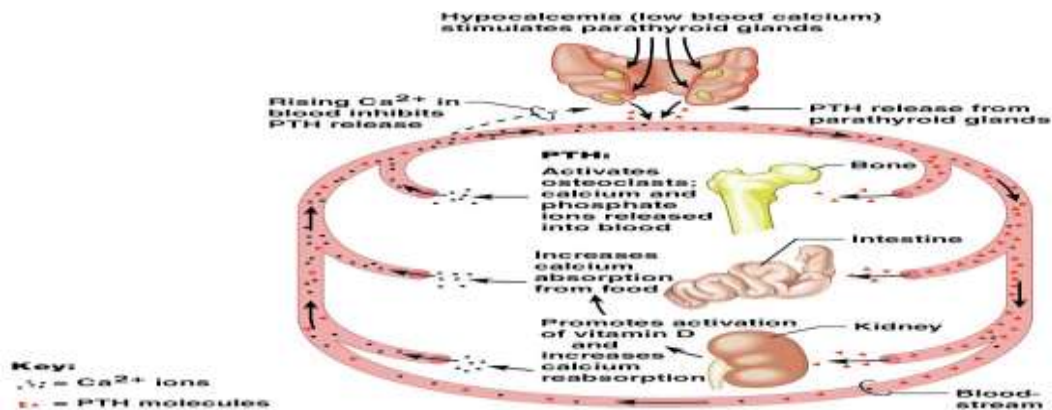
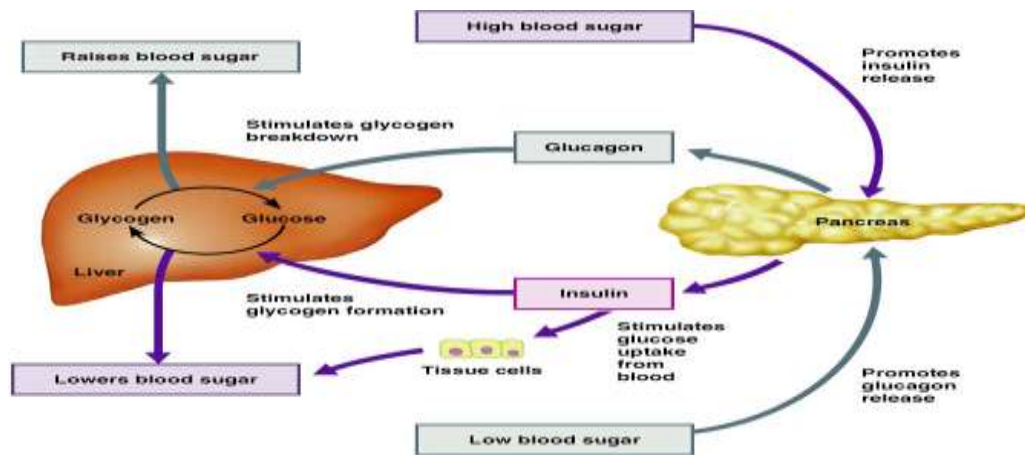


## AMINE HORMONE



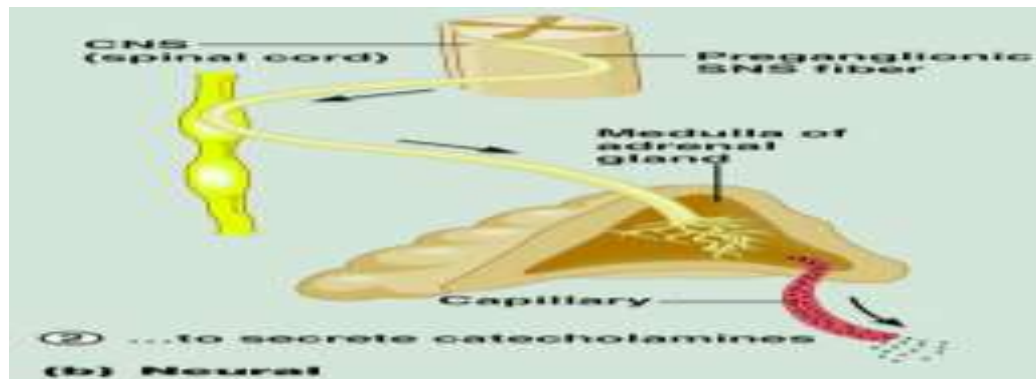
## CLASSIFICATION OF STIMULI:

- Humoral Stimuli.
  - Neural Stimuli.
  - Hormonal Stimuli.
- 
- **Humoral Stimuli:**
  - Secretion of hormones in direct response to changing in blood levels of ions and nutrients

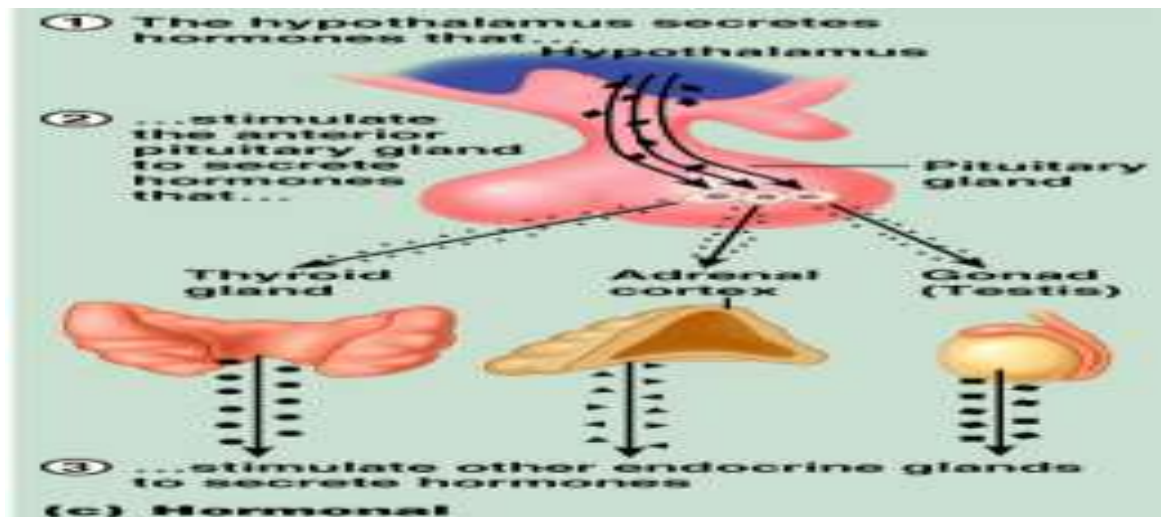


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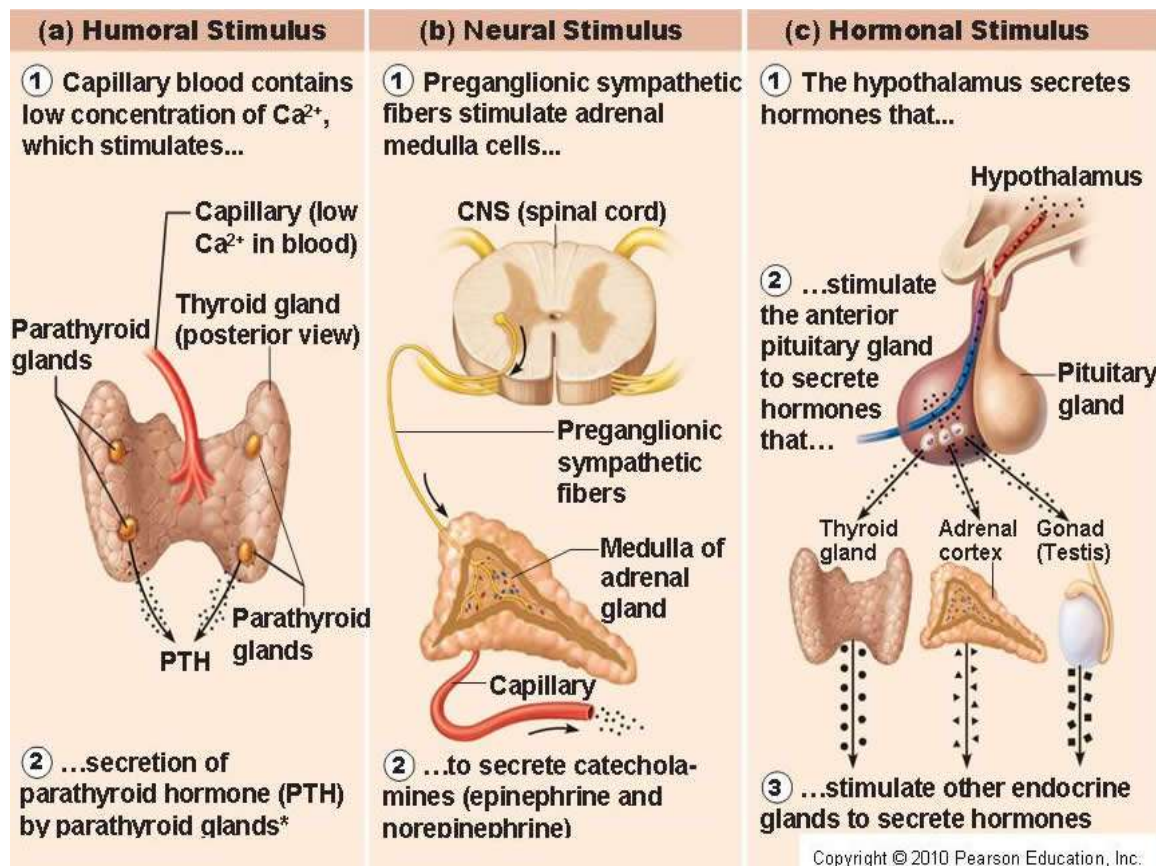
- Neural Stimuli:
- Nerve fibers stimulate hormone release.



- Hormonal Stimuli:
- Release of hormones in response to hormones produced by other endocrine gland.





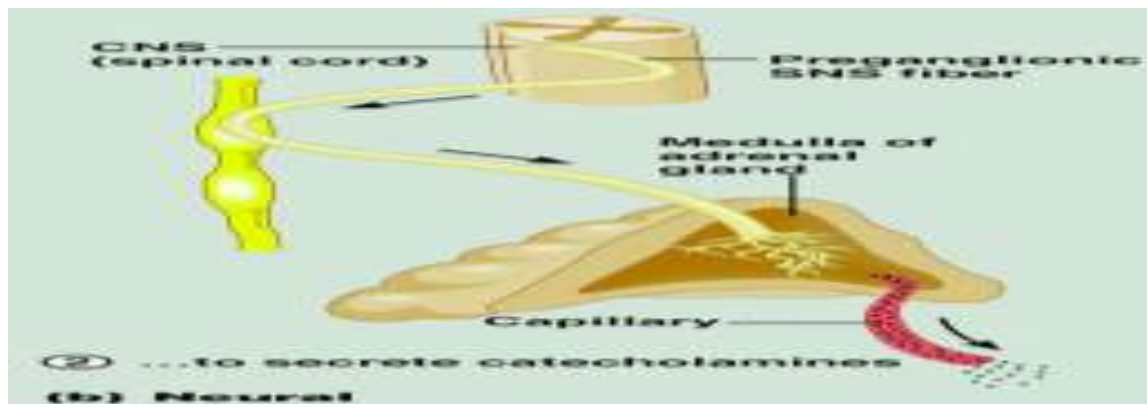


## REGULATION OF HORMONE SECRETION:

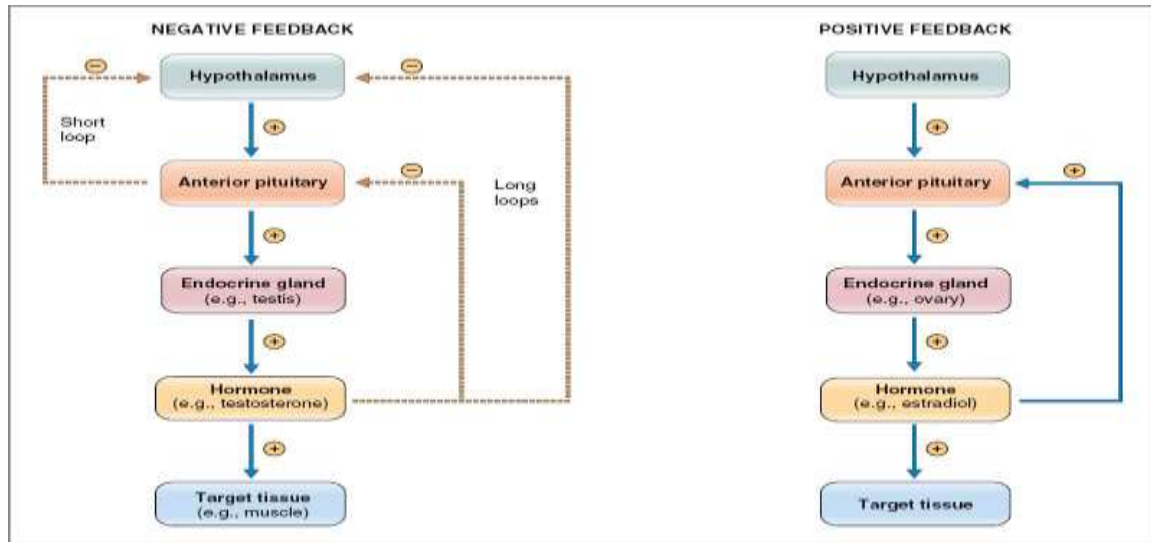
Neural mechanism.

Feedback mechanism.

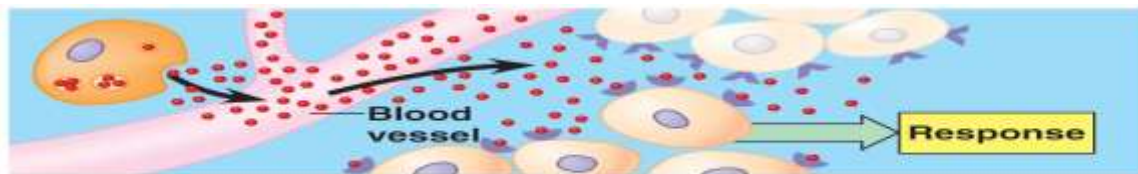
## NEURAL MECHANISM:



## FEEDBACK MECHANISM:

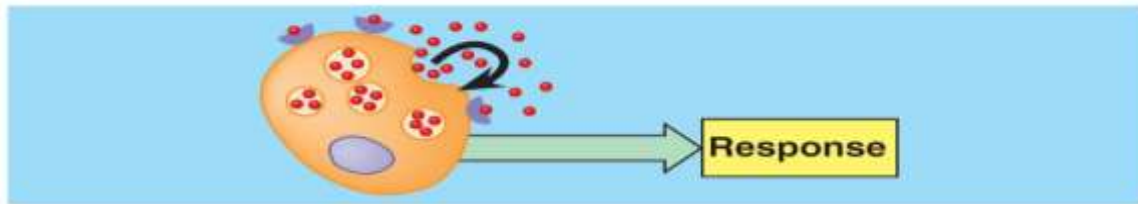


- Autocrines – chemicals that exert their effects on the same cells that secrete them.
- Paracrines – locally acting chemicals that affect cells other than those that secrete them.



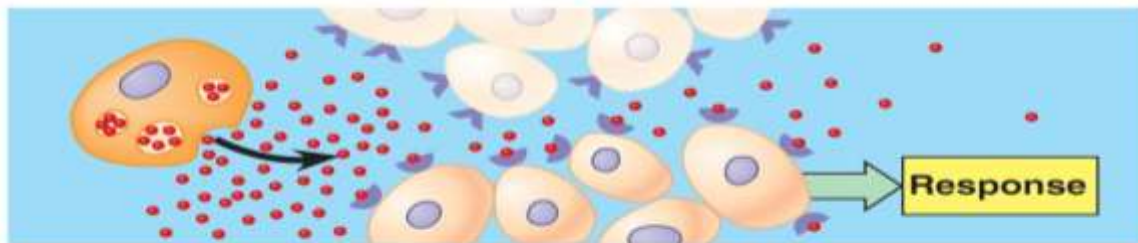
(a) Endocrine signaling





**(c) Autocrine signaling**

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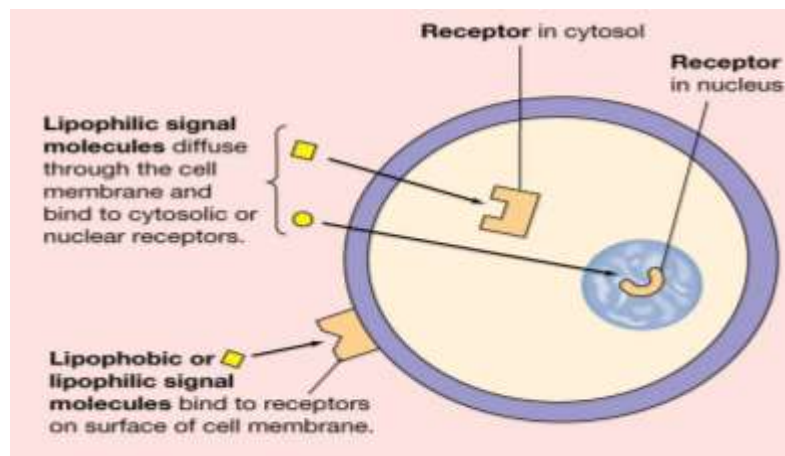


**(b) Paracrine signaling**

**TARGET TISSUE:**

**MECHANISM OF ACTION**

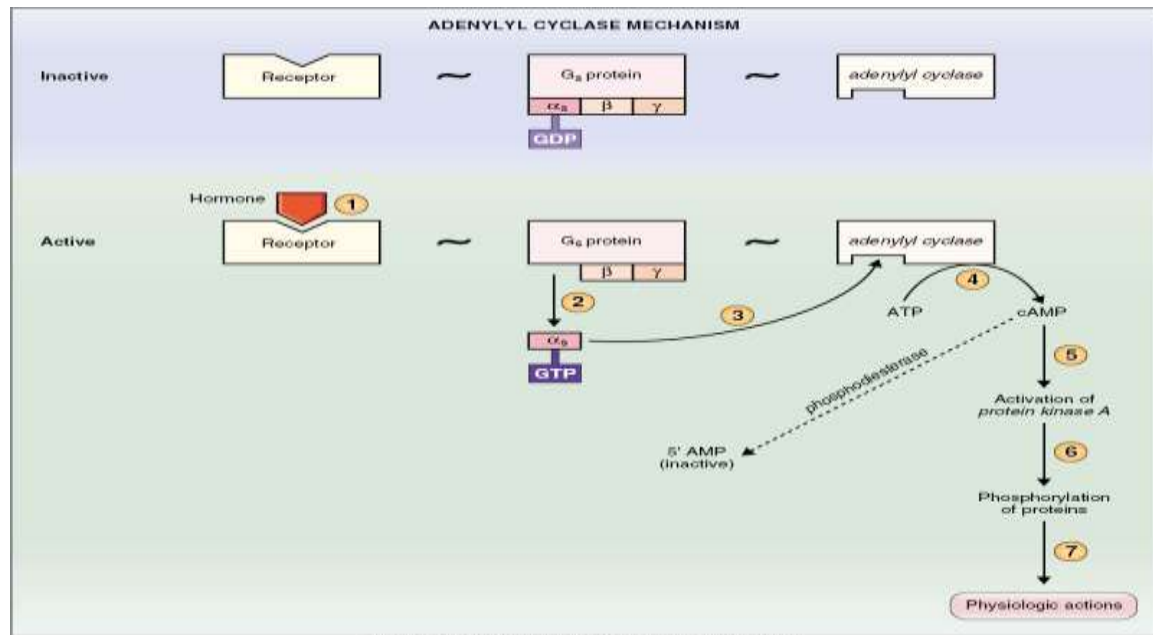
- Receptors + hormone → conformational changes → ?????? → action

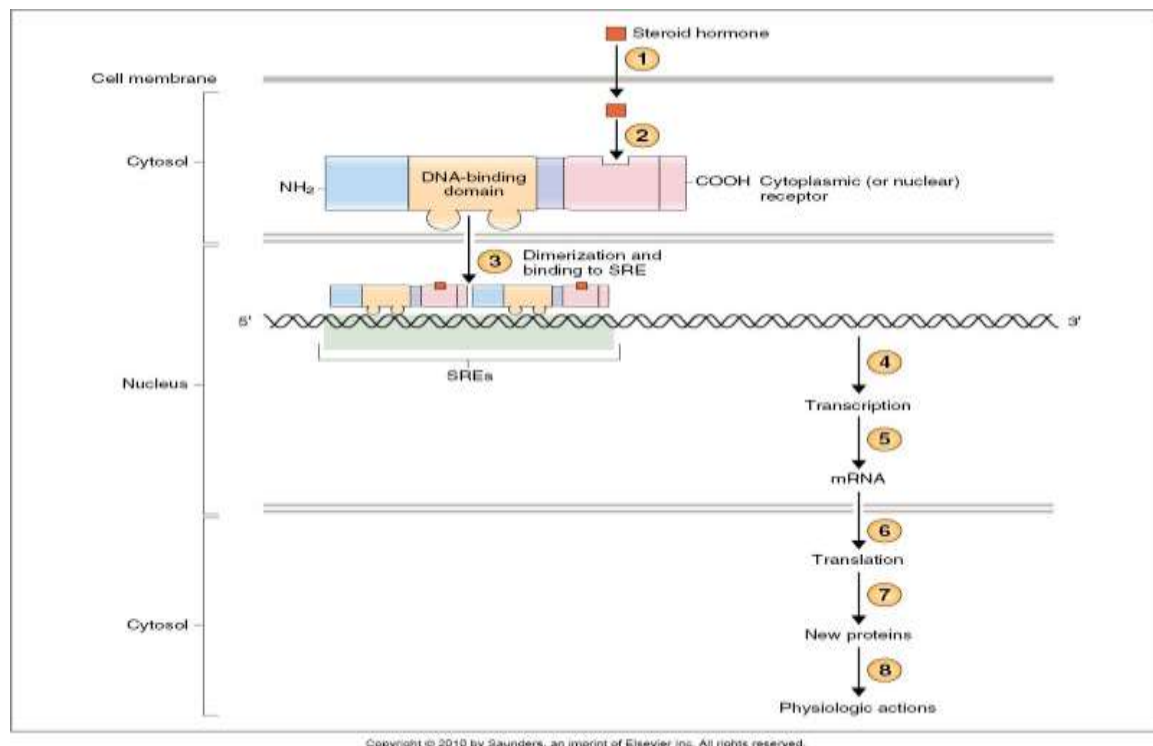
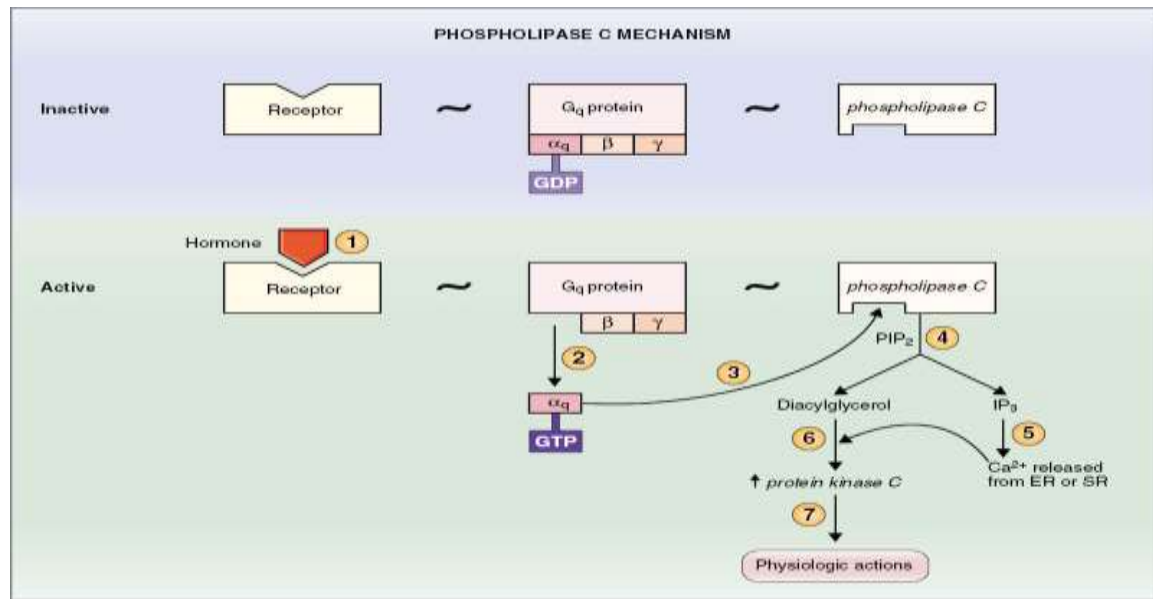


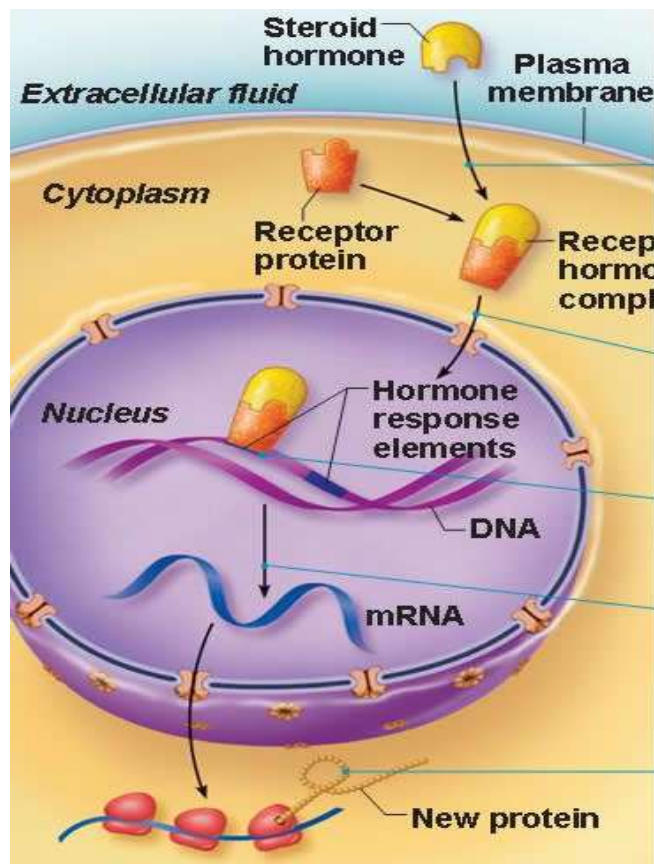
**RECEPTOR LOCATIONS:**

- Cytosolic or Nuclear
  - Lipophilic ligand enters cell
  - Often activates gene
  - Slower response

- Cell membrane
  - Lipophobic ligand can't enter cell
  - Outer surface receptor
  - Fast response







① The steroid hormone diffuses through the plasma membrane and binds an intracellular receptor.

② The receptor-hormone complex enters the nucleus.

③ The receptor-hormone complex binds a hormone response element (a specific DNA sequence).

④ Binding initiates transcription of the gene to mRNA.

⑤ The mRNA directs protein synthesis.

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**Table 9-3** Mechanisms of Hormone Action

Adenylyl Cyclase Mechanism (cAMP)	Phospholipase C Mechanism (IP <sub>3</sub> /Ca <sup>2+</sup> )	Steroid Hormone Mechanism	Tyrosine Kinase Mechanism	Guanylate Cyclase Mechanism (cGMP)
ACTH	GnRH	Glucocorticoids	Insulin	Atrial natriuretic peptide (ANP)
LH	TRH	Estrogen	IGF-1	Endothelial-derived relaxing factor (EDRF)
FSH	GHRH	Progesterone		Nitric oxide (NO)
TSH	Angiotensin II	Testosterone		
ADH (V <sub>2</sub> receptor)	ADH (V <sub>1</sub> receptor)	Aldosterone		
HCG	Oxytocin	1,25-Dihydroxycholecalciferol		
MSH	α <sub>1</sub> Receptors	Thyroid hormones		
CRH				
Calcitonin				
PTH				
Glucagon				
β <sub>1</sub> and β <sub>2</sub> receptors				

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#### REGULATION OF HORMONE RECEPTORS

- **Dose-response relationship.**
- **Sensitivity.**
- **Number.**
- **Affinity.**

#### DOWN-REGULATION

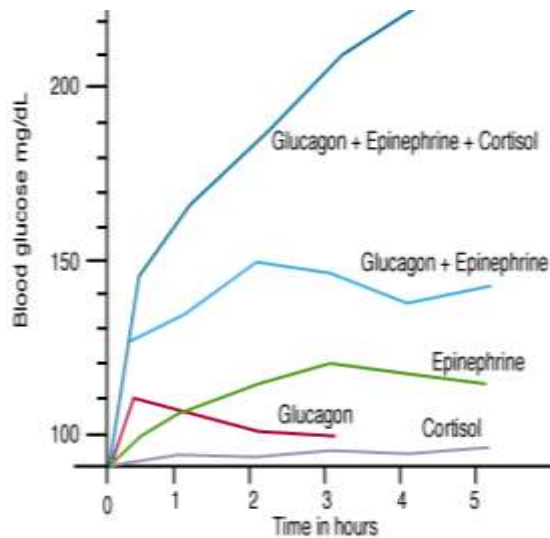
- **Decrease synthesis.**
- **Increase degradation.**
- **Inactivation .**
- **T3, progesterone.**

## UP-REGULATION

- Increase synthesis.
- Decrease degradation.
- activation .
- Estrogen, GH, prolactin.

## INTERACTION OF HORMONES AT TARGET CELLS:

- Permissiveness (Thyroid hormone have permissive effect on growth hormone action)
- Synergism (glucagon, cortisol and epinephrine)
  - Antagonism (Glucagon /insulin)



## HORMONE CONCENTRATIONS IN THE BLOOD:

- Concentrations of circulating hormone reflect:
  - Rate of release
  - Speed of inactivation and removal from the body
- Hormones are removed from the blood by:
  - Degrading enzymes



- **The kidneys**
- **Liver enzyme systems**