Norepinephrine (NE) Epinephrine(E) Receptors

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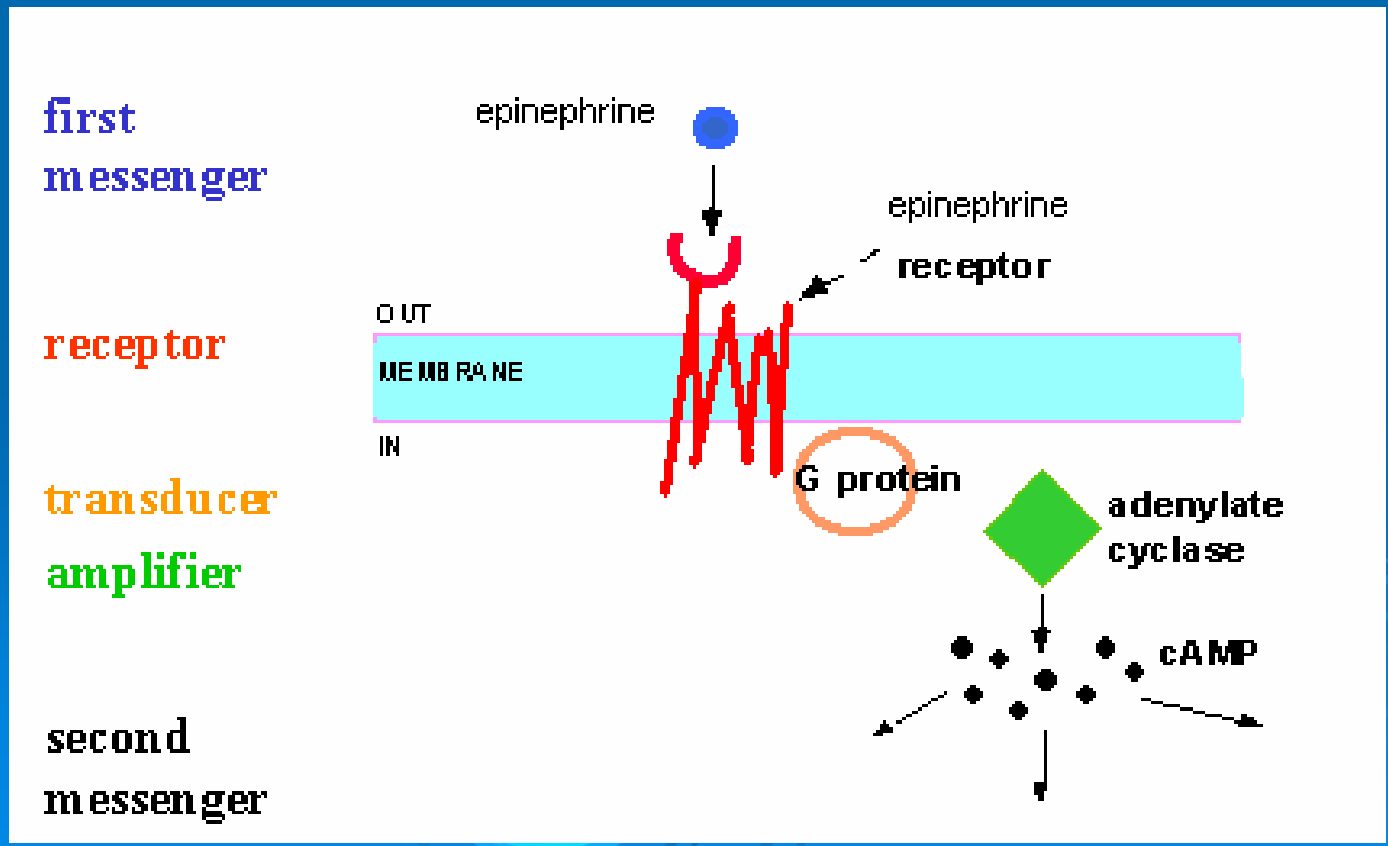
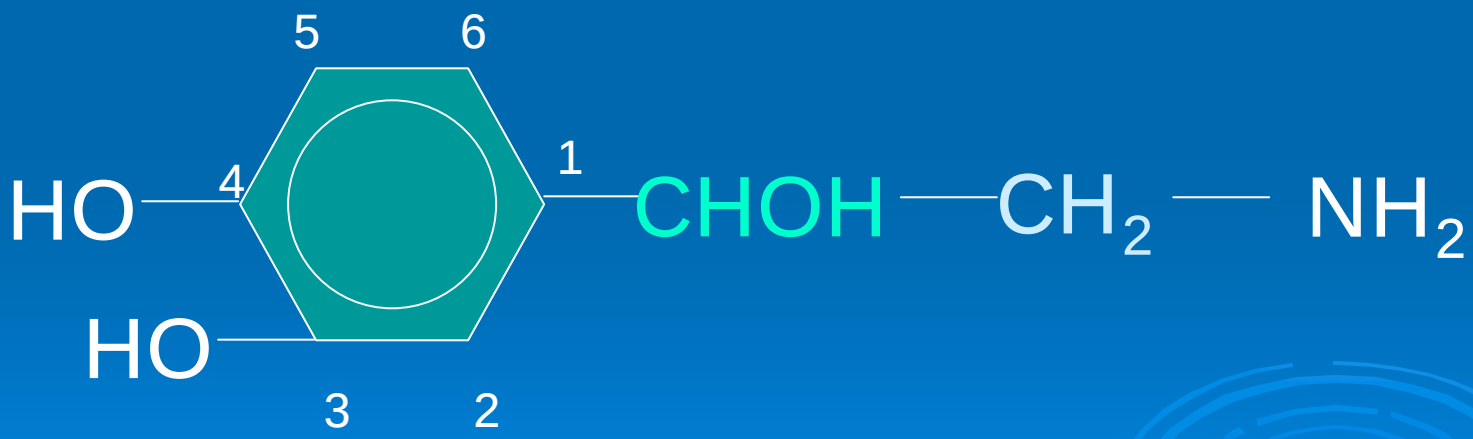
Norepinephrine, epinephrine, are in the class of catecholamines and they bind to adrenergic receptors.



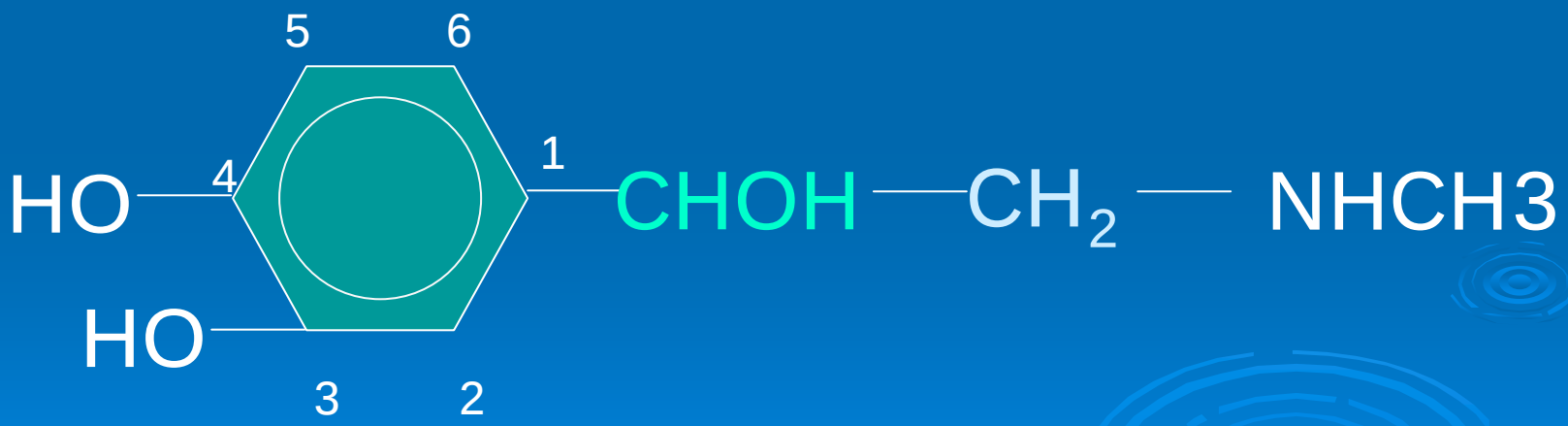
Norepinephrine (noradrenalin)

- Released by the sympathetic postganglionic nerve endings



Epinephrine (adrenalin)

- A methyl derivative of norepinephrine. It is primarily **an emergency hormone** produced by the adrenal medulla.



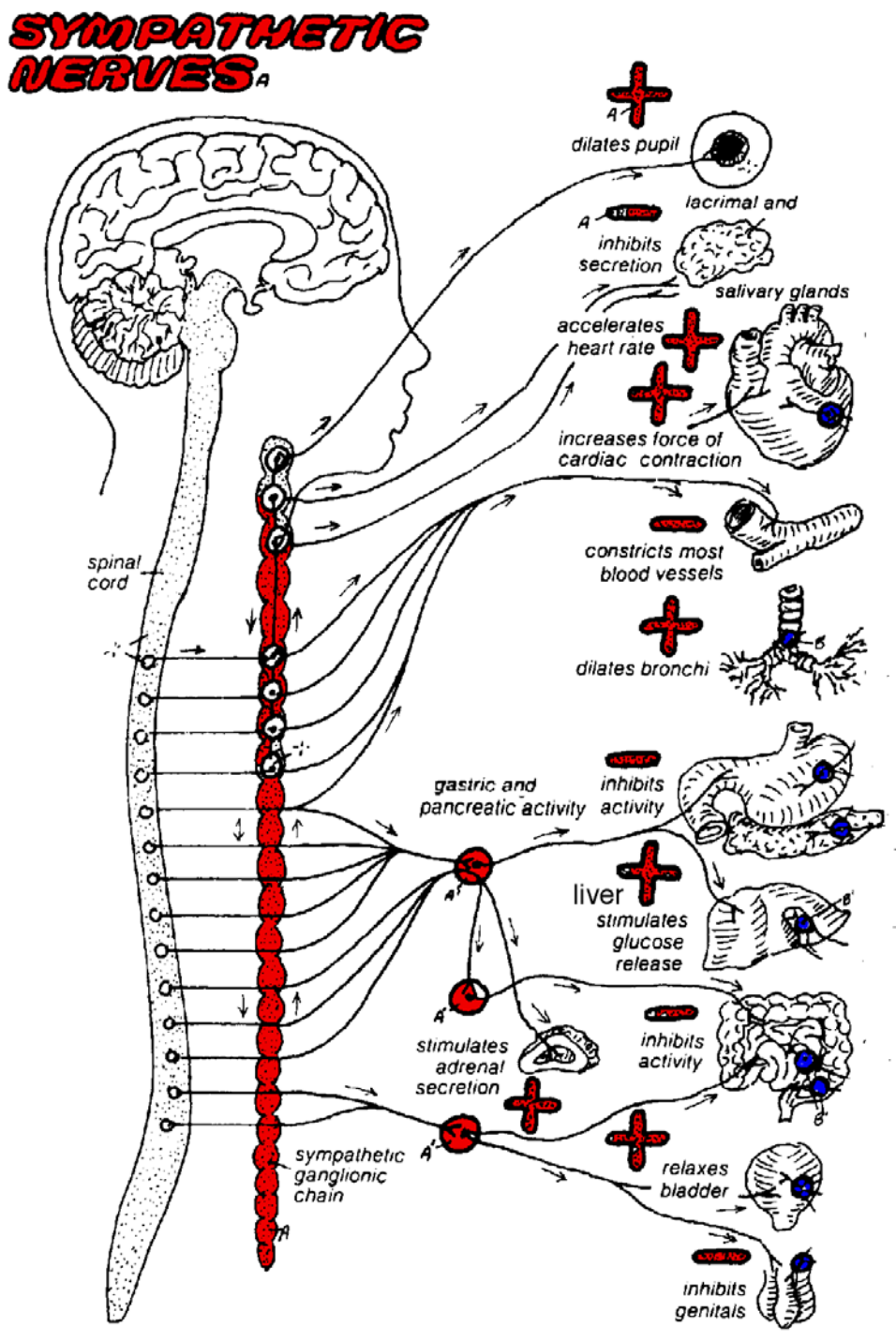
Sympathetic Division

Both NE and E affect sympathetic nerves

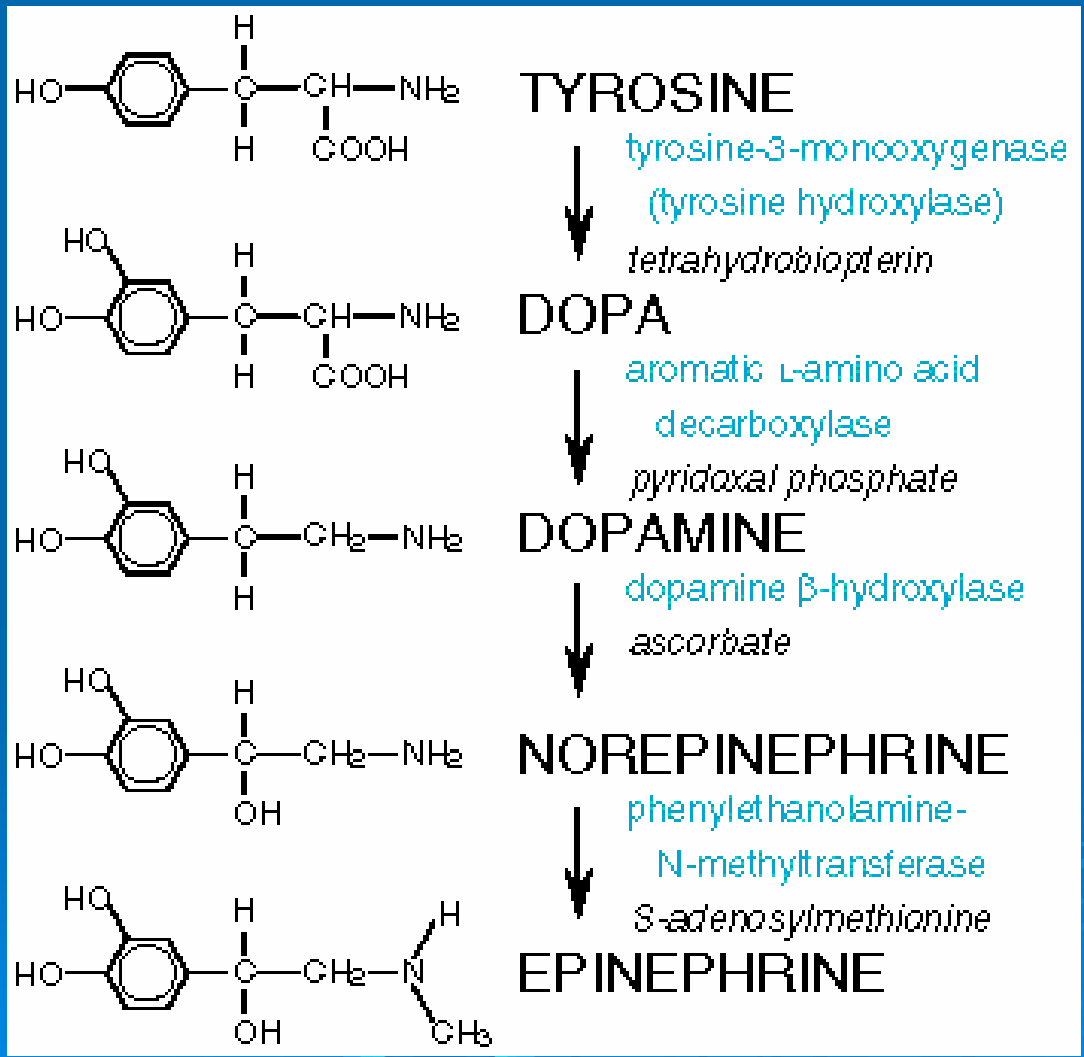
-NE is neurotransmitter

-E is hormone

- Increase heart rate and strength of contraction
- Mobilize glucose from liver
- Inhibit digestive activity

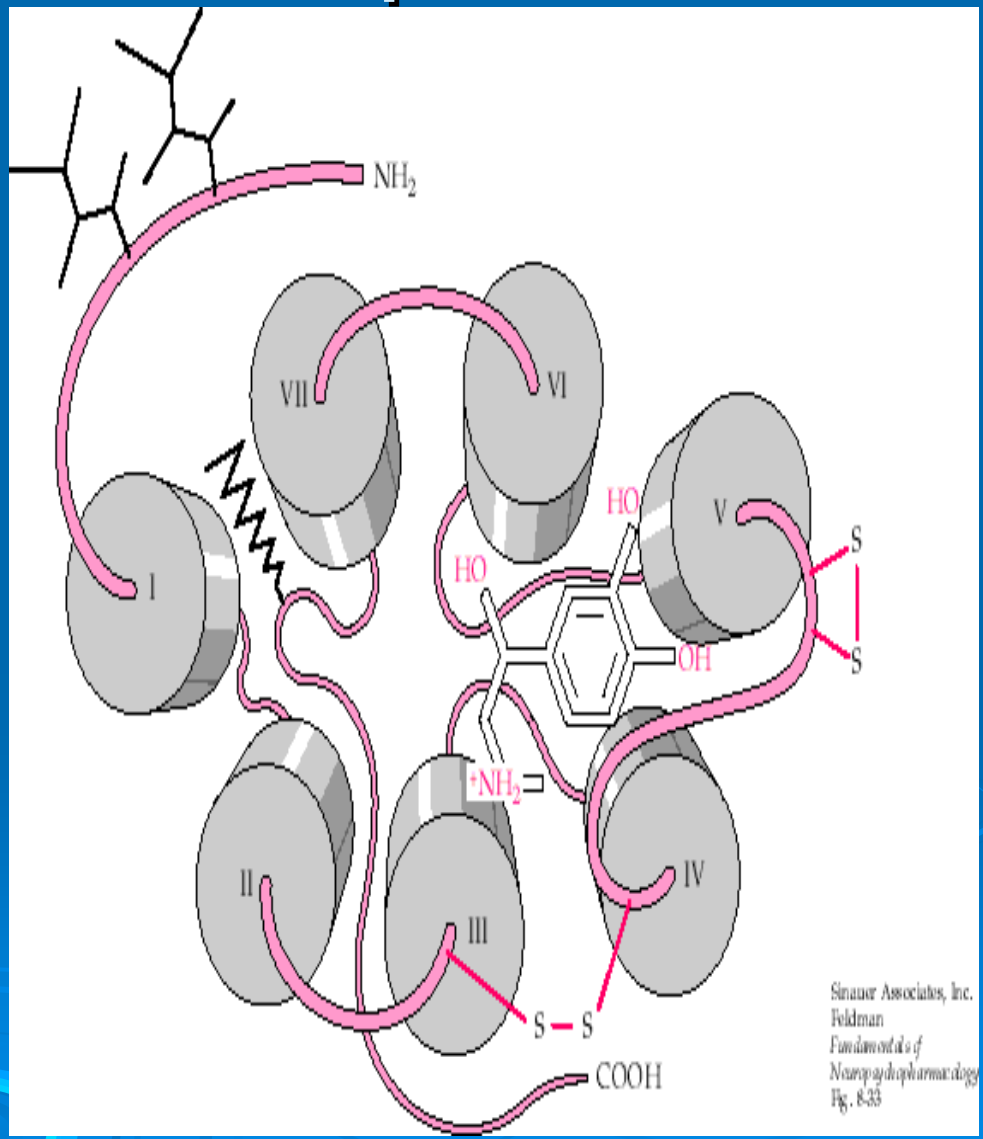


Synthesis of E and NE

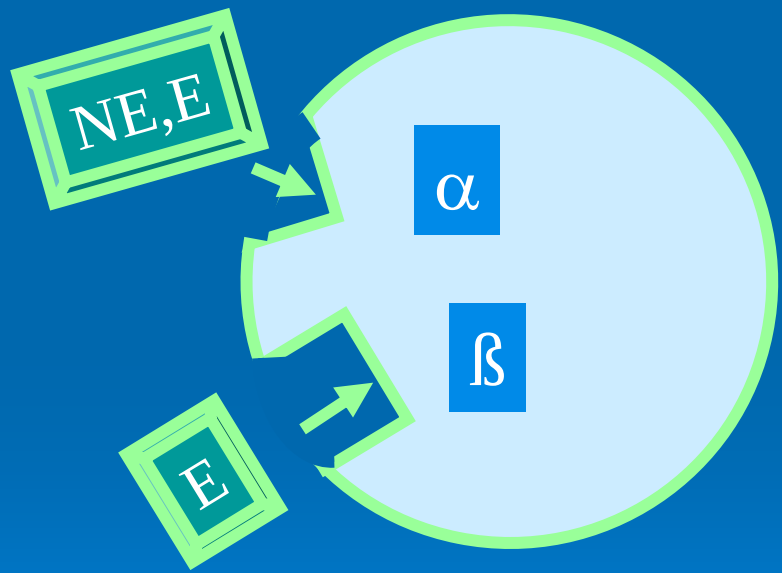


Adrenergic Receptors

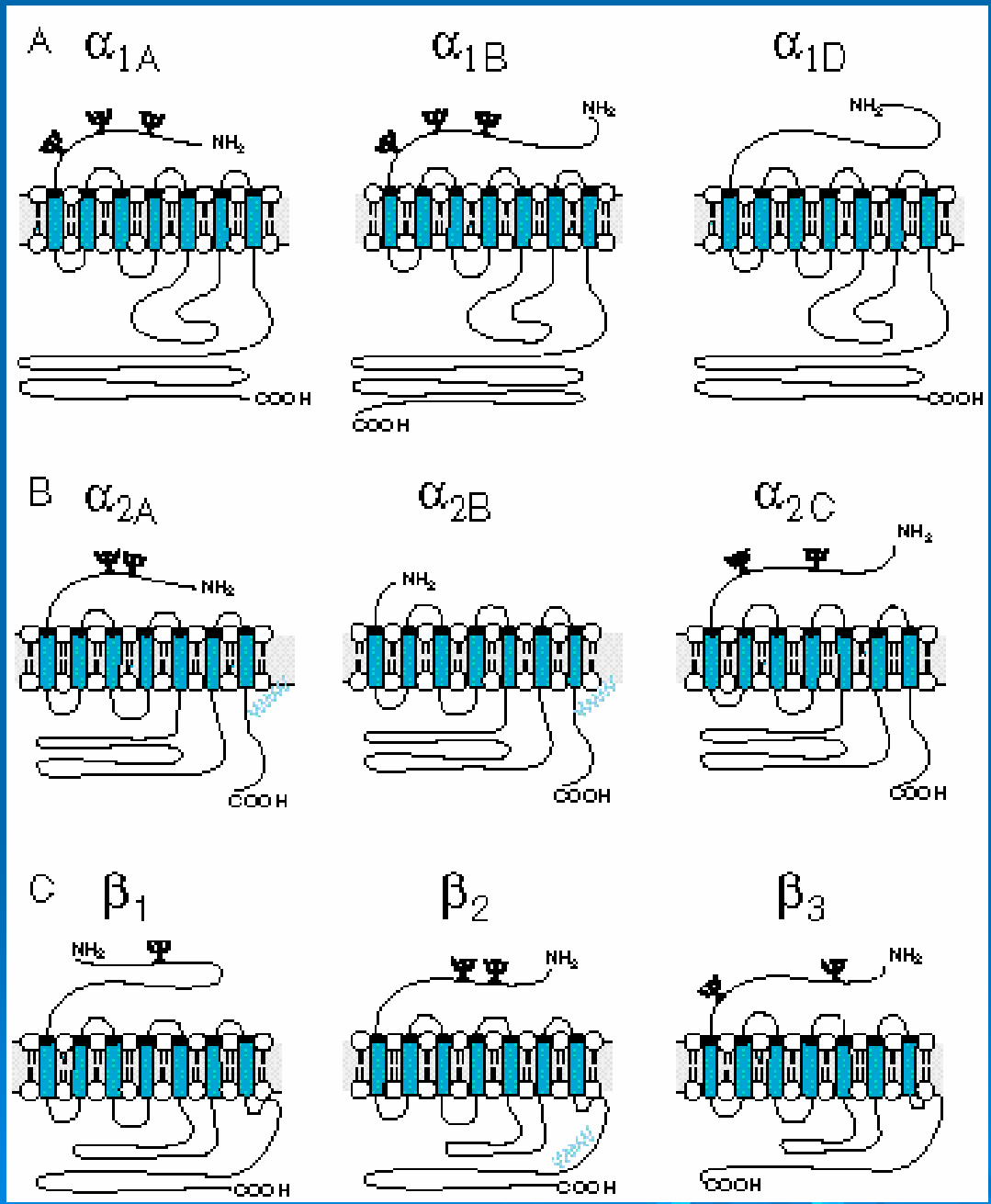
- Seven-pass transmembrane proteins that are *coupled to G proteins*
- There are multiple receptor types which are differentially expressed in different tissues and cells.



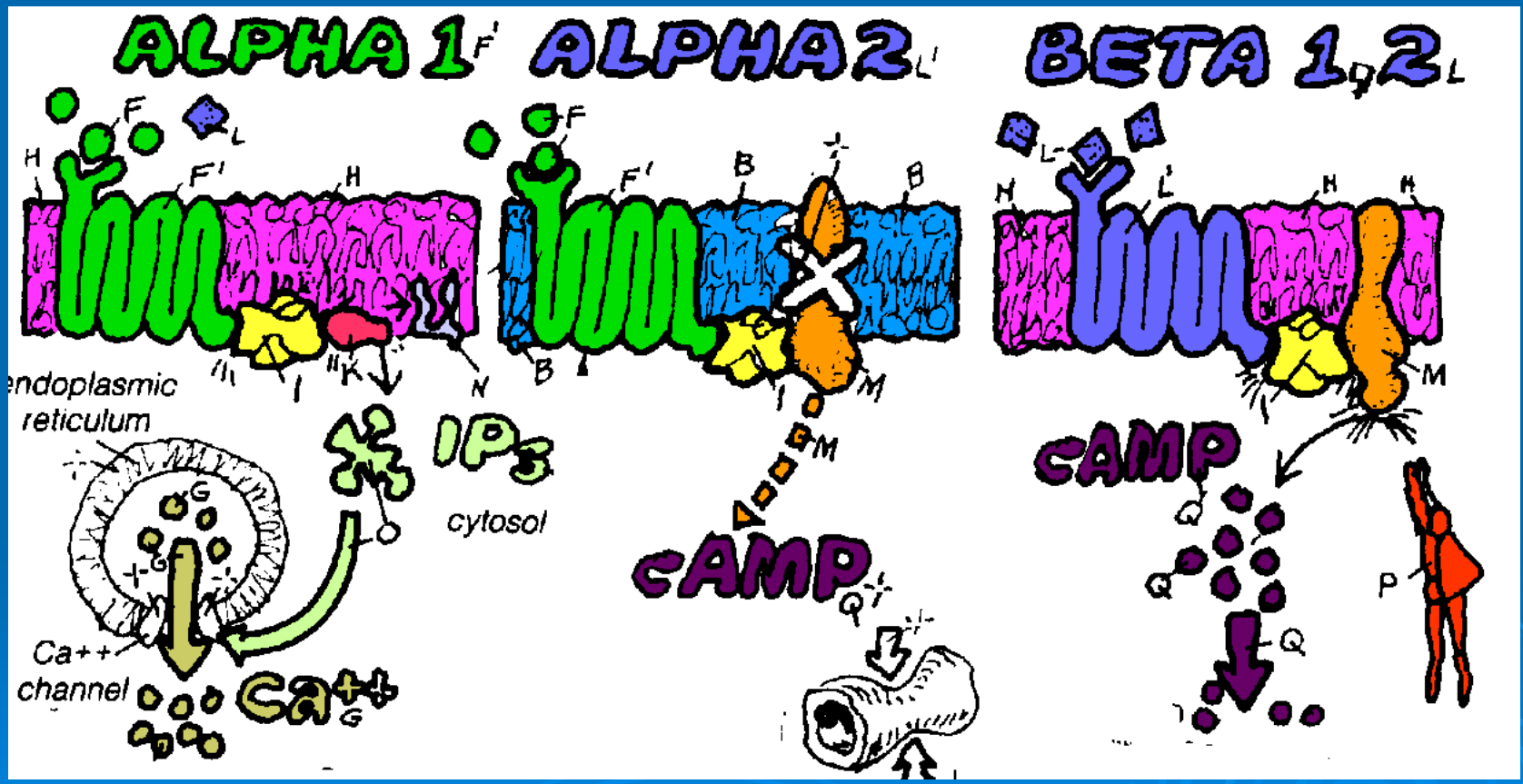
- Two main families of adrenergic receptors
  - Alpha (α)
  - Beta (ß)

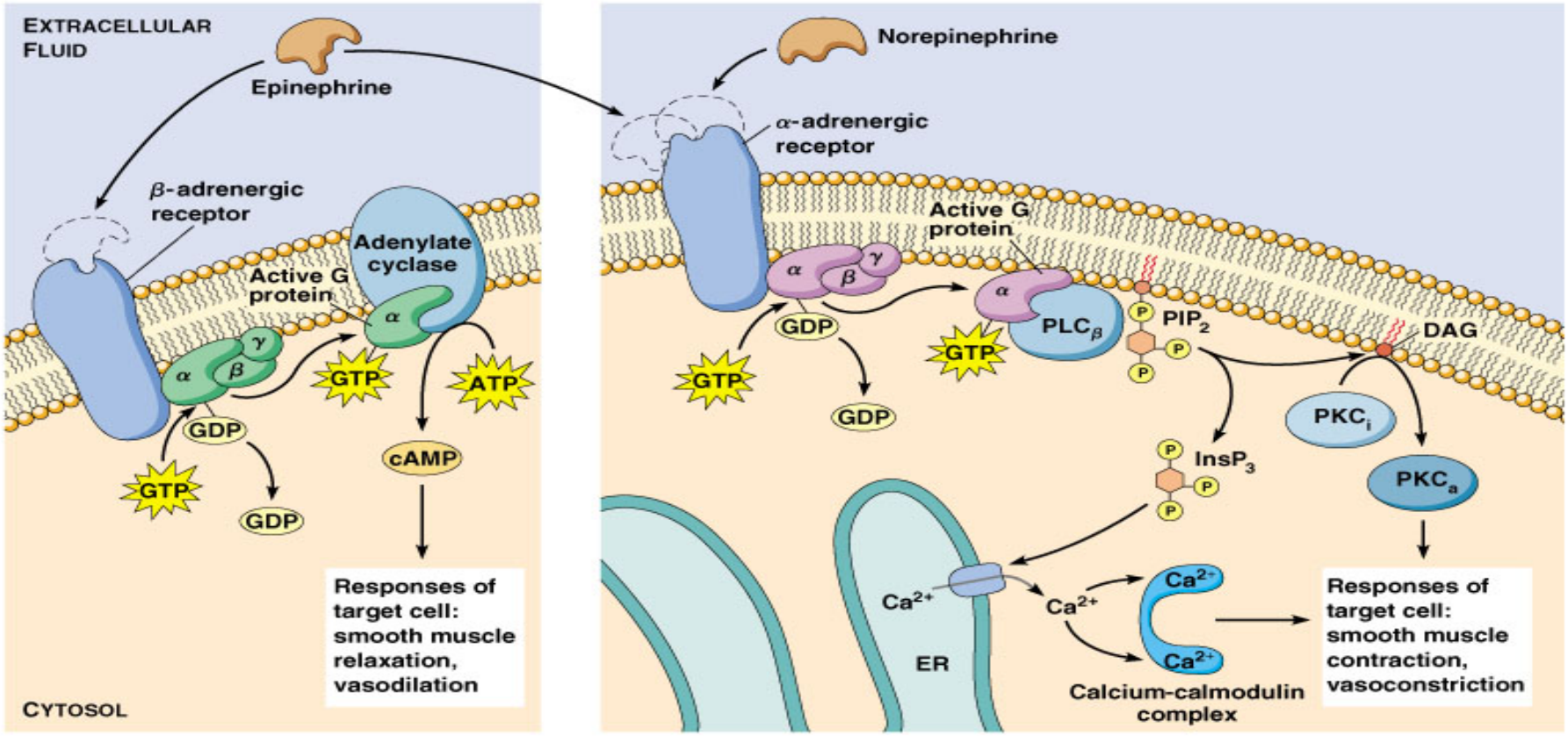


Adrenergic Receptor Subtypes



Main Type of Adrenergic Receptors





(a) cAMP pathway initiated by activation of β-adrenergic receptor

(b) Inositol-phospholipid-calcium pathway initiated by activation of α-adrenergic receptor

Receptor	Agonists	Second Messenger	G protein
alpha$_1$ (α_1)	E>NE	IP_3/Ca^{2+}; DAG	G_q
alpha$_2$ (α_2)	NE>E	↓ cyclic AMP	G_i
beta$_1$ (β_1)	E=NE	↑ cyclic AMP	G_s
beta$_2$ (β_2)	E>>NE	↑ cyclic AMP	G_s

Process	α_1-receptor (IP_3, DAG)	α_2-receptor (↓ cAMP)	β_1-receptor (↑ cAMP)	β_2-receptor (↑ cAMP)
Carbohydrate metabolism	↑ liver glycogenolysis	No effect	No effect	↑ liver/muscle glycogenolysis; ↑ liver gluconeogenesis; ↓ glycogenesis
Fat metabolism	No effect	↓ lipolysis	↑ lipolysis	No effect
Hormone secretion	No effect	↓ insulin secretion	No effect	↑ insulin and glucagon secretion

Norepinephrine

Epinephrine

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