



G-Protein Receptors Guanine Nucleotide-Binding Proteins

Psychology 372

Physiological Psychology

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Background

- Consist of three subunits
 - Alpha
 - Beta
 - Gama

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Alpha

- Is loosely associated with the membrane
- Is usually the coupling agent between receptors and primary effector enzymes.
- Have more than 12 types
 - Each has different action and name.

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Family Group Contains

- Alpha and Beta adrenergic receptors
- Muscarinic Ach receptors
- GABA_B Receptors
- Certain Glutamate receptors
- Certain Serotonin Receptors
- Neuropeptide Receptors
- Odorant Receptors
- Rhodopsin
- Others

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Beta-Gamma Complex

- Is more tightly fixed to the membrane
- Can also affect ion channels directly.

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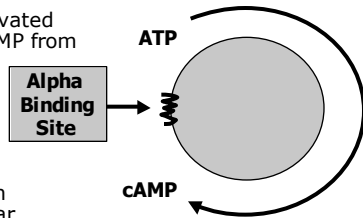
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Other Important Structures

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Adenylyl Cyclase (AC)

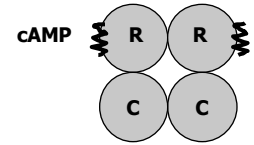
- Is activated by the Alpha subunit
- When activated makes cAMP from ATP
- cAMP is an intracellular messenger



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Protein Kinases

- Have four subunits
- Two Regulatory Subunits
 - Where cAMP binds
- Two Catalytic Subunits
 - Puts phosphate groups on ion channels
 - Is the working part of the enzyme



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External Signal
First Messenger (NT)



Receptor

Transducer | Primary Effector

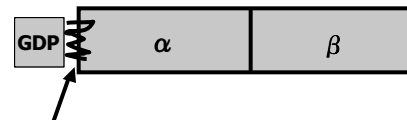


Second Messenger
Secondary Effector

G Proteins At Rest

RECEPTOR BINDING SITE

XXXXXXXXXXXXXXXXXXXX



GTP Binding Site
GTP is converted to GDP

GDP occupies the binding site when the receptor is at rest.

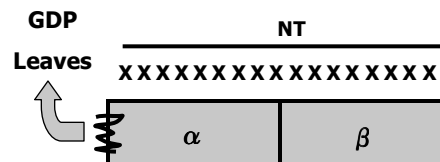
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What Happens

- Stimulation
- NT causes a conformational change and knocks off GDP
- Result - Leaves Alpha binding site open

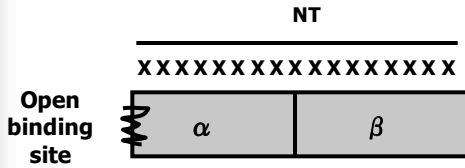
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Stimulation begins



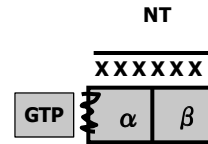
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Open Binding Site



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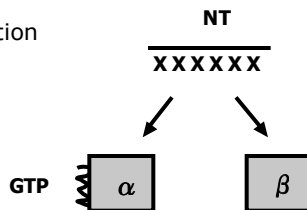
GTP binds to the open binding site



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Conformation Change

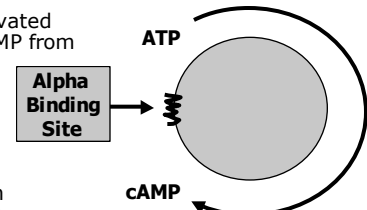
- Causes a conformational change
- Get Dissociation



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Adenylyl Cyclase (AC)

- Is activated by the Alpha subunit
- When activated makes cAMP from ATP
- cAMP is an intracellular messenger



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Note

- alpha binds on AC
- When it binds, it becomes GTPase
- GTPase's convert GTP to GDP
- When converts to GDP, it breaks the bond from AC
- Then, rebinds with the beta subunits
- At same time, NT is being removed from the receptor binding site.
- Alpha and Beta's then link to the receptor site
- Repeat the process

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Kinases

- Kinases put phosphate groups on something.
- Where: A protein (Ion Channel)
- Result: Protein Kinase
- Many types of PK
 - CAMP Protein Kinase
 - CaCal Protein Kinase
 - Protein Kinase C
 - Others

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Protein Kinases

- Has four subunits
- Two Regulatory Subunits
 - Where enzymes (cAMP) binds
- Two Catalytic Subunits
 - Puts phosphate groups on ion channels
 - Is the working part of the enzyme

