

# L'organismo pluricellulare necessita di comunicazione intercellulare

## Omeostasi

“Mantenimento di condizioni stabili mediante meccanismi fisiologici coordinati”

- 1) Interazione con l'esterno
- 2) Comunicazione tra cellule

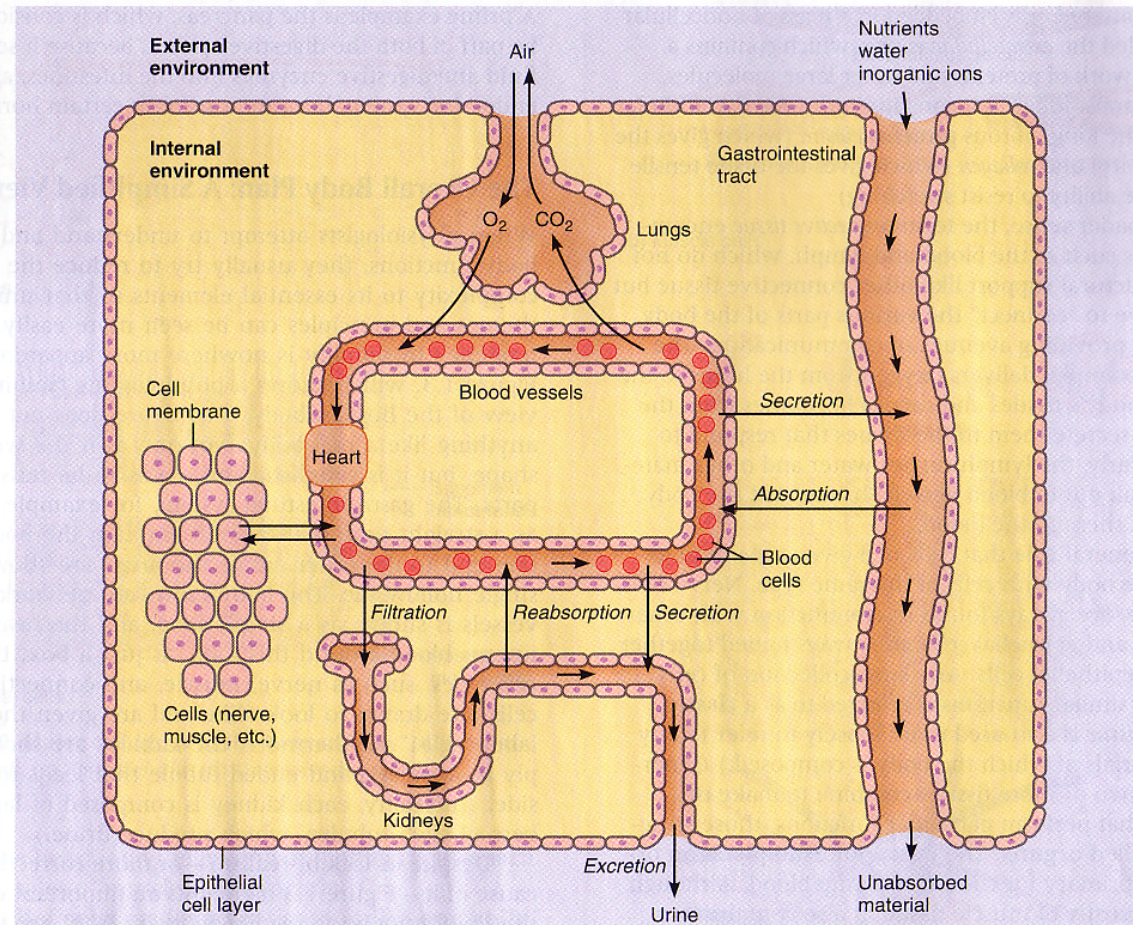
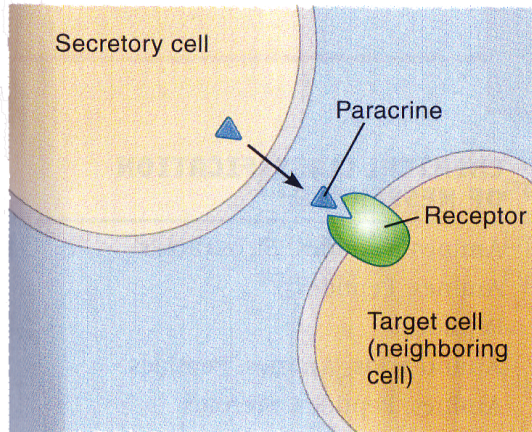


FIGURE 1.3 A highly simplified view of the overall plan of the human body.

Flows of material are indicated by arrows.



# Comunicazione chimica tra le cellule



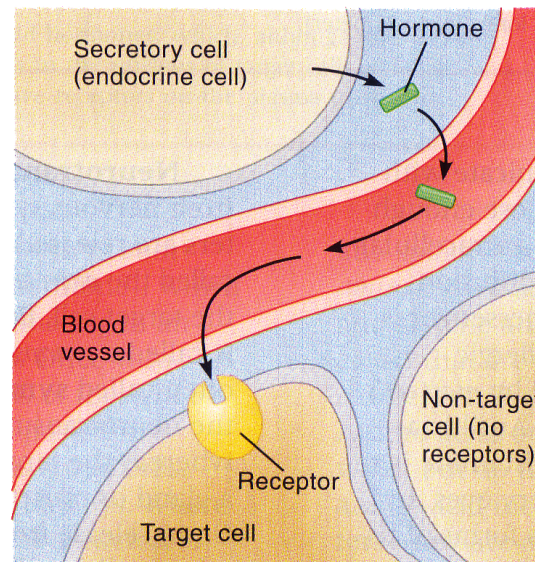
(a) Paracrines

Quando le cellule sono vicine  
(comunicazione a breve distanza)

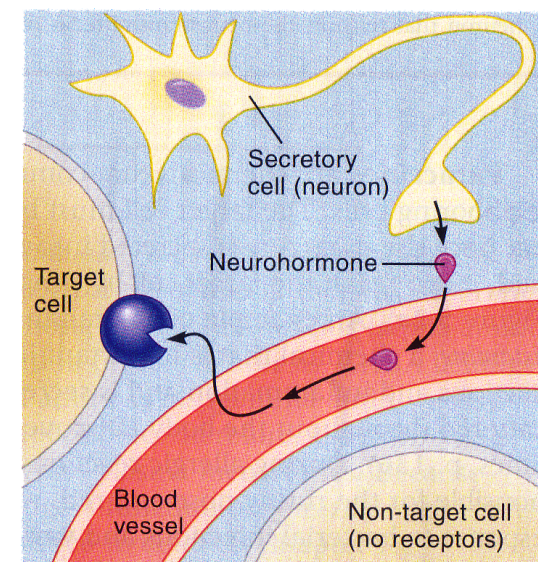
diffusione semplice

Quando le cellule sono lontane  
(comunicazione a lunga distanza)

trasporto mediato  
dal torrente circolatorio

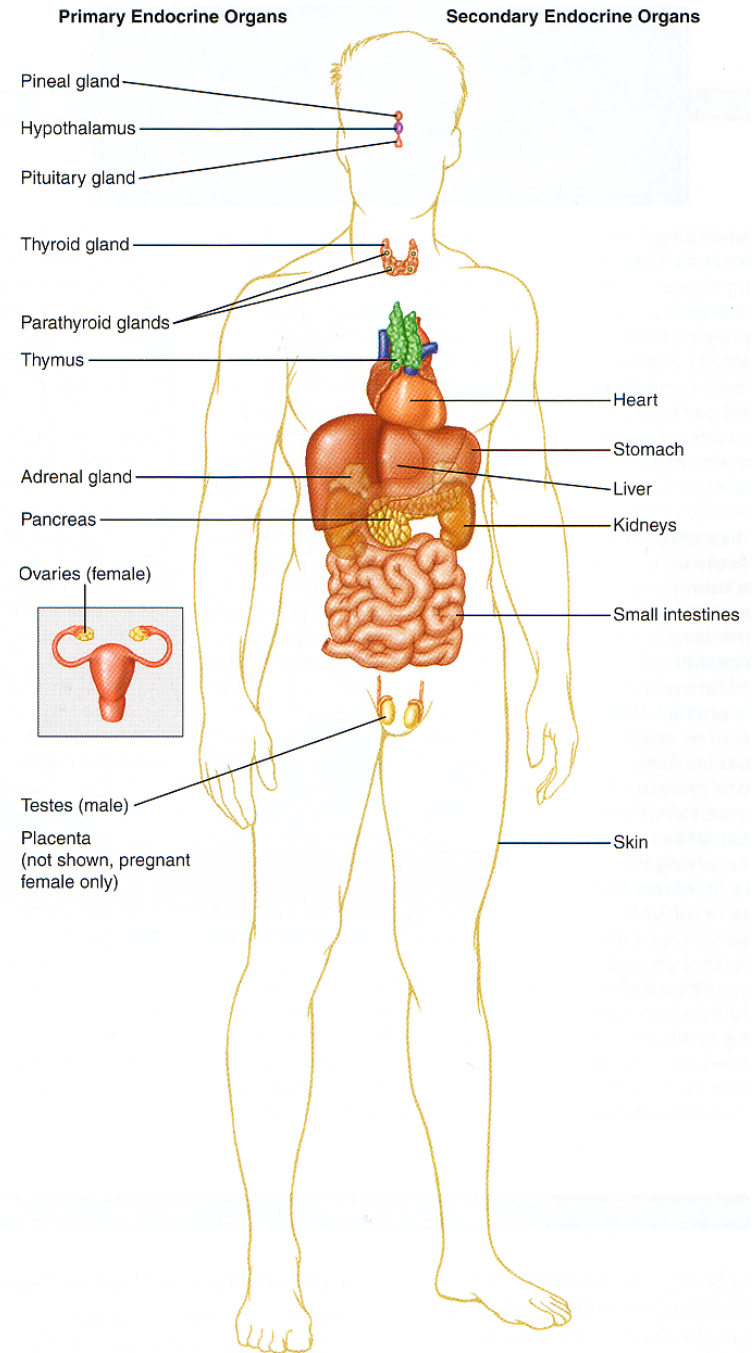


(e) Hormones



(f) Neurohormones

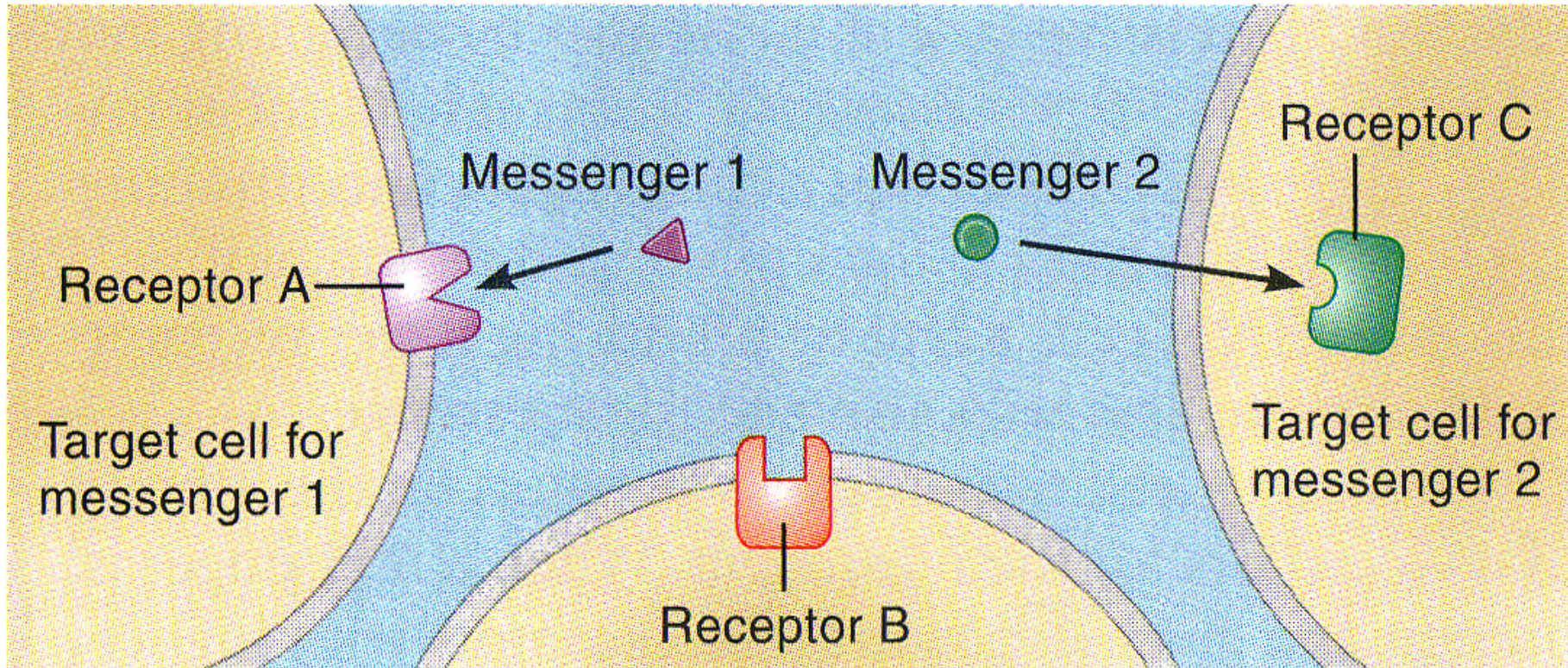
# Le ghiandole endocrine





# Il recettore e la specificità di risposta

- Il recettore è in genere una glicoproteina
- La sua attivazione si basa su un meccanismo “chiave-serratura” (sito di legame specifico)



**FIGURE 5.8 Receptor specificity.** Receptor A is specific for messenger 1, receptor C is specific for messenger 2, and neither messenger can bind to receptor B. Note that receptors can be located either on the plasma membrane (receptors A and B) or inside the cell (receptor C).



# La localizzazione del recettore è funzione delle proprietà chimico fisiche del segnale extracellulare

**TABLE 5.2 CHEMICAL CLASSIFICATION OF MESSENGERS**

<b>CLASS</b>	<b>CHEMICAL PROPERTY</b>	<b>LOCATION OF RECEPTORS ON TARGET CELL</b>	<b>FUNCTIONAL CLASSIFICATION</b>
Amino acids	<u>Lipophobic</u>	<u>Plasma membrane</u>	Neurotransmitters
Amines*	<u>Lipophobic</u>	<u>Plasma membrane</u>	Paracrines, autocrines, neurotransmitters, hormones
Peptides	<u>Lipophobic</u>	<u>Plasma membrane</u>	Paracrines, autocrines, cytokines, neurotransmitters, hormones
Steroids	<u>Lipophilic</u>	<u>Cytosol</u> <sup>†</sup>	Hormones
Eicosanoids	<u>Lipophilic</u>	<u>Cytosol</u>	Paracrines

\*One exception is the thyroid hormones, which, although amines, are lipophilic and have receptors in the nucleus of target cells.

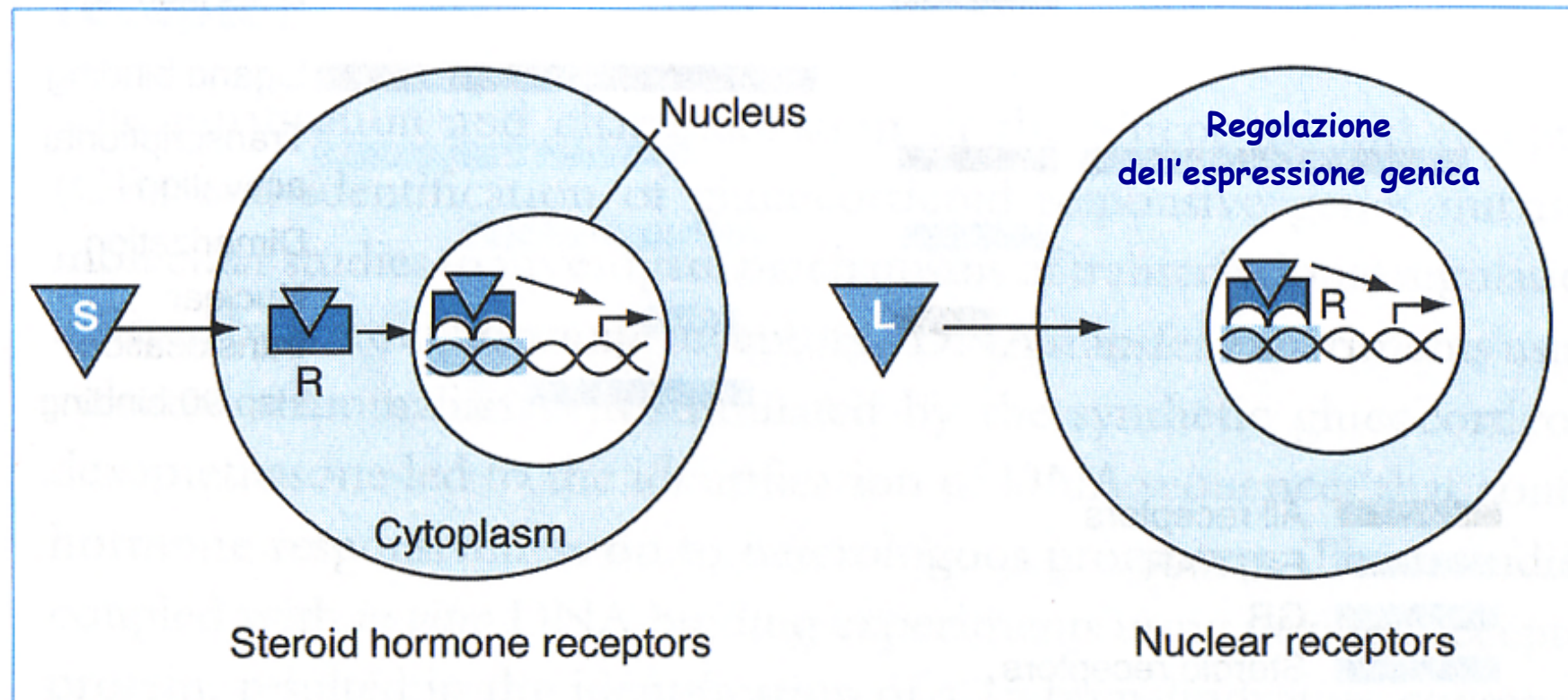
<sup>†</sup>A few steroid hormones have receptors on the plasma membrane.



## Se il segnale extracellulare (o ligando) è lipofilo i recettori sono intracellulari

I recettori intracellulari possono essere:

- citoplasmatici
- nucleari





Se il segnale extracellulare (o ligando) è idrofilo  
i recettori sono inseriti nella membrana plasmatica

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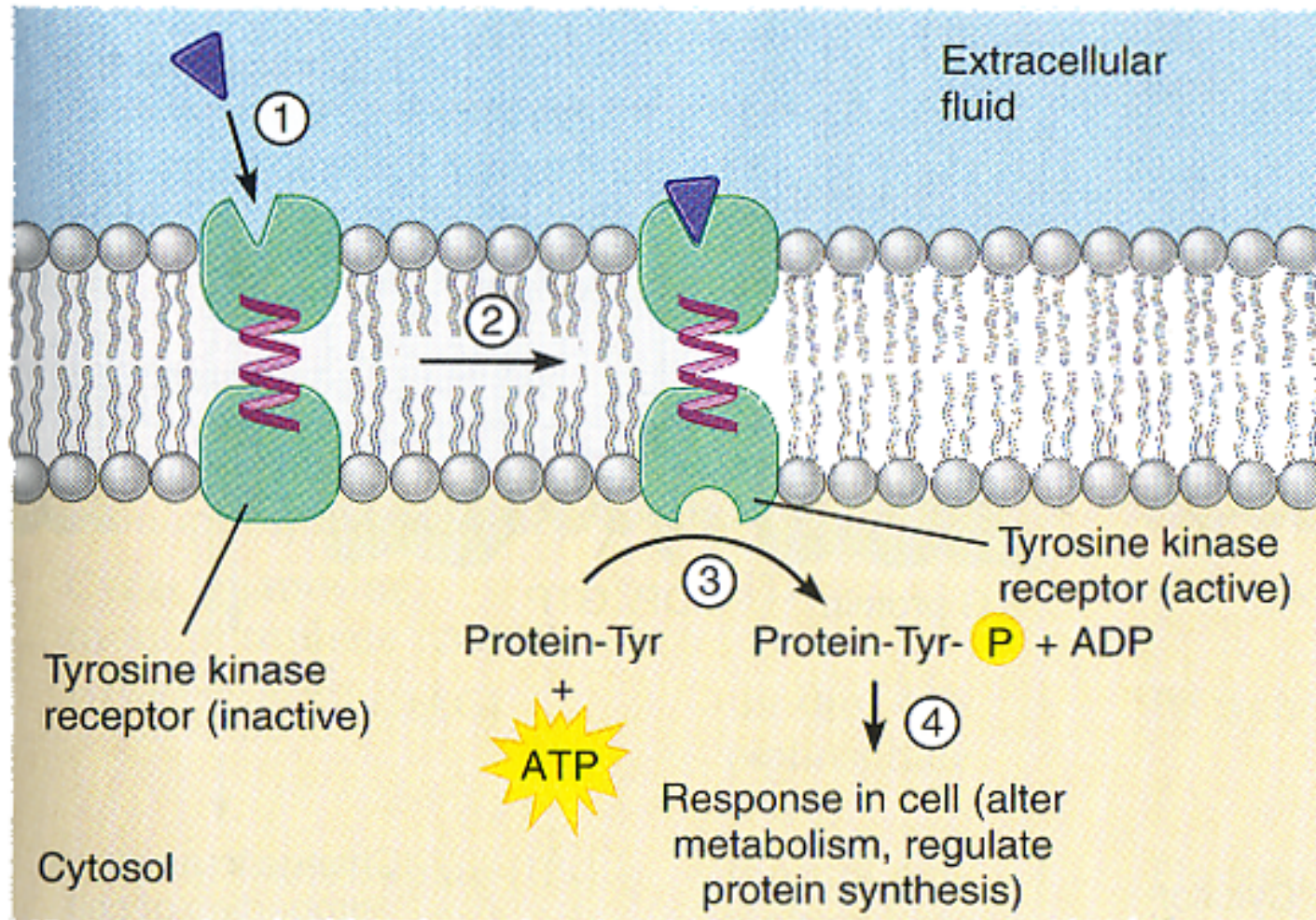
I recettori di membrana possono essere:

**recettori dotati di attività enzimatica**

**recettori accoppiati a proteine G**



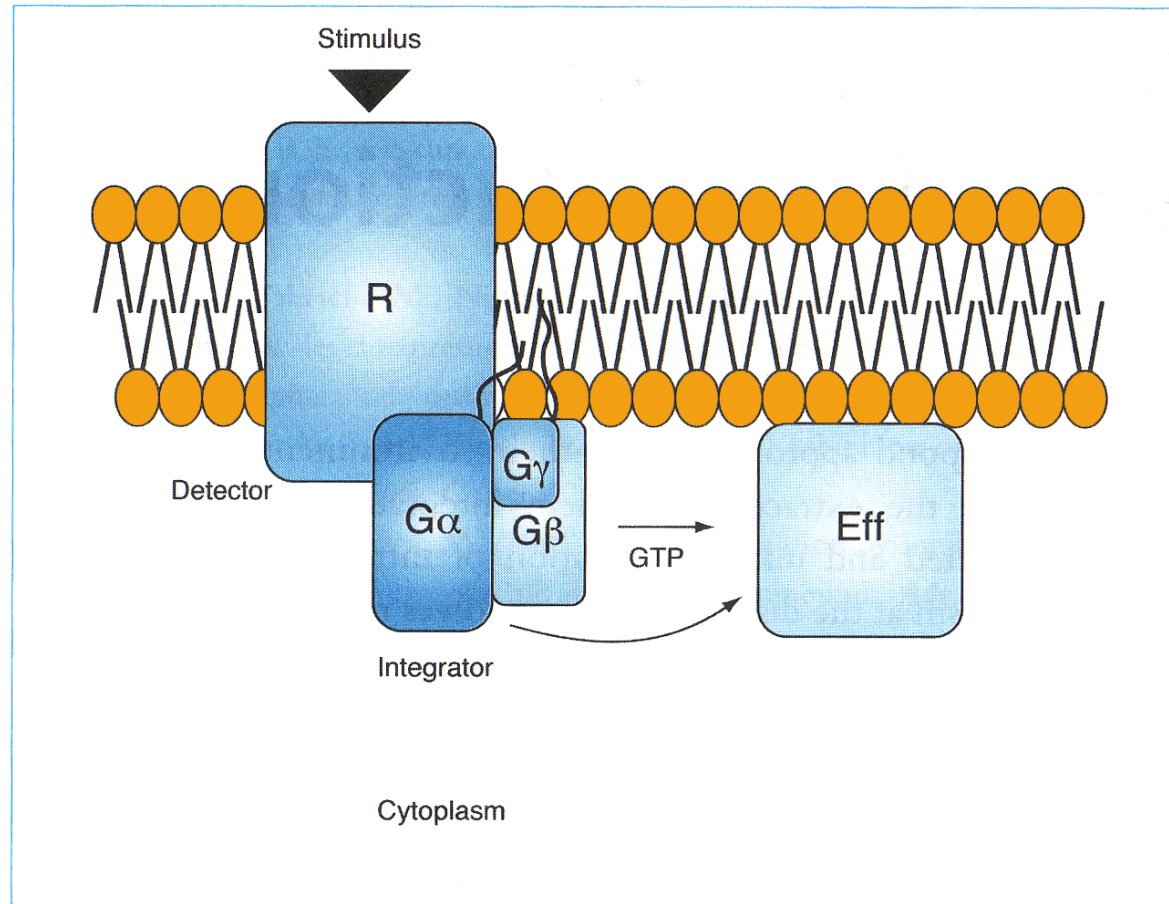
# I recettori con attività enzimatica: i recettori tirosina chinasi



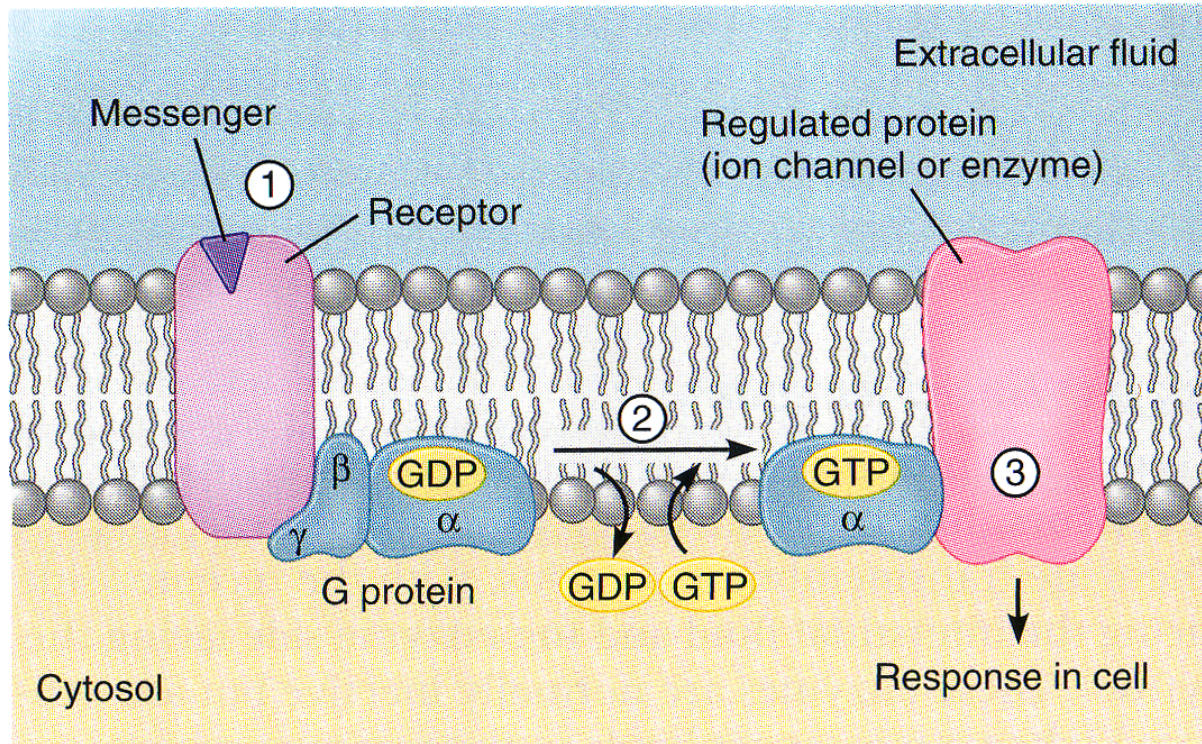


# Gli elementi caratterizzanti la trasduzione via recettori accoppiati a proteine G

**Figure 19.1** Basic pathway for G-protein-dependent signal transduction. Stimulation of receptors initiates a vectorial signaling cascade that results in the production of an amplified intracellular signal. See text for details. Abbreviations: R, receptor; G, G protein; Eff, effector.



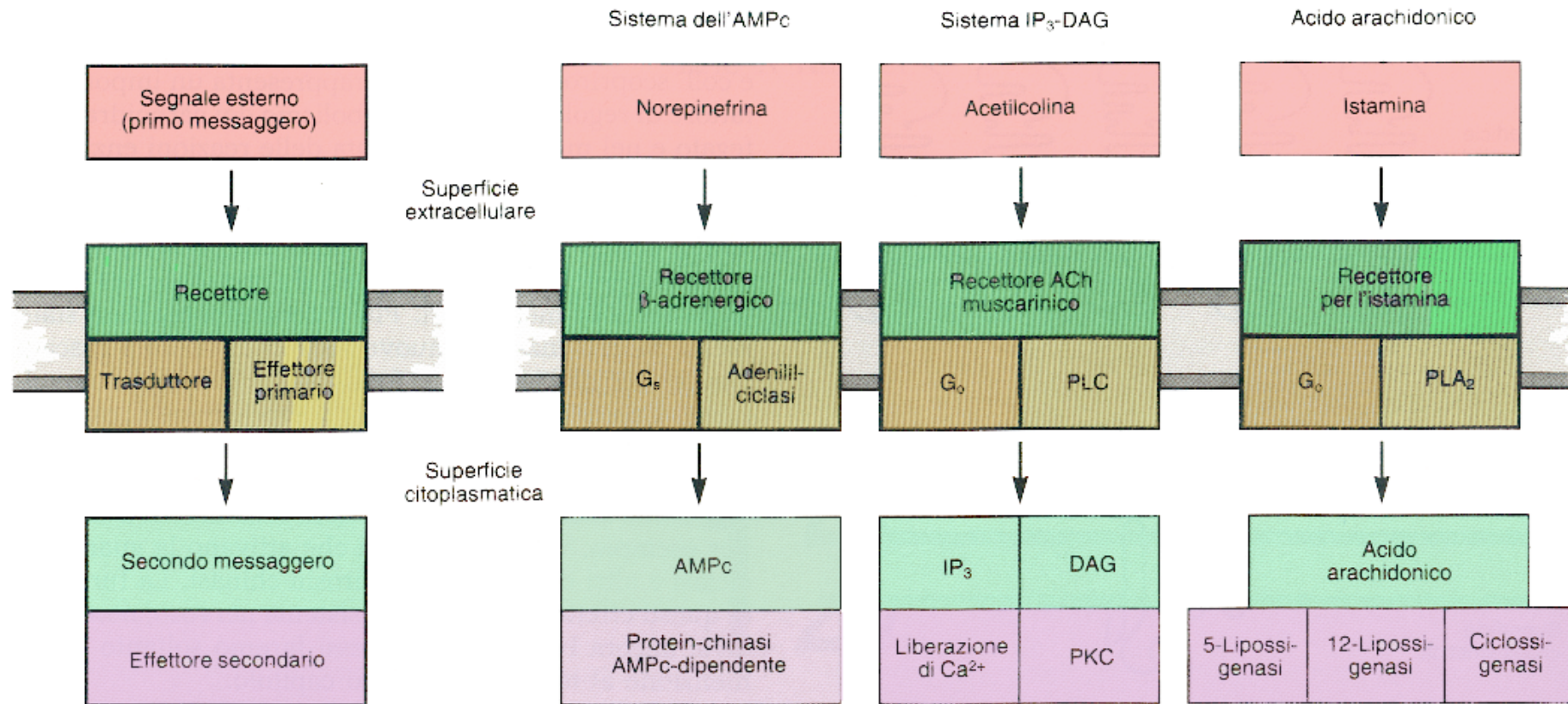
# L'effettore è un enzima



**FIGURE 5.14 Actions of G proteins.** *G proteins have three subunits: alpha, beta, and gamma. The alpha subunit has binding sites for guanosine nucleotides. In the inactive state, GDP is bound to the alpha subunit. ① Binding of a messenger to a G-protein-linked receptor activates the G protein. ② The GDP is released as the alpha subunit moves laterally within the membrane and binds a GTP. ③ The alpha unit then activates another membrane protein, producing a response in the cell.*

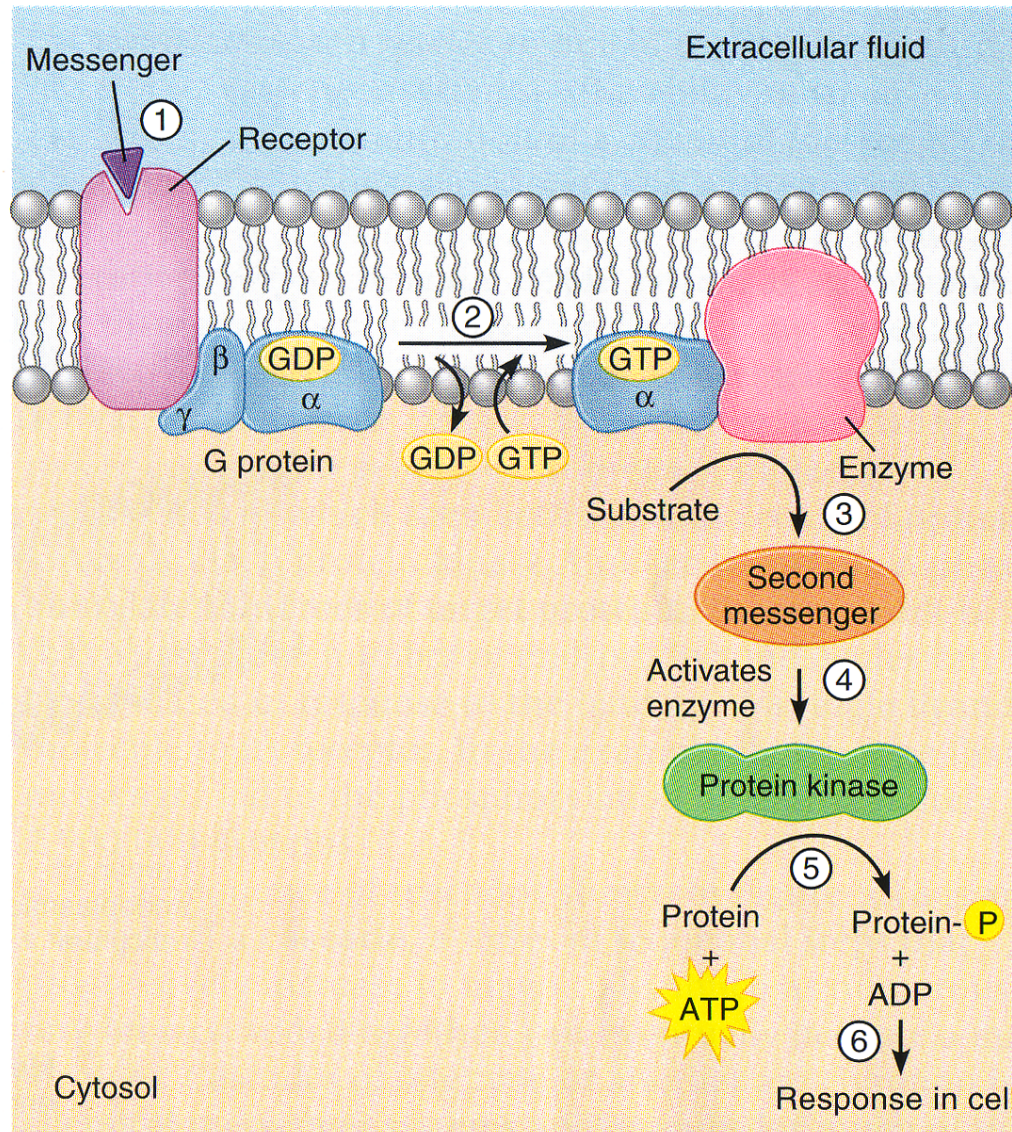


# I secondi messaggeri





# Il secondo messaggero attiva le protein chinasi



## Fosforilazione

strategia “universale”  
di attivazione cellulare

**FIGURE 5.16 G-protein-regulated enzymes and second messengers.** In this example the G protein is coupled to an enzyme in the plasma membrane. ① Binding of the messenger to its receptor activates the G protein. ② The alpha subunit moves to and activates an enzyme in the membrane. ③ The activated enzyme catalyzes formation of a second messenger in the cytosol. ④ The second messenger activates a protein kinase, which ⑤ catalyzes phosphorylation of a protein, which ⑥ initiates a response in the cell.