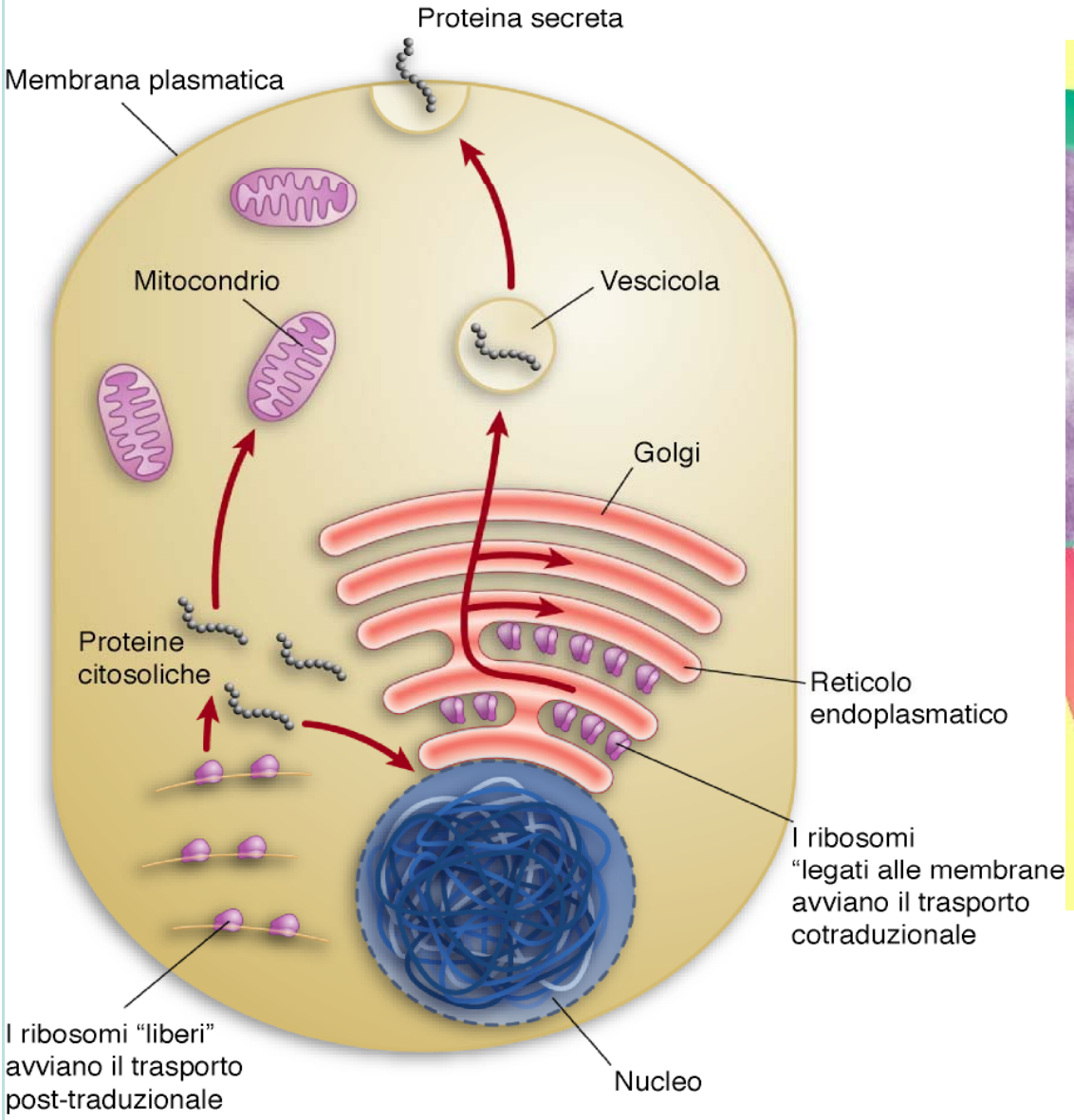
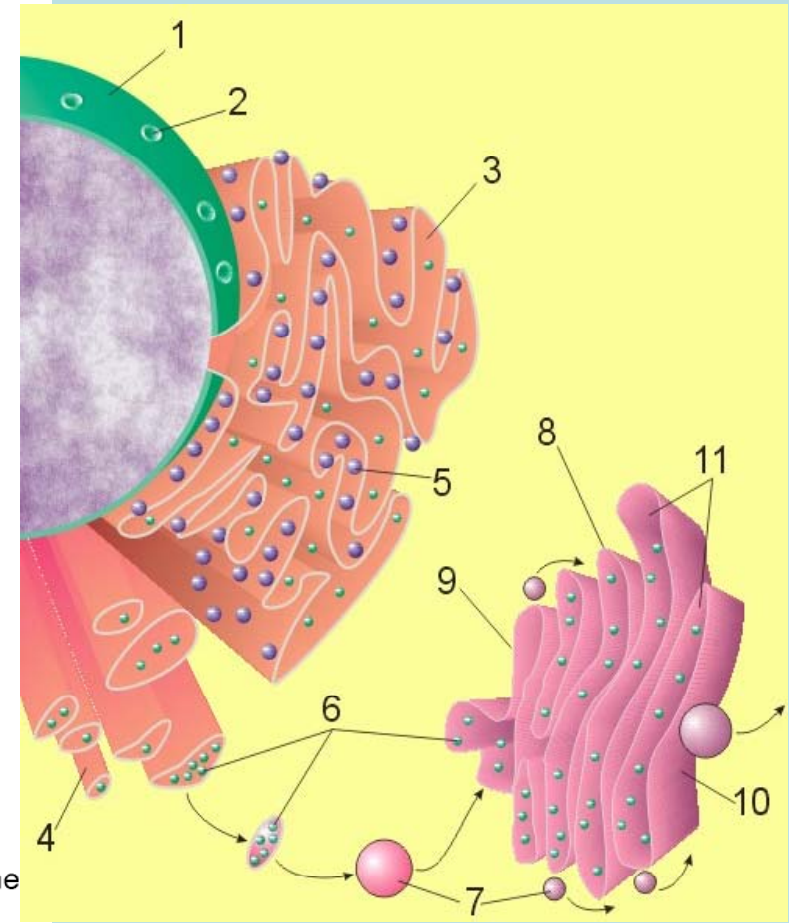
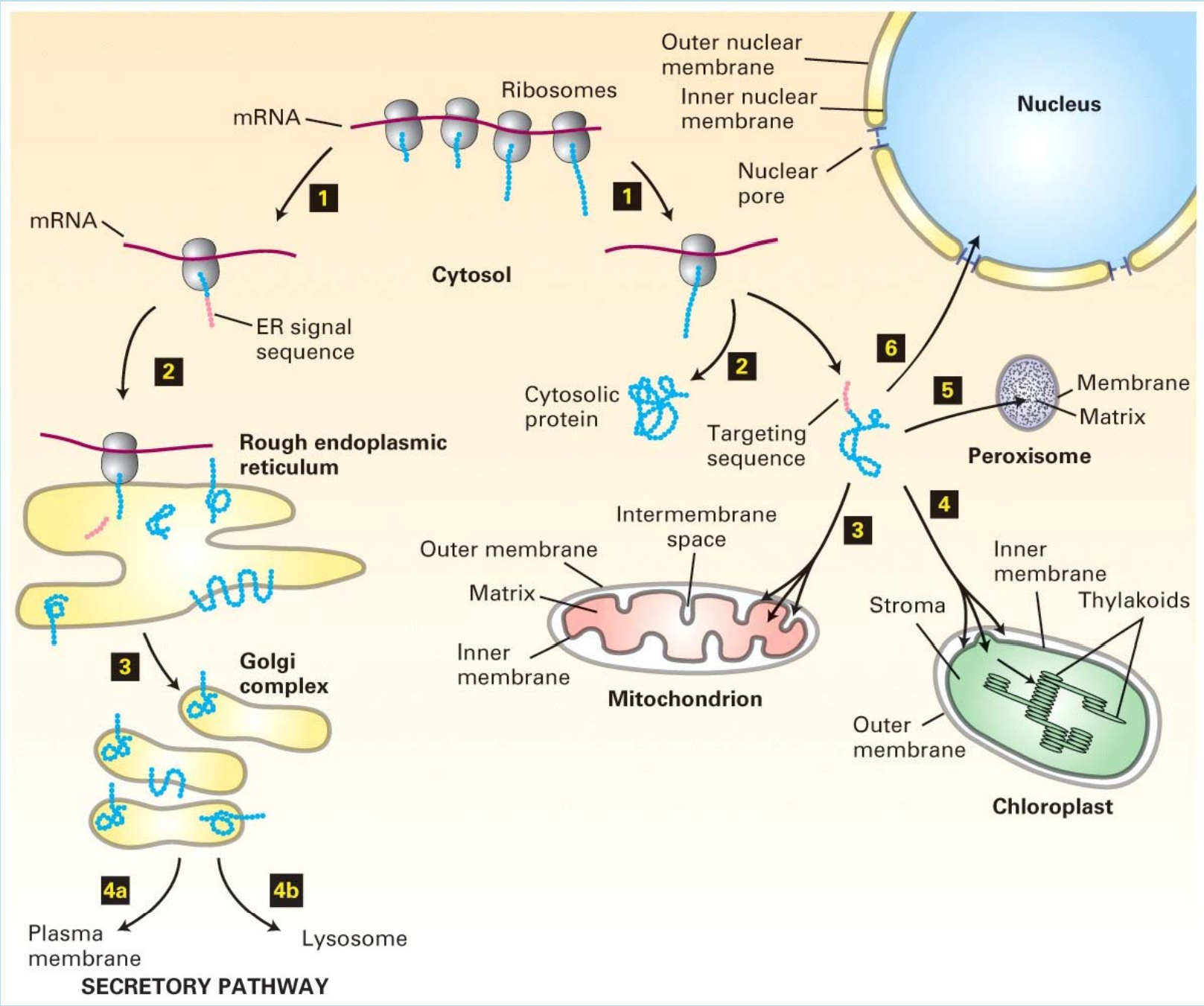
Localizzazione delle proteine

- ***Citosol***
- ***Membrana citoplasmatica***
- ***Nucleo***
- ***Organelli***
- ***Reticolo endoplasmatico***
- ***Ambiente extracellulare***

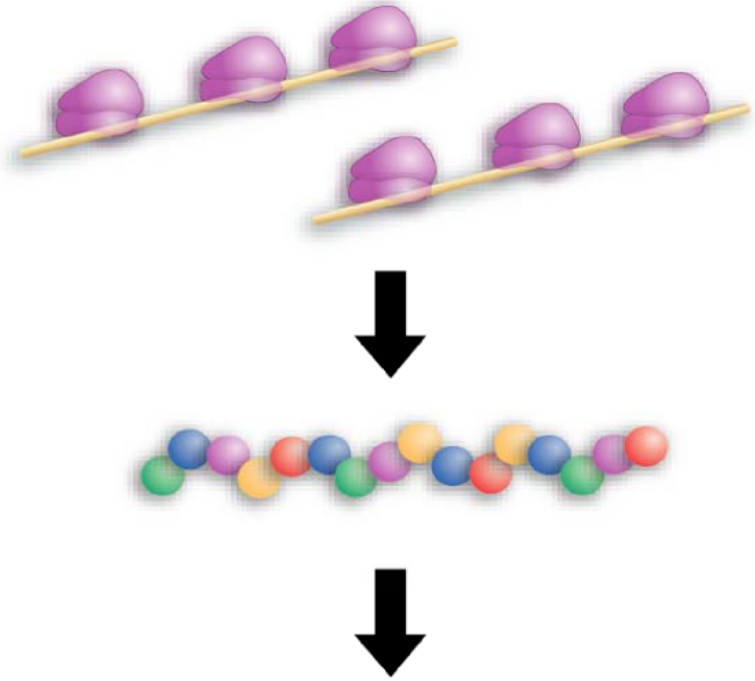
Le proteine si localizzano tramite vie specifiche






Outer nuclear membrane
Inner nuclear membrane
Nucleus
Nuclear pore
Ribosomes
mRNA
1
1
mRNA
Cytosol
ER signal sequence
2
2
Cytosolic protein
6
5
Membrane
Matrix
Peroxisome
Targeting sequence
Rough endoplasmic reticulum
4
3
Intermembrane space
Outer membrane
Matrix
Inner membrane
Mitochondrion
Inner membrane
Thylakoids
Stroma
3
Golgi complex
Outer membrane
Chloroplast
4a
4b
Plasma membrane
Lysosome
SECRETORY PATHWAY

Le proteine sono localizzate tramite brevi segnali

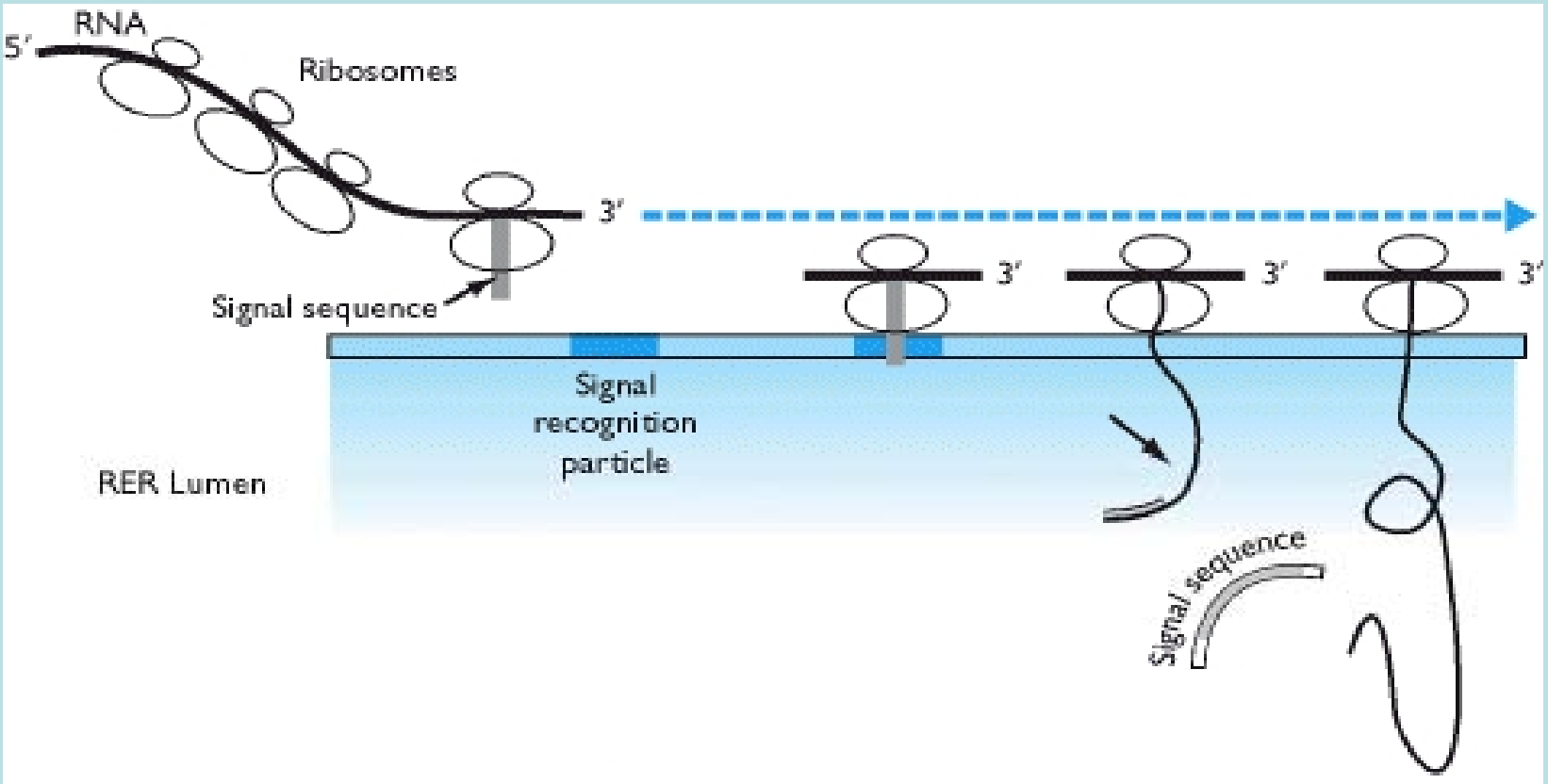


Organello	Localizzazione del segnale	Tipo	Lunghezza del segnale
Mitocondrio	N-terminale	Elica anfipatica	12-30
Cloroplasto	N-terminale	Carica elettrica	>25
Nucleo	Interna	Regione basica o bipartita	4-9
Perossisoma	C-terminale	Breve tetrapeptide	3-4

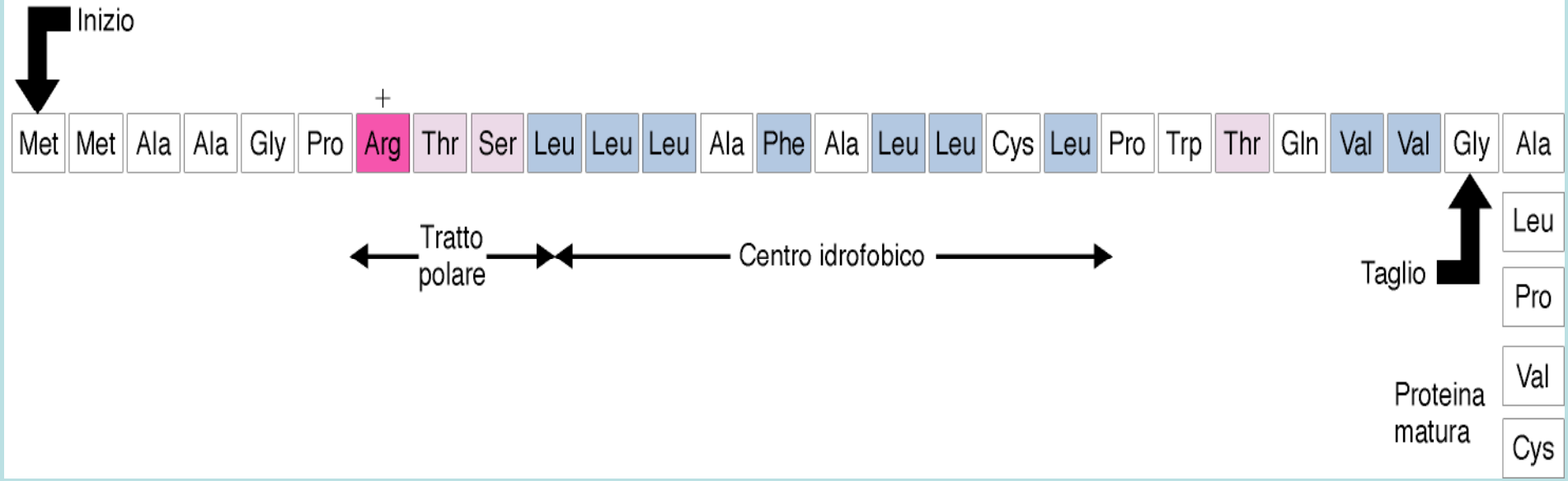
Localizzazione delle proteine

- ***Co-traduzionale***
- ***Post-traduzionale***

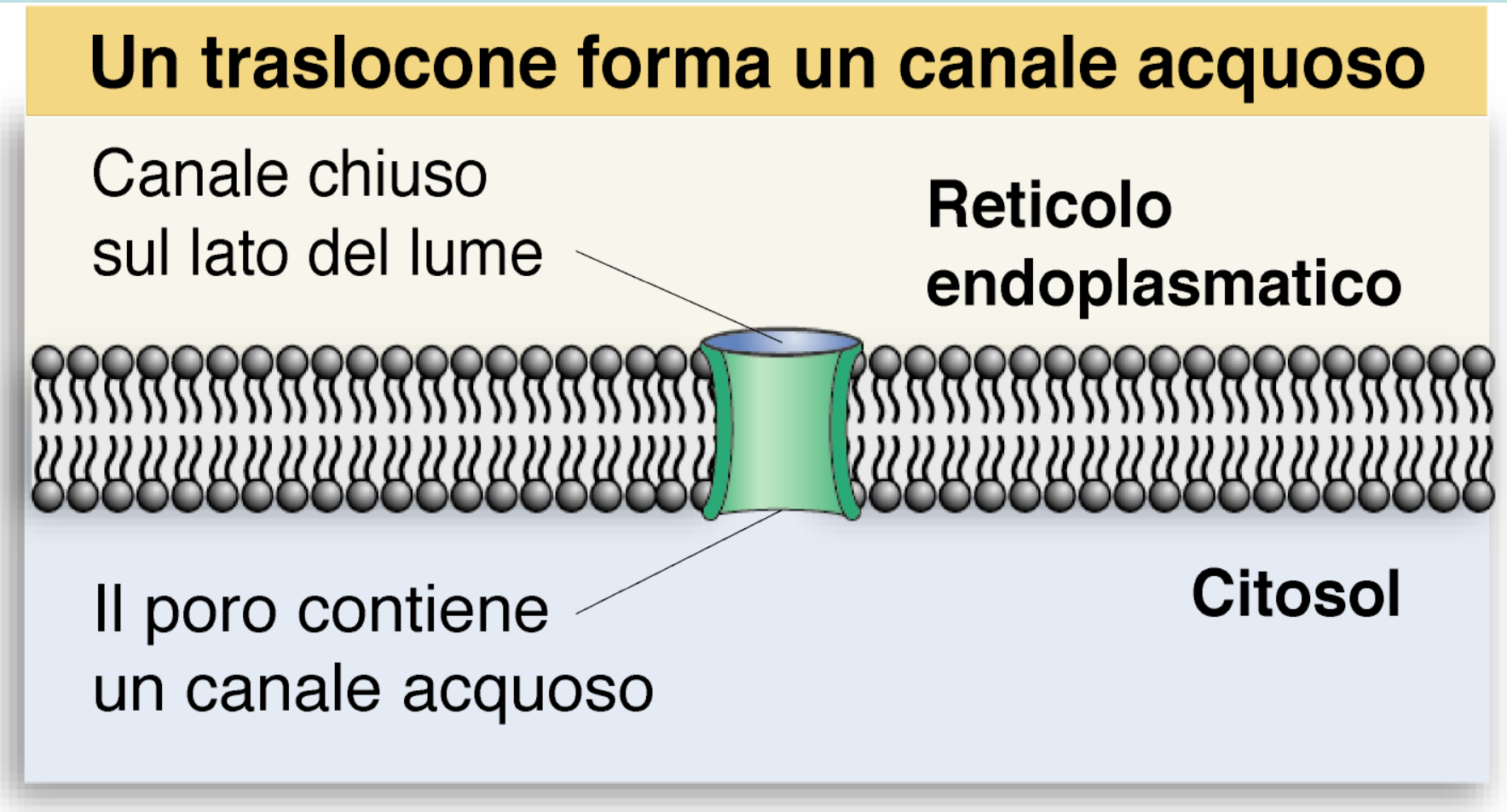
Le proteine possono entrare nell'ER soltanto mentre vengono sintetizzate

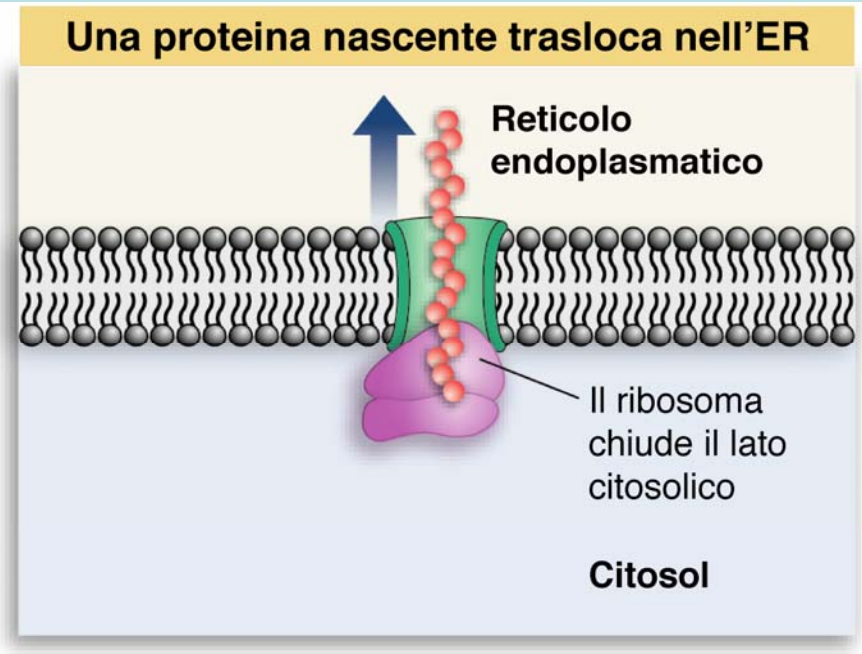


Una sequenza segnale N-terminale è idrofobica



Un traslocone forma un canale acquoso





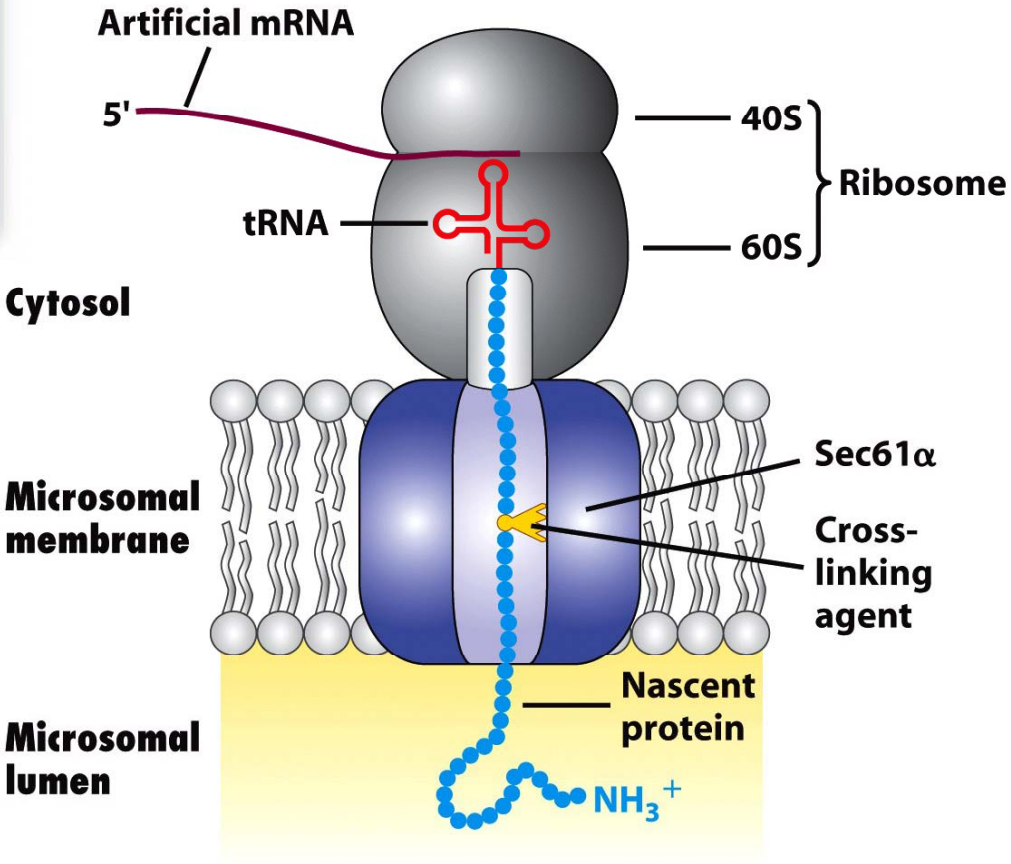


Figure 13-7
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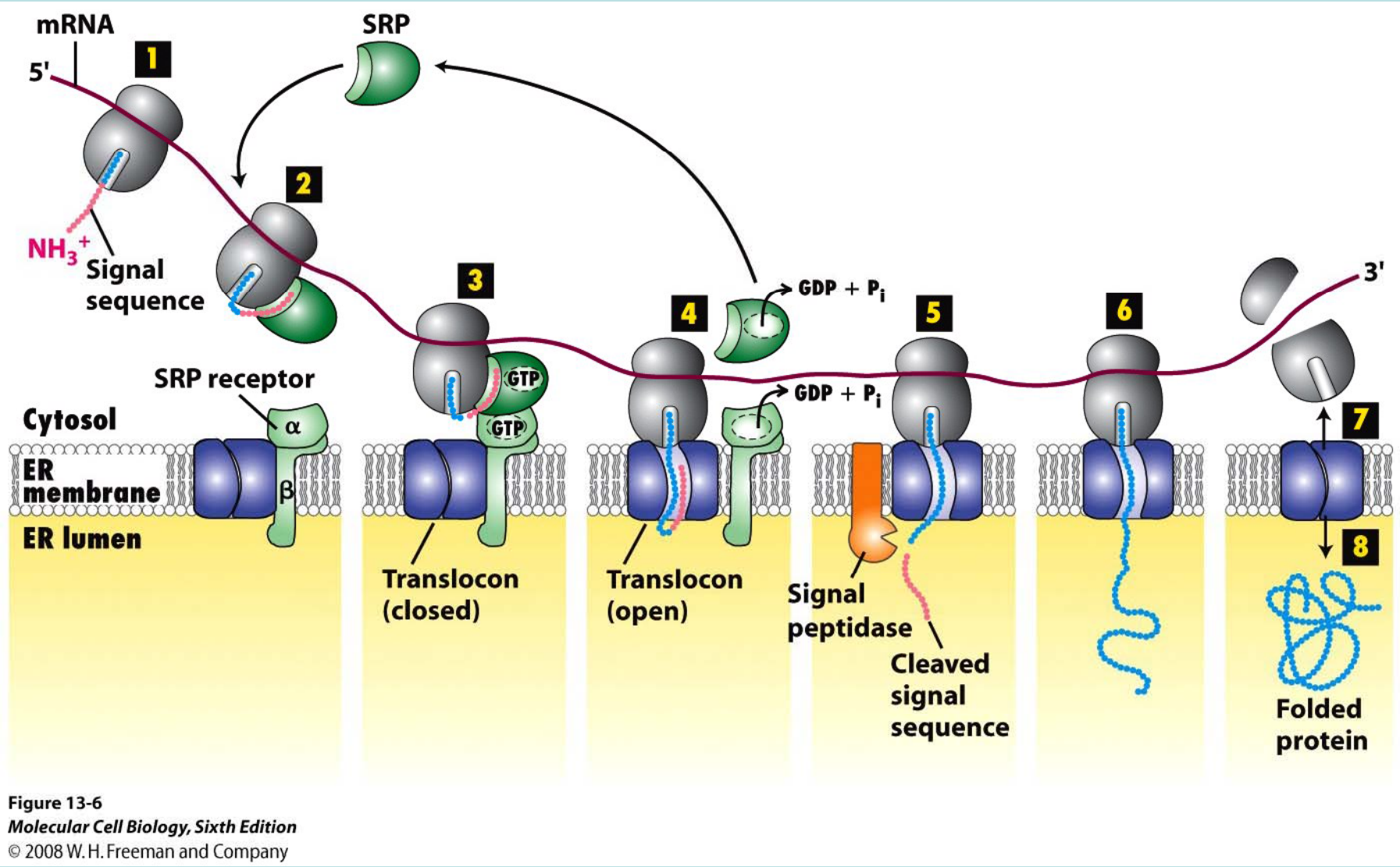

Figure 13-6
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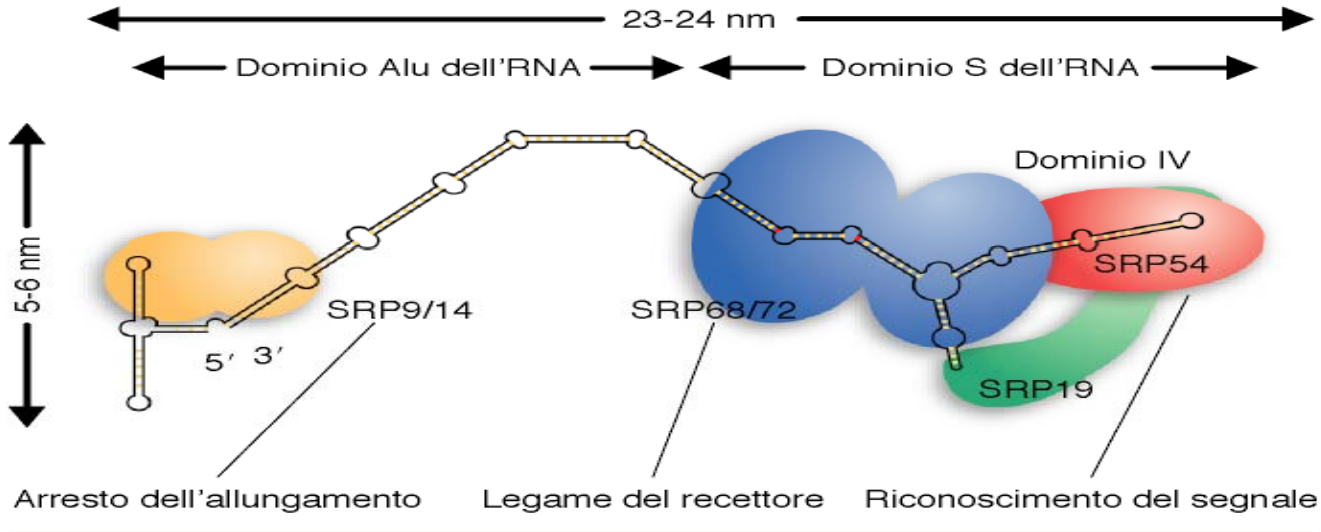
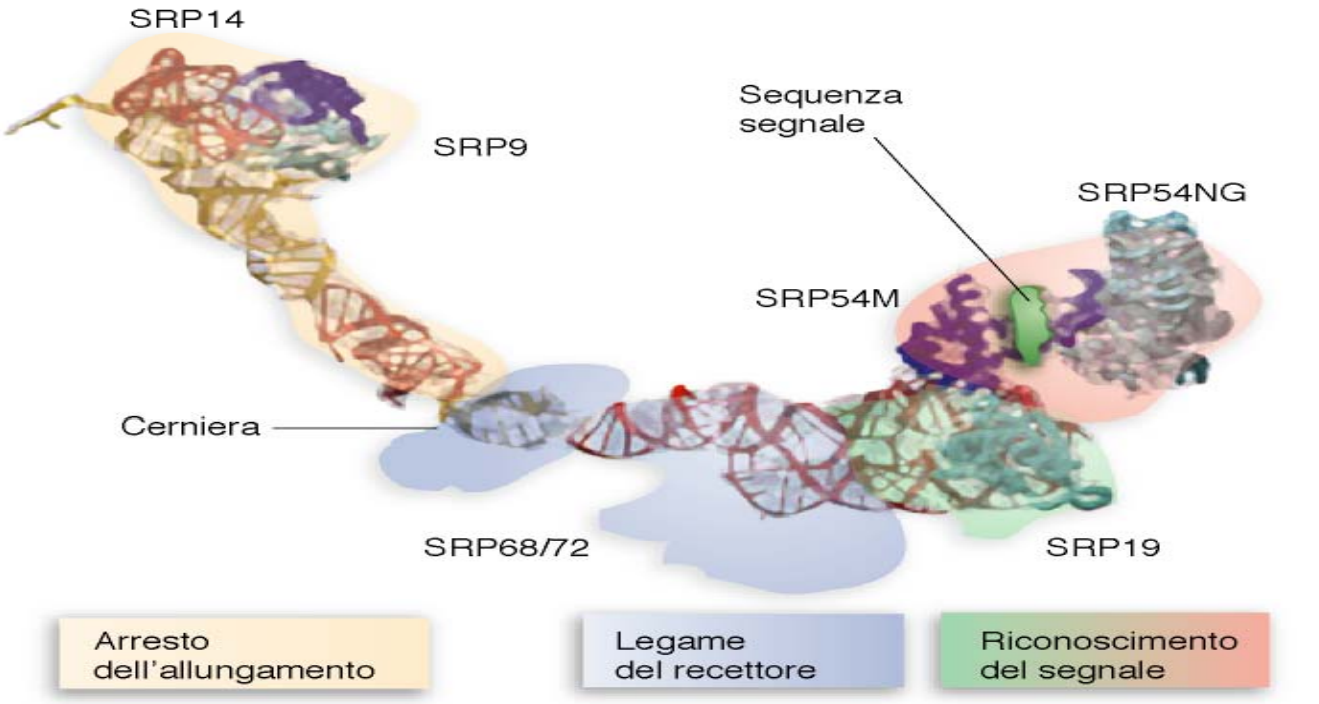
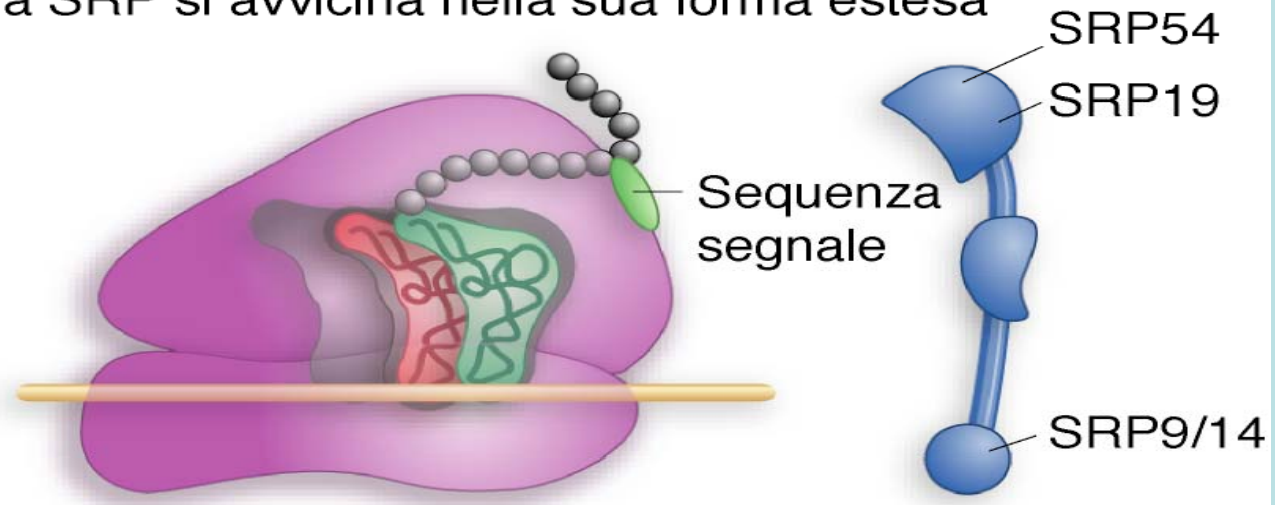
La SRP è composta da RNA 7S + 6 proteine



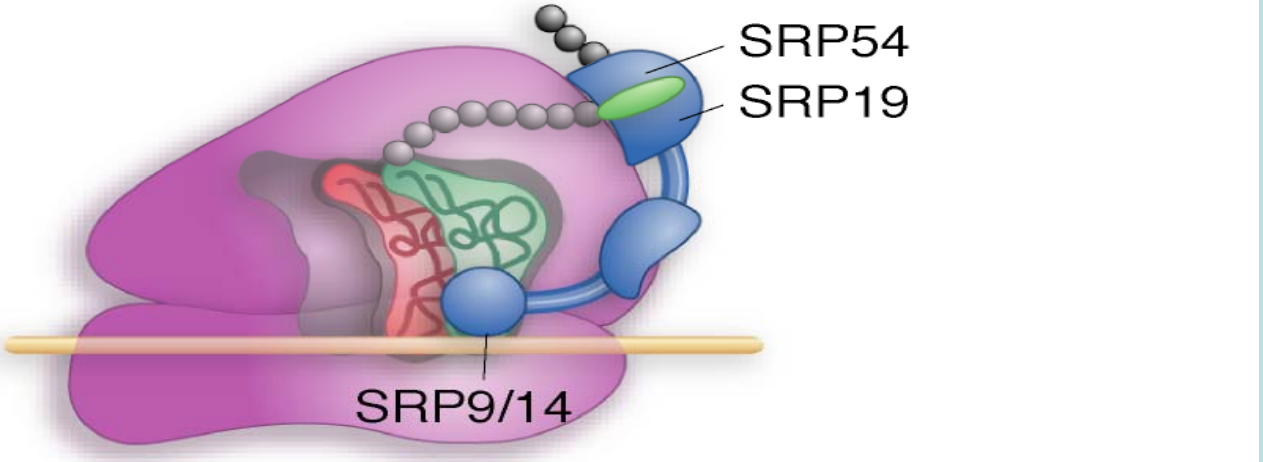


Il legame del segnale provoca un cambiamento conformazionale nella SRP

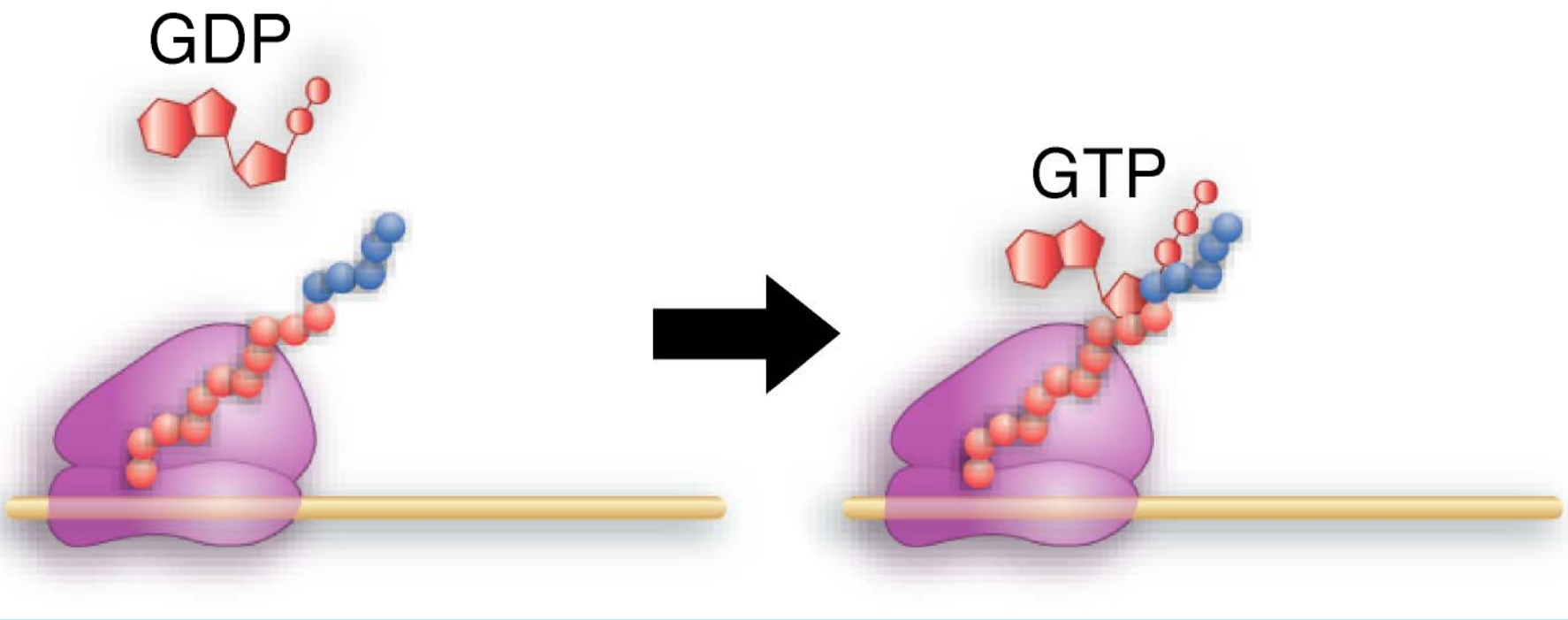
La sequenza segnale emerge dal ribosoma;
la SRP si avvicina nella sua forma estesa



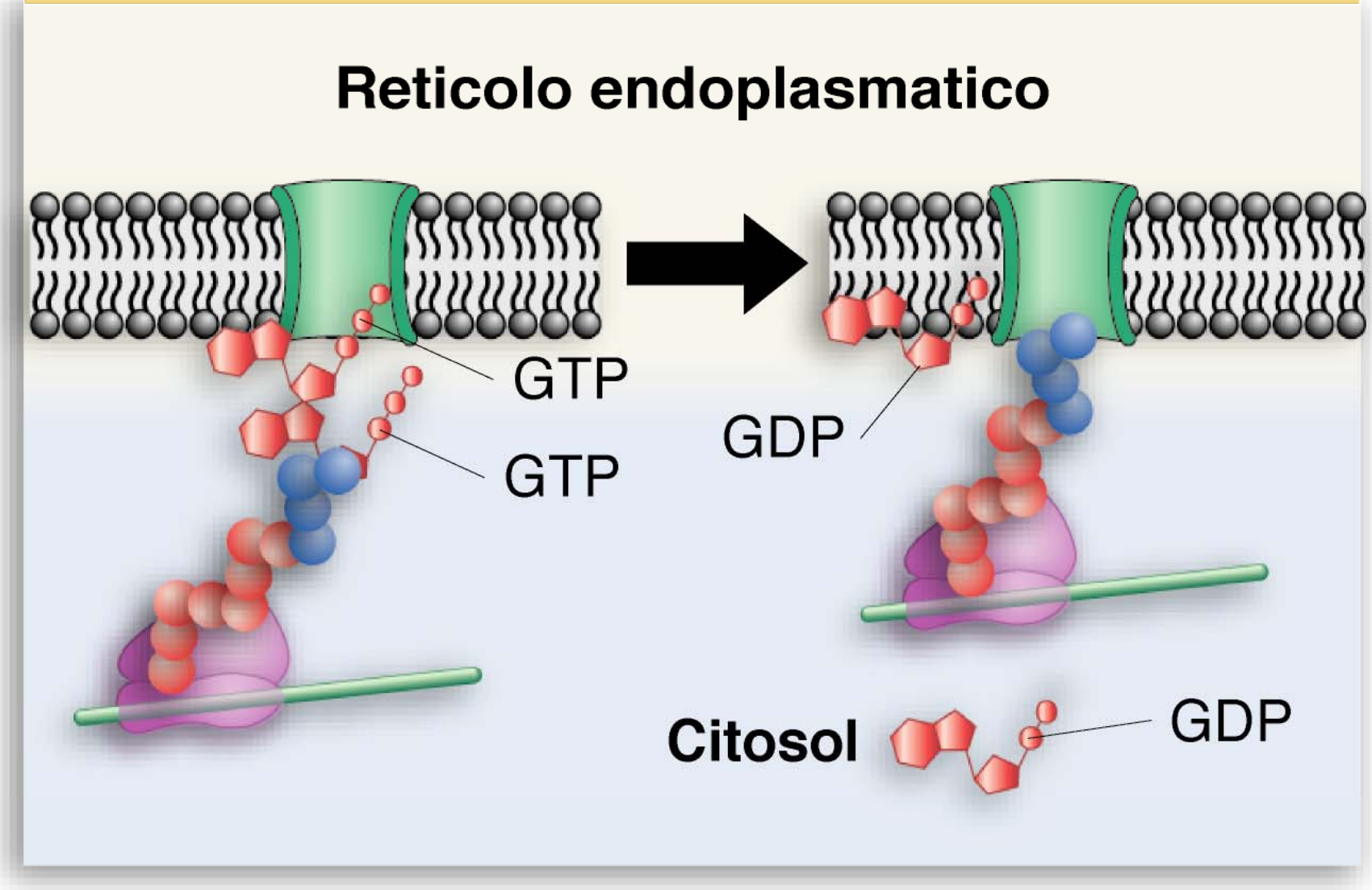
La SRP si lega alla sequenza segnale e si piega a livello della "cerniera" prendendo contatto col ribosoma



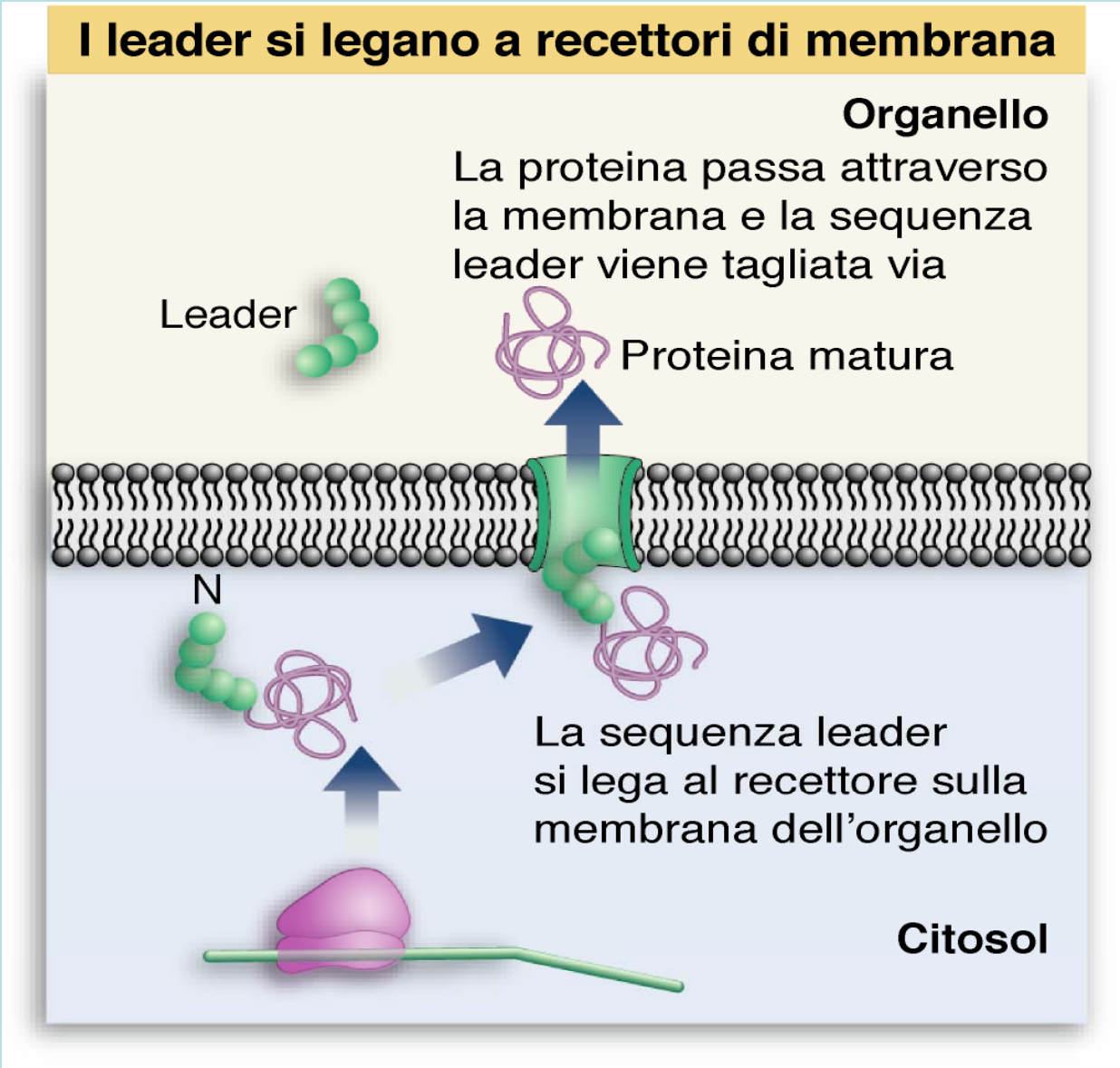
Il ribosoma converte SRP-GDP in SRP-GTP



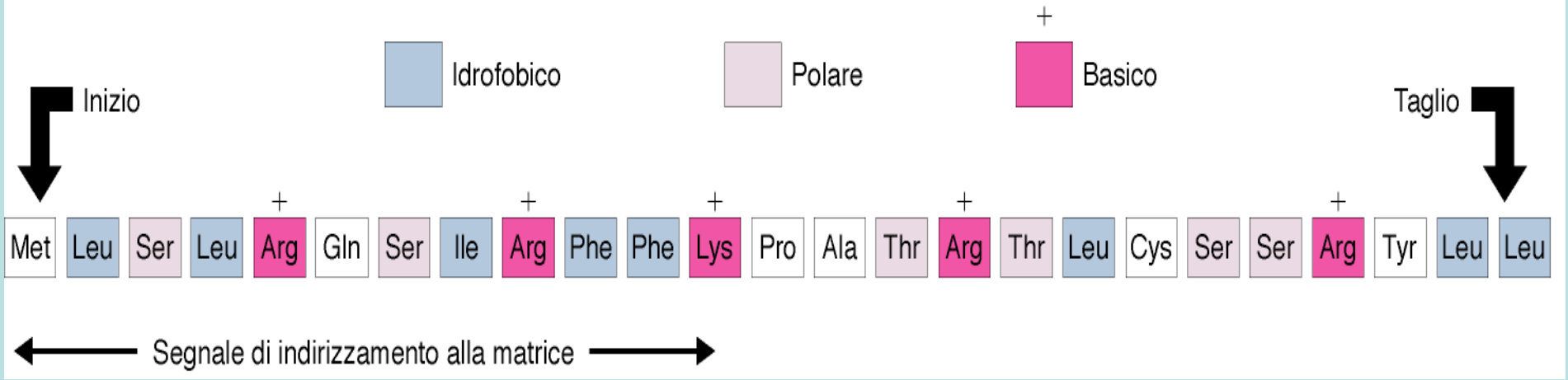
L'idrolisi del GTP mette termine all'interazione SRP-recettore

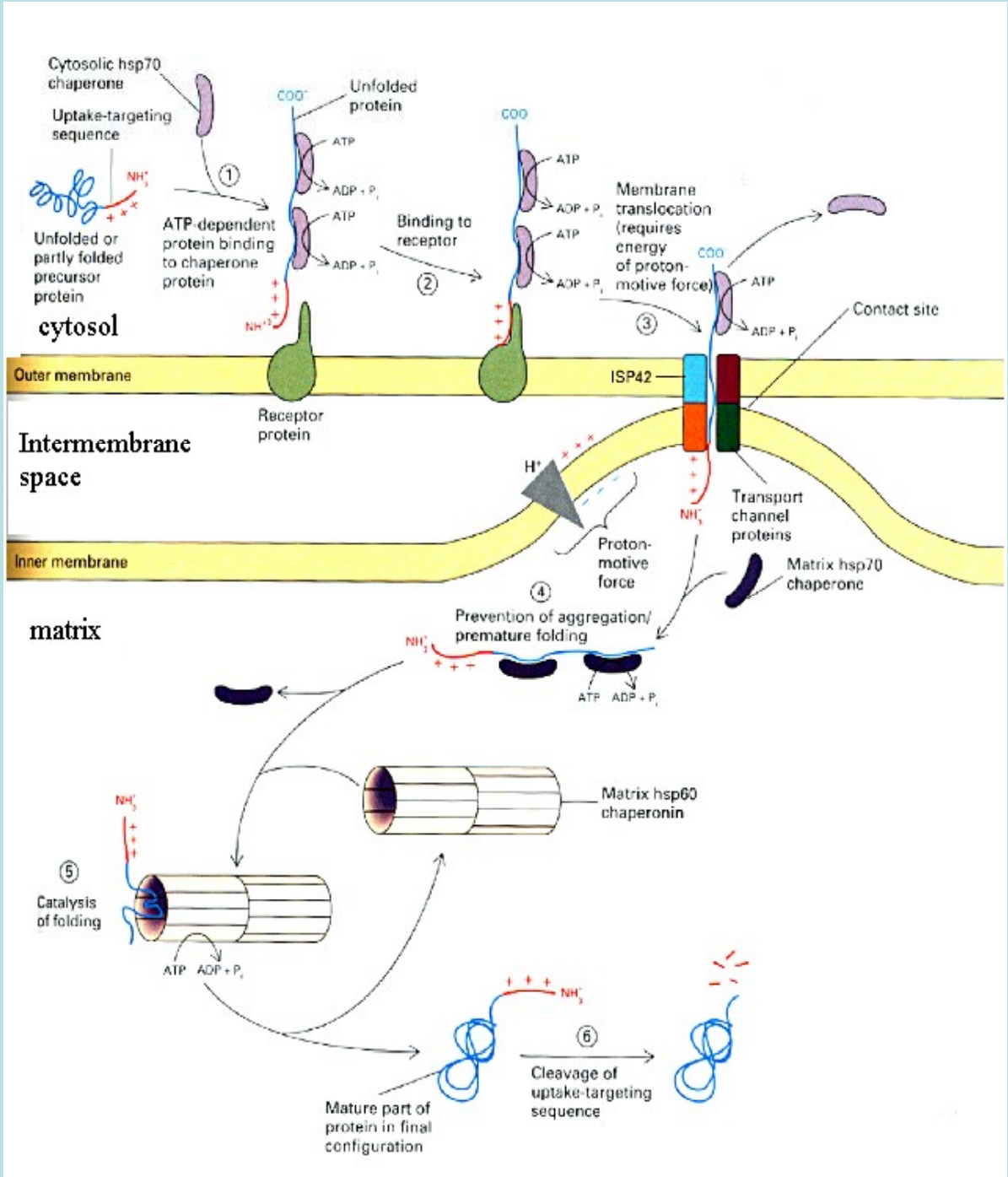


Traslocazione negli organelli



I segnali per l'indirizzamento ai mitocondri sono N-terminali

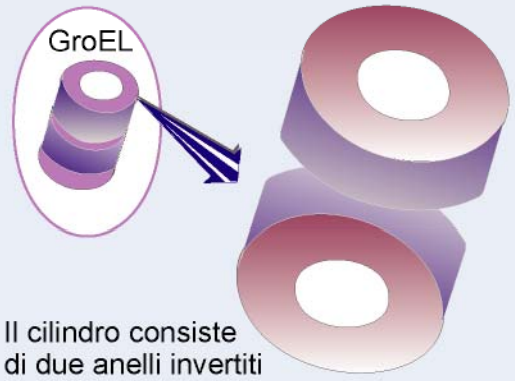




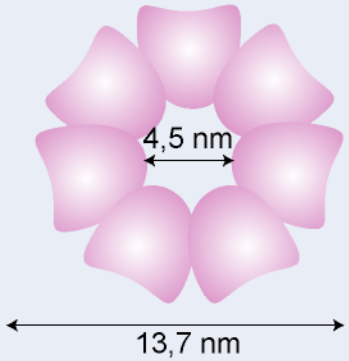
Le proteine vengono sintetizzate nel citosol in forma non ripiegata o parzialmente ripiegata. Esistono proteine che interagiscono con queste e le mantengono solubili in forma non ripiegata (unfolded) prima e dopo la traslocazione (chaperoni) e che le aiutano a raggiungere la forma correttamente ripiegata (folded) all'interno della matrice (chaperonine).

GroEL ha due anelli sovrapposti

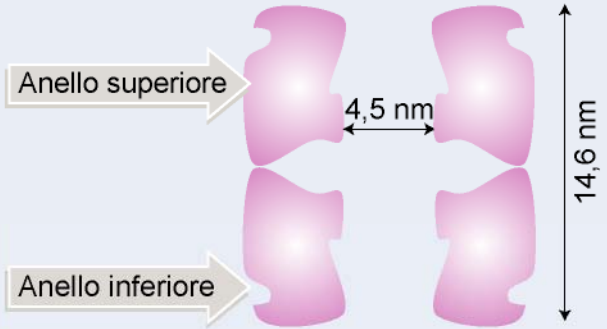
Struttura generale: due cilindri sovrapposti invertiti

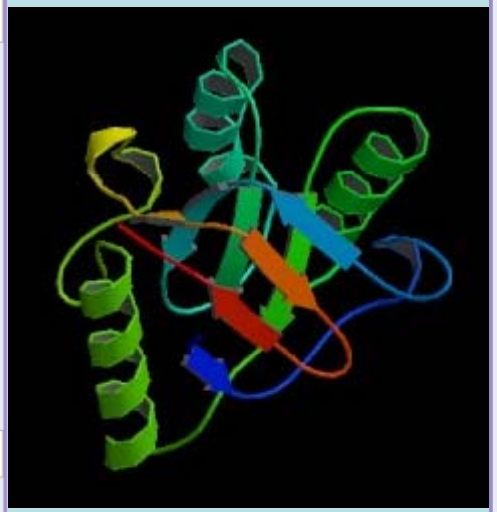


Vista dall'alto: simmetria a sette assi con un foro centrale



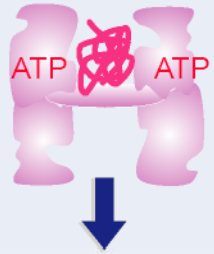
Vista laterale: gli anelli hanno orientamenti invertiti



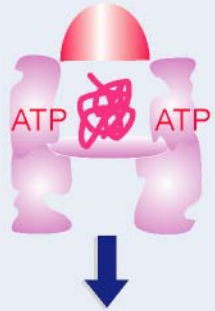


Per il ripiegamento è necessaria idrolisi di ATP

La cavità prossimale è definita dall'attacco di substrato + ATP

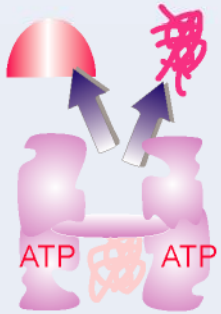


L'attacco di GroES allarga la cavità prossimale



Idrolisi dell'ATP prossimale

Substrato + ATP si attaccano alla cavità distale. GroES e substrato sono rilasciati dalla cavità prossimale



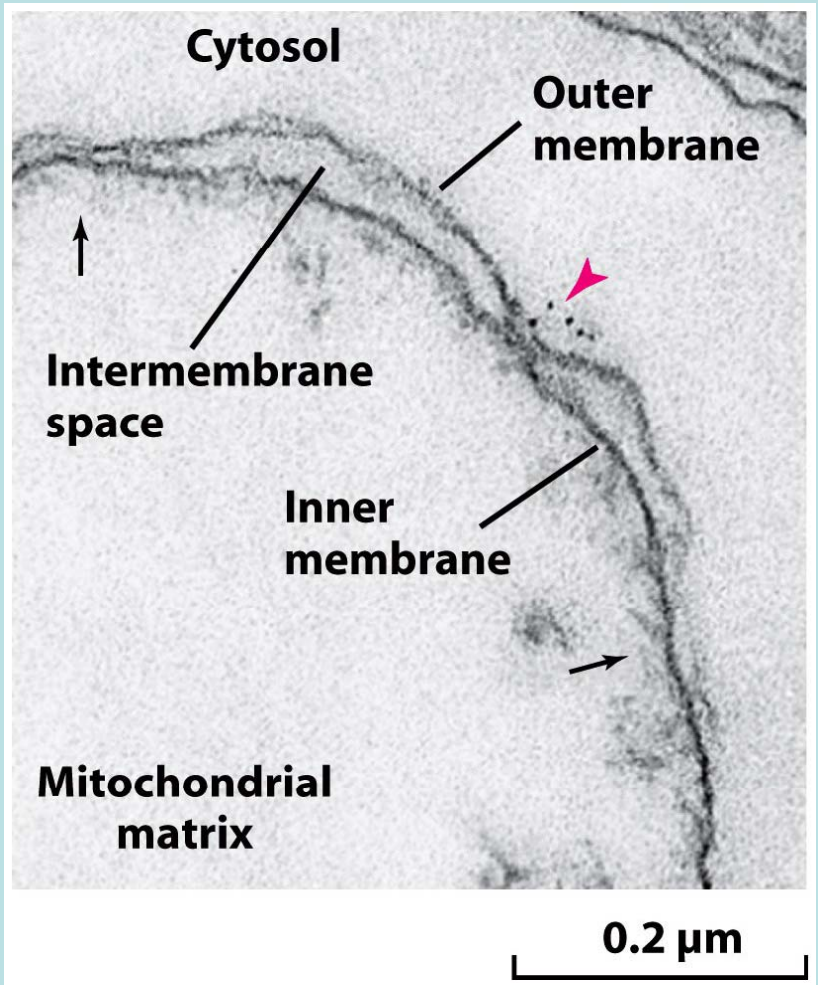


Figure 13-24c
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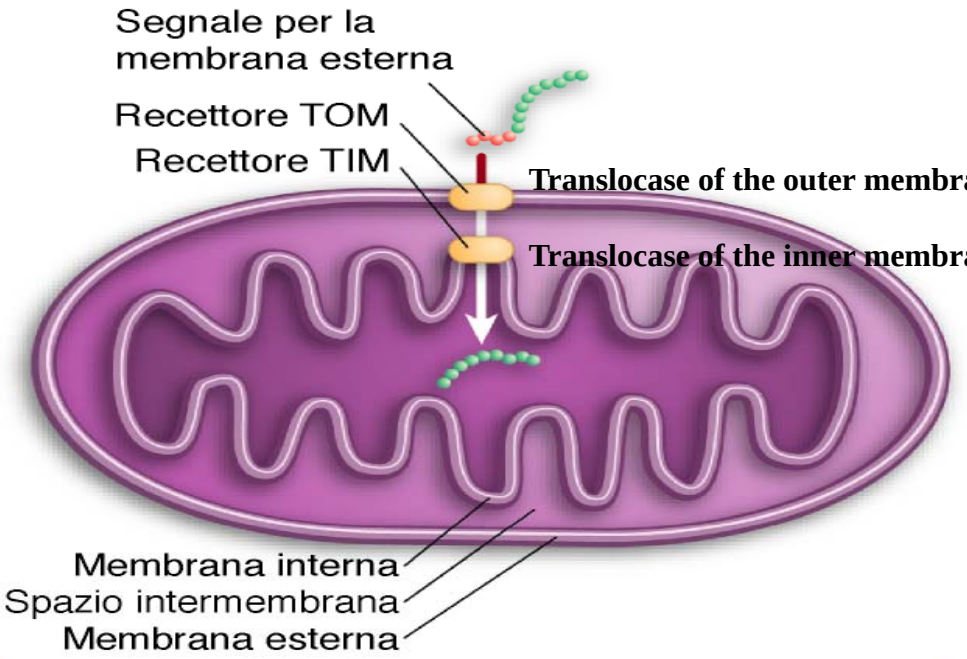
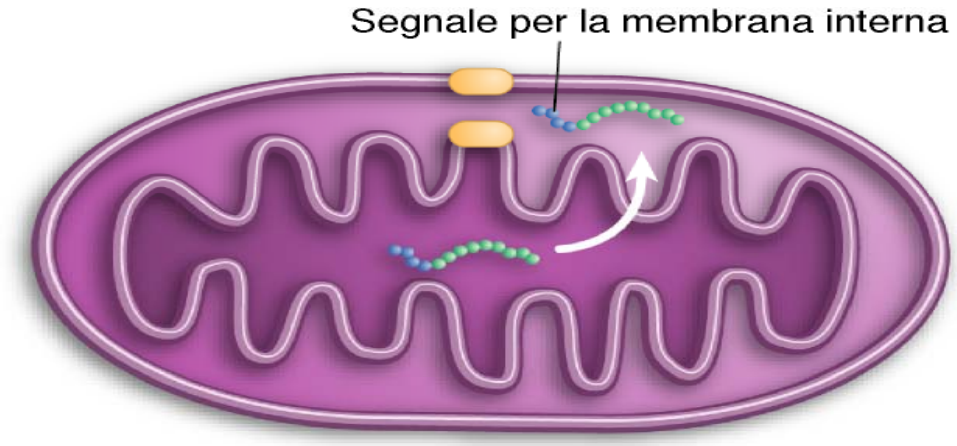
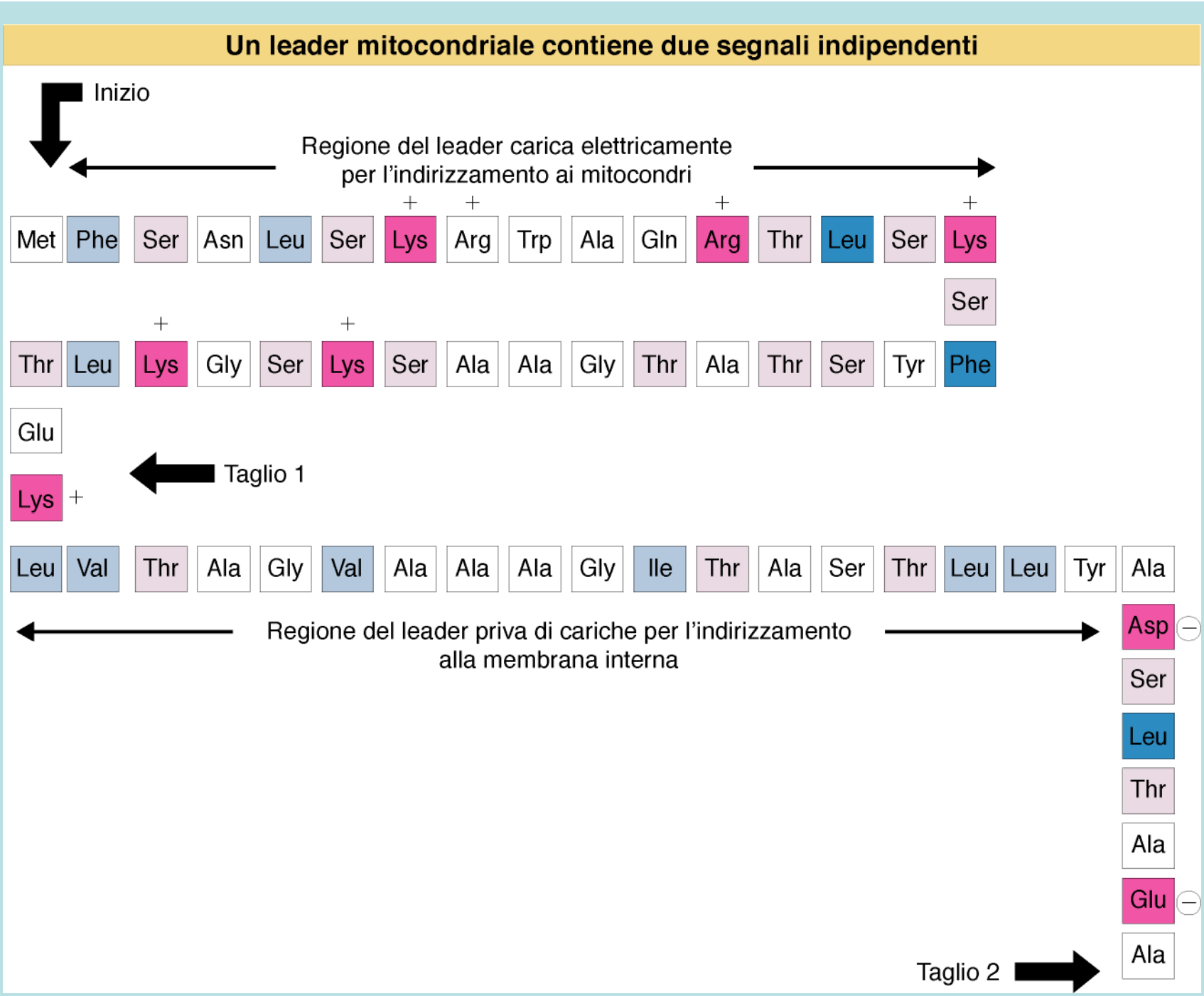
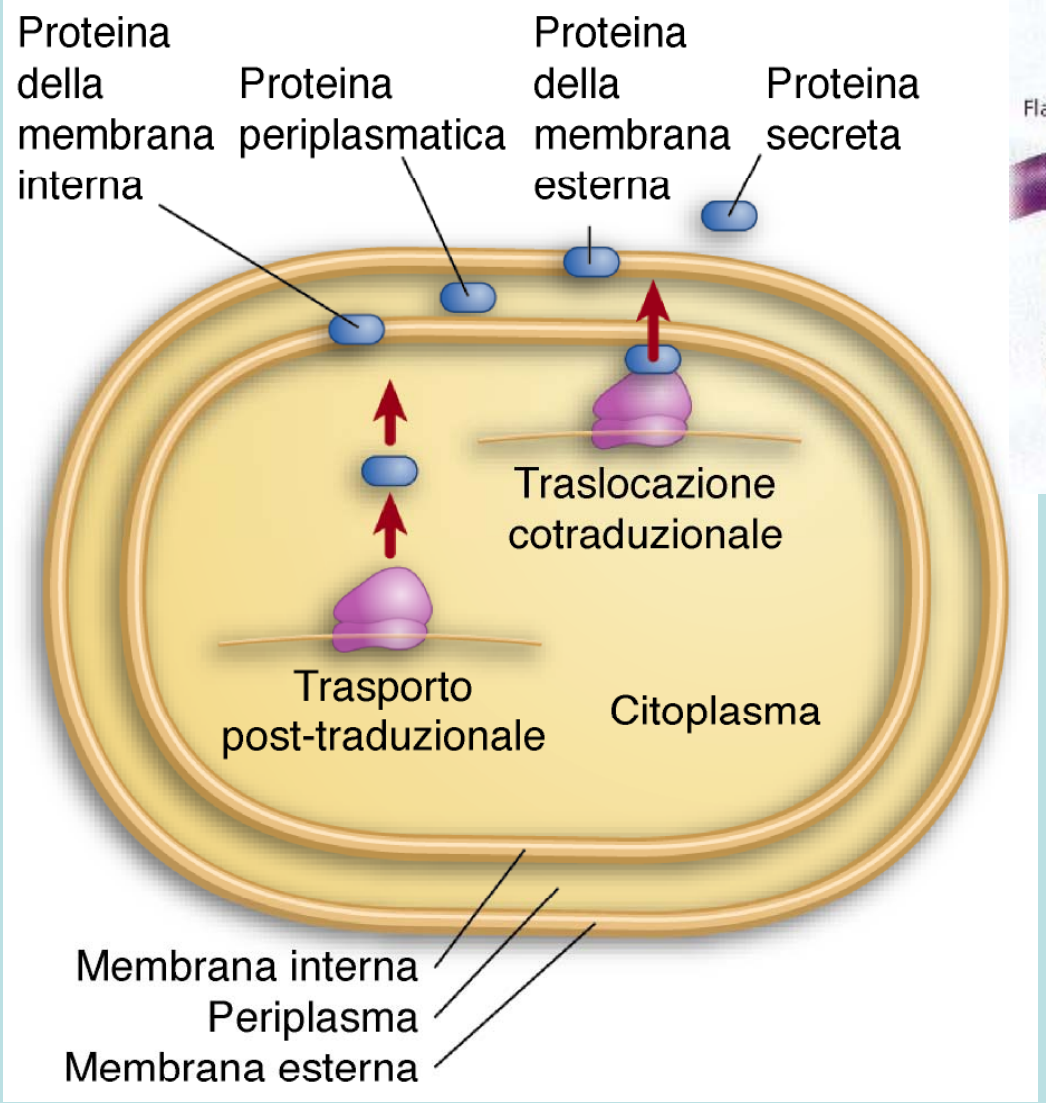
I segnali gerarchici sono indipendenti nel loro funzionamento

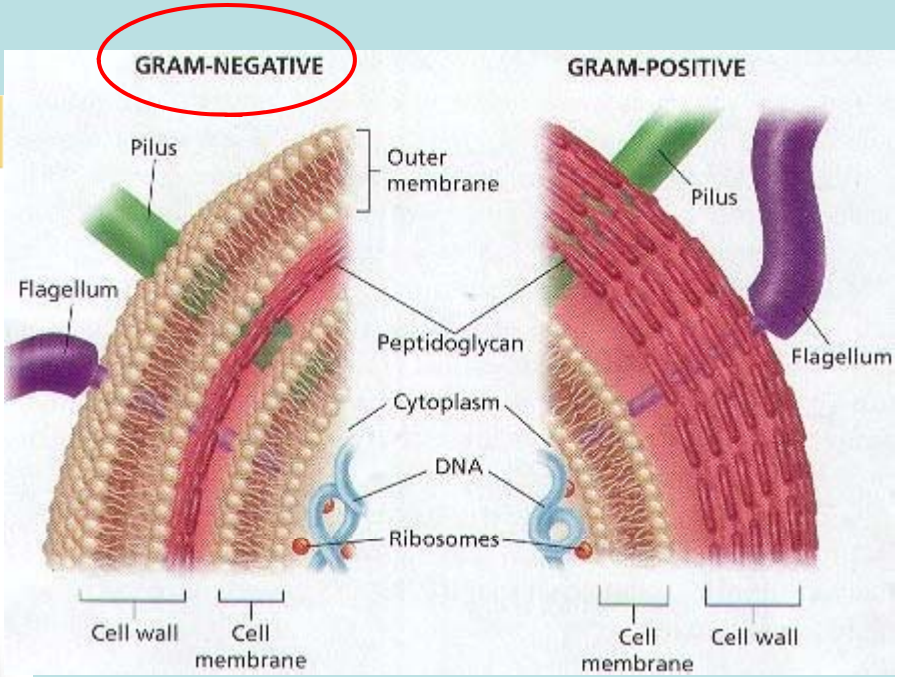


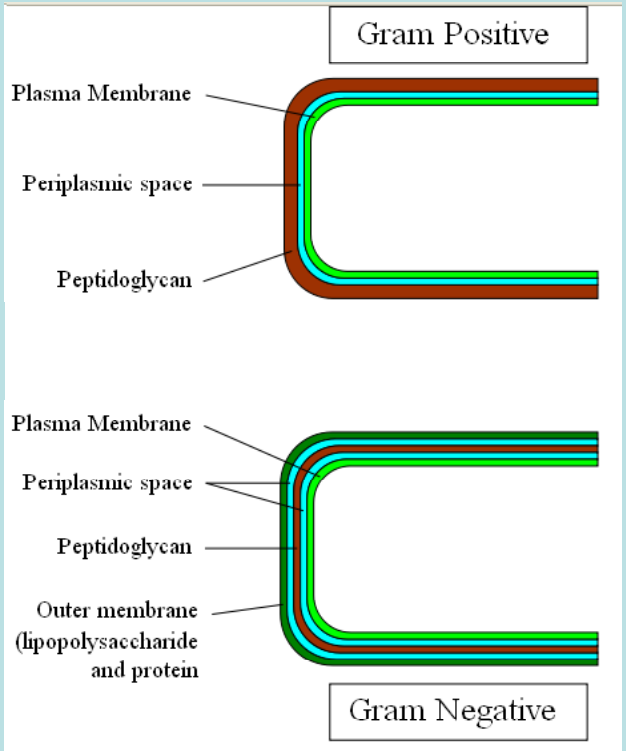



Un leader mitocondriale contiene due segnali indipendenti
Inizio
Regione del leader carica elettricamente per l'indirizzamento ai mitocondri
Met Phe Ser Asn Leu Ser Lys Arg Trp Ala Gln Arg Thr Leu Ser Lys
Ser
Thr Leu Lys Gly Ser Lys Ser Ala Ala Gly Thr Ala Thr Ser Tyr Phe
Glu
Lys
Taglio 1
Leu Val Thr Ala Gly Val Ala Ala Ala Gly Ile Thr Ala Ser Thr Leu Leu Tyr Ala
Regione del leader priva di cariche per l'indirizzamento alla membrana interna
Asp
Ser
Leu
Thr
Ala
Glu
Ala
Taglio 2

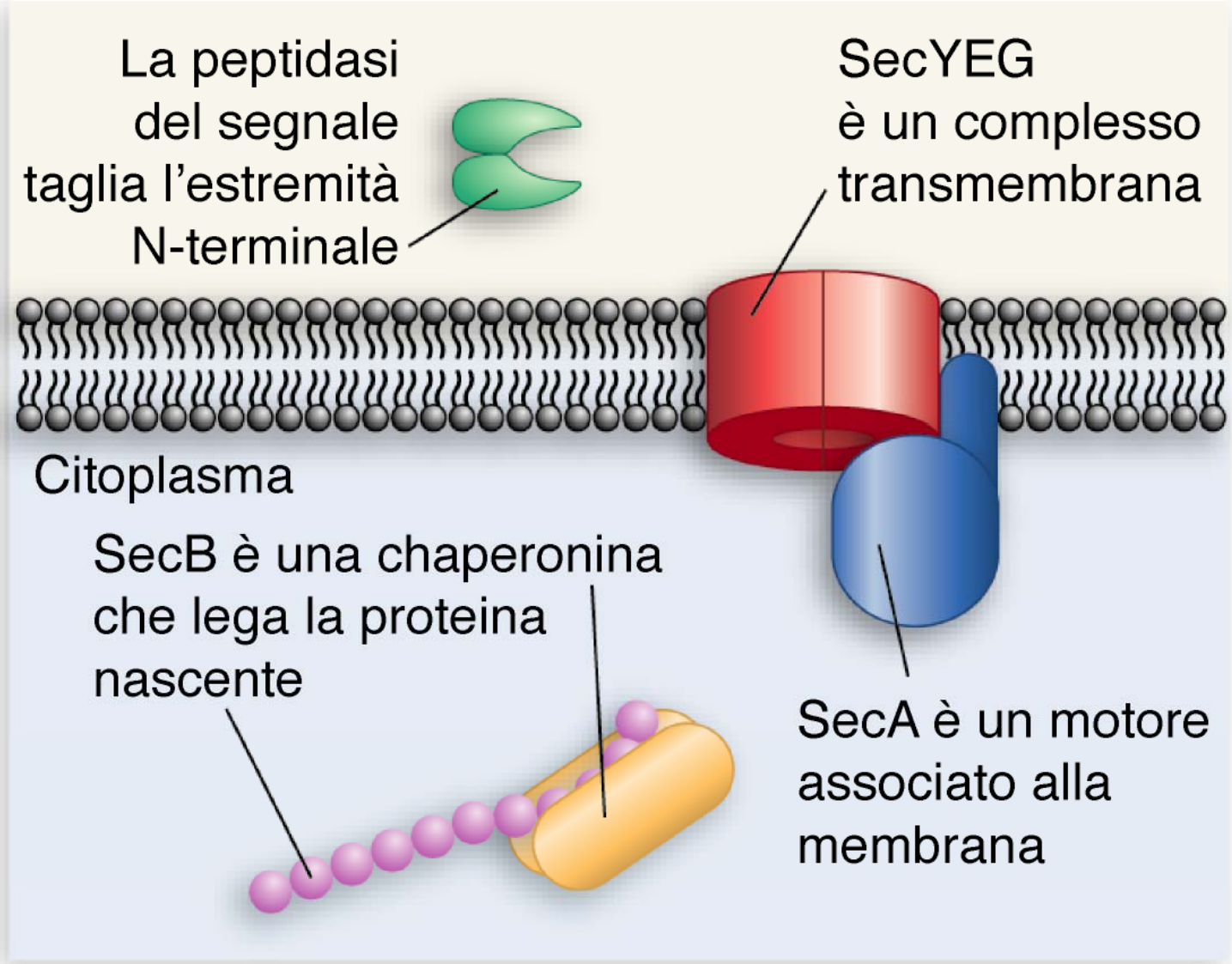
I batteri hanno due membrane

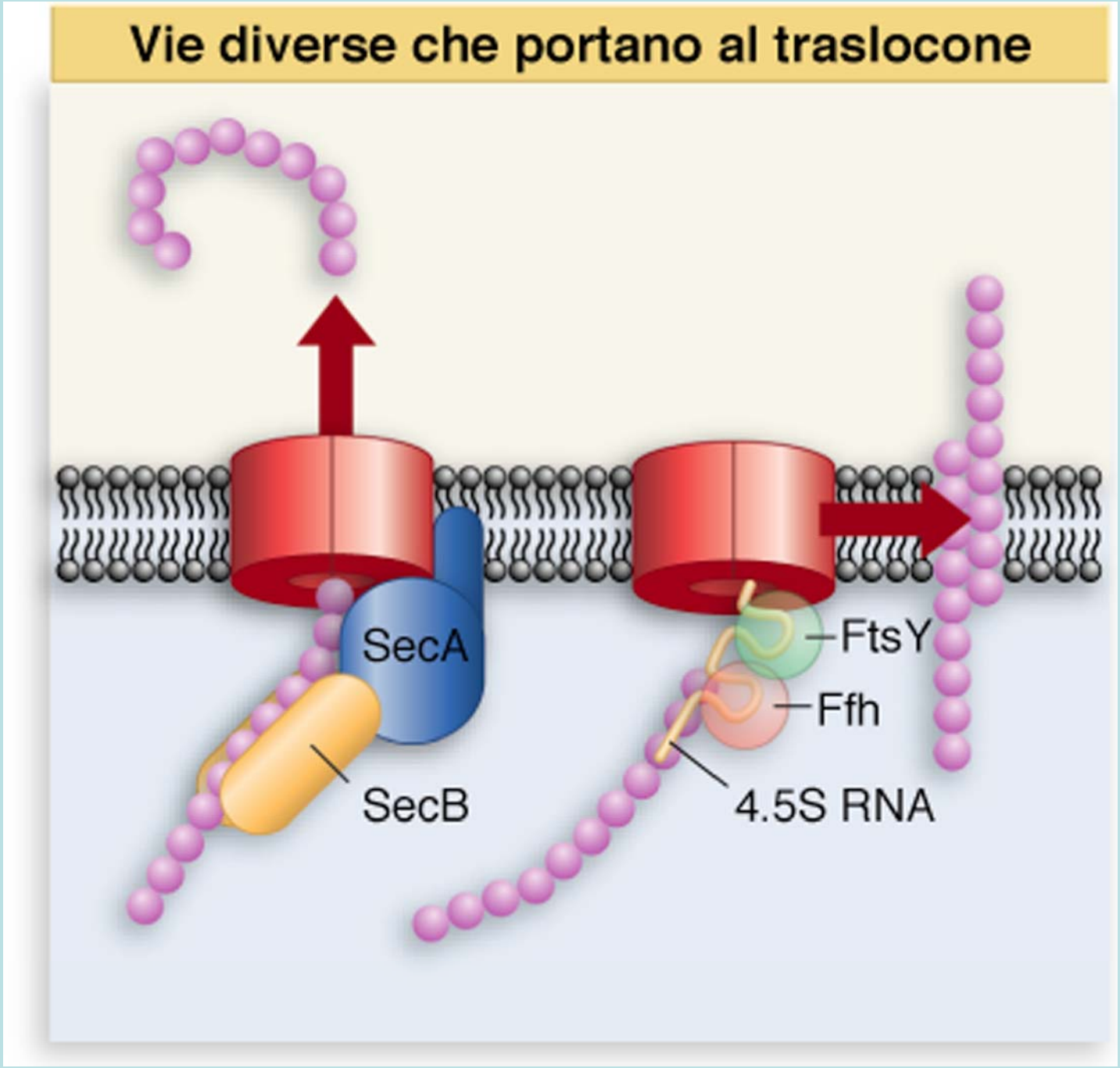


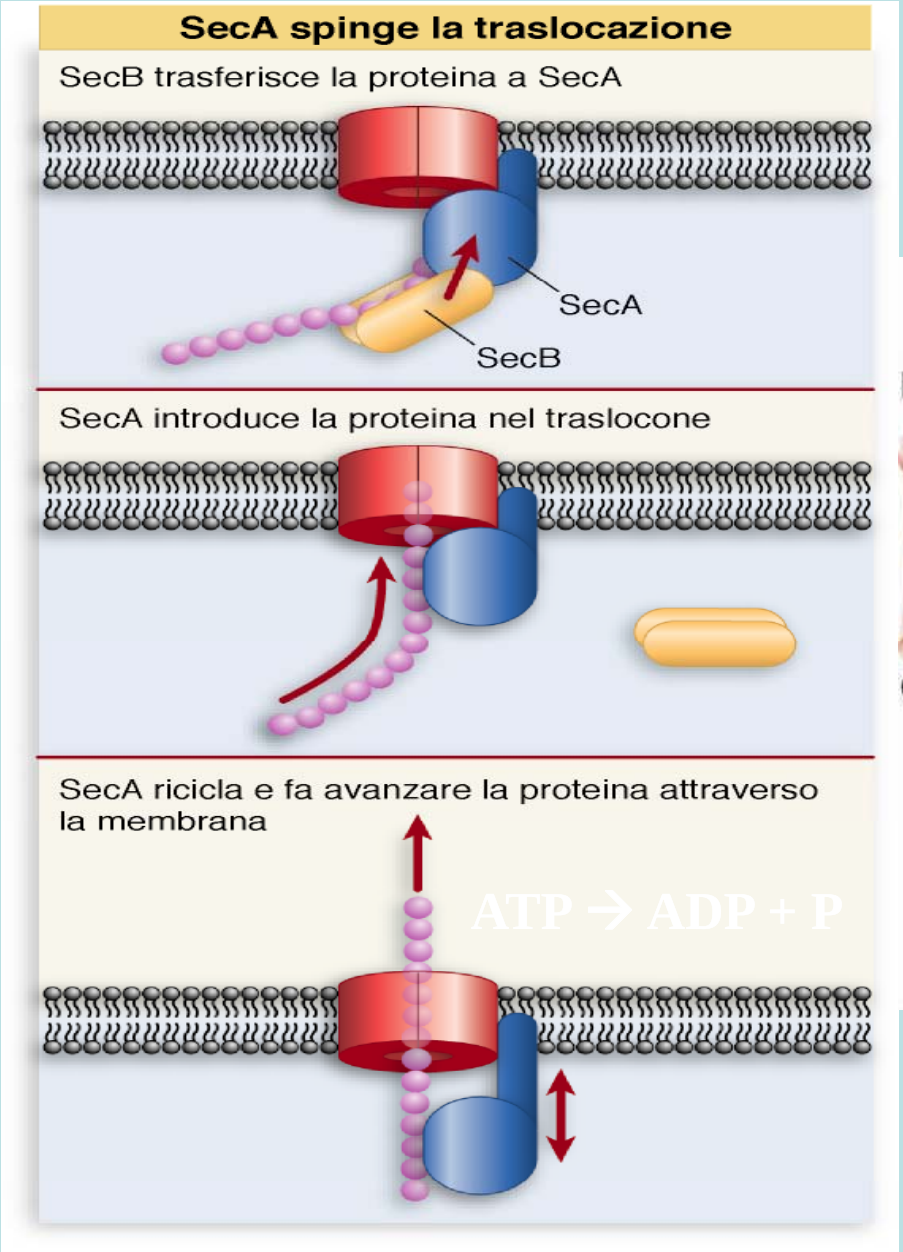


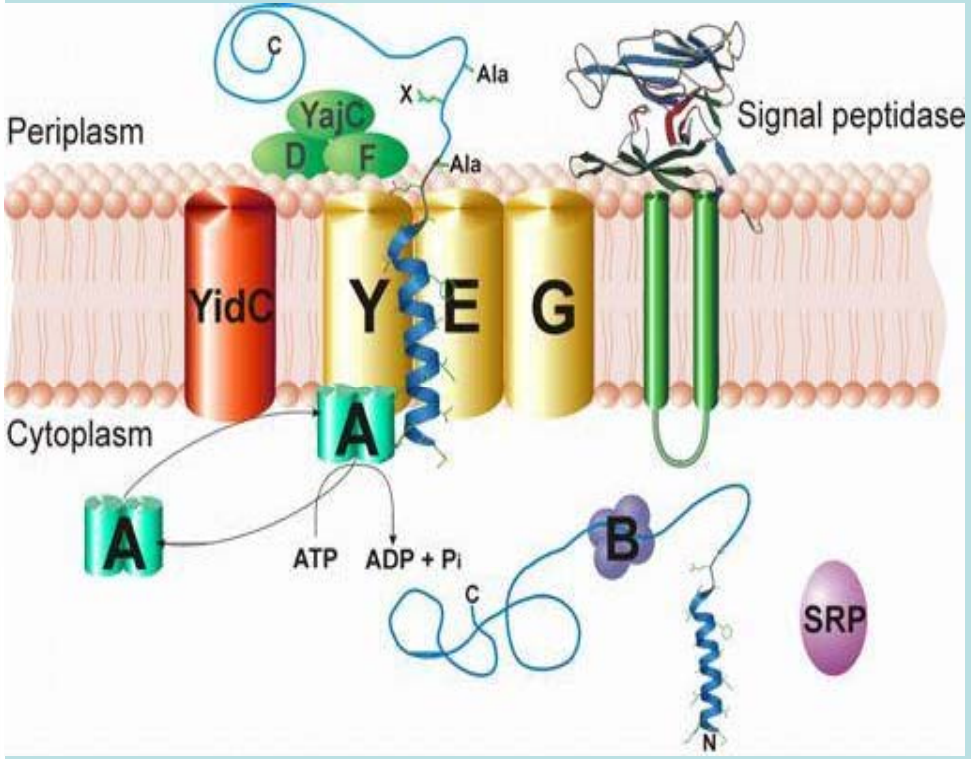


La traslocasi Sec è deputata al trasporto delle proteine batteriche



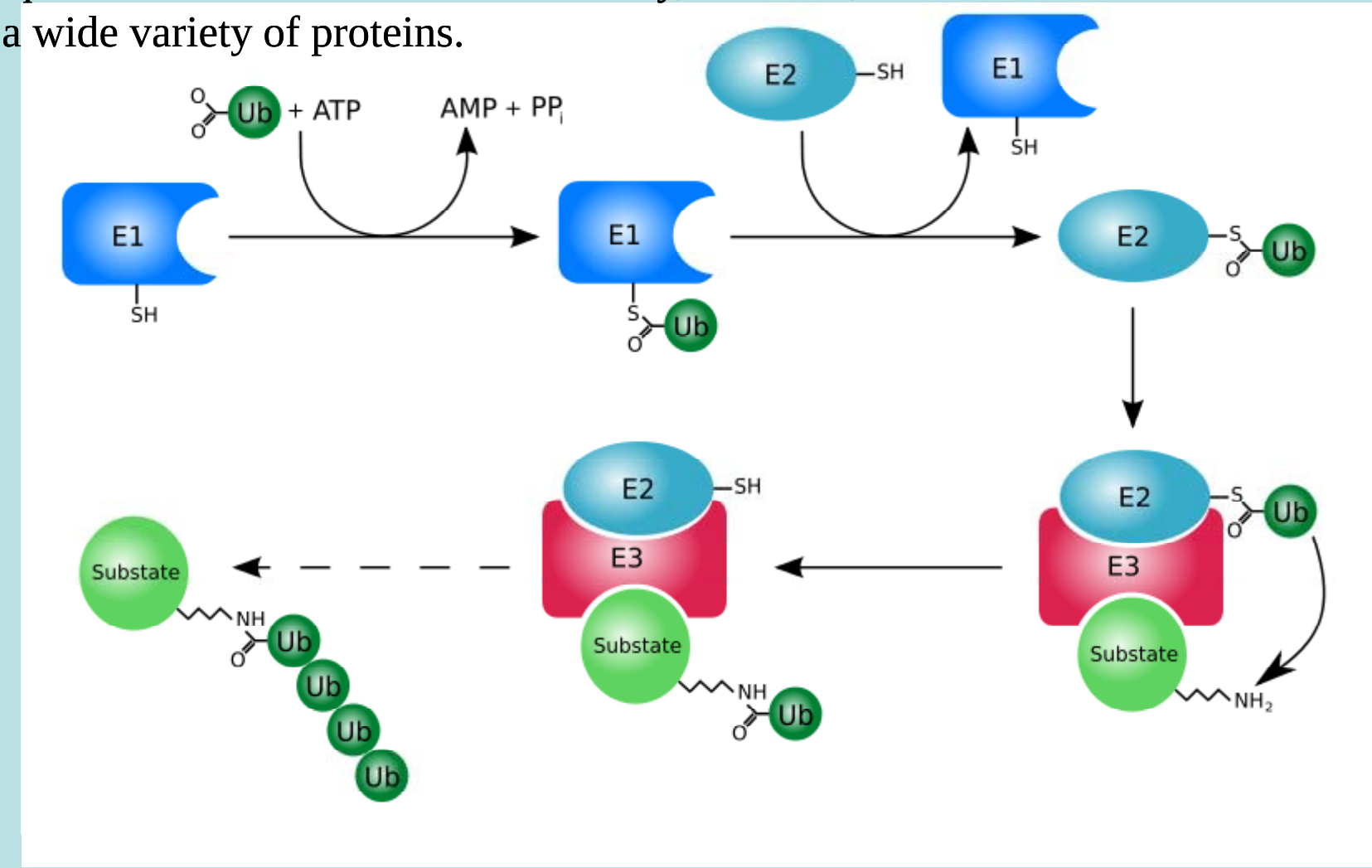

Vie diverse che portano al traslocone
SecA
SecB
FtsY
Ffh
4.5S RNA

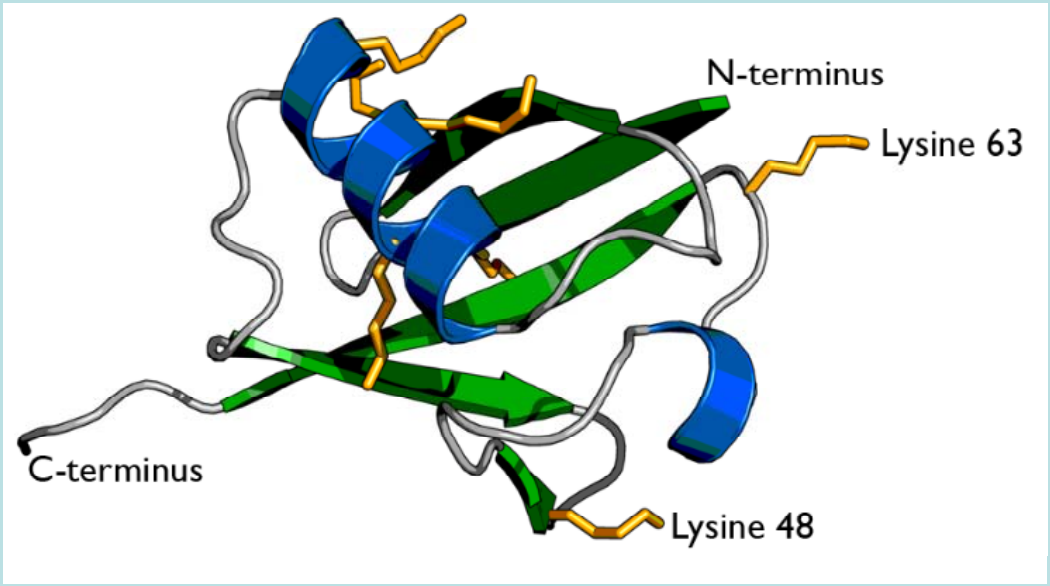

SecA spinge la traslocazione
SecB trasferisce la proteina a SecA
SecA
SecB
SecA introduce la proteina nel traslocone
SecA ricicla e fa avanzare la proteina attraverso la membrana
ATP → ADP + P


Periplasm
Cytoplasm
YajC
D
F
X
Ala
Ala
C
Signal peptidase
YidC
Y
E
G
A
A
ATP
ADP + Pi
B
C
N
SRP

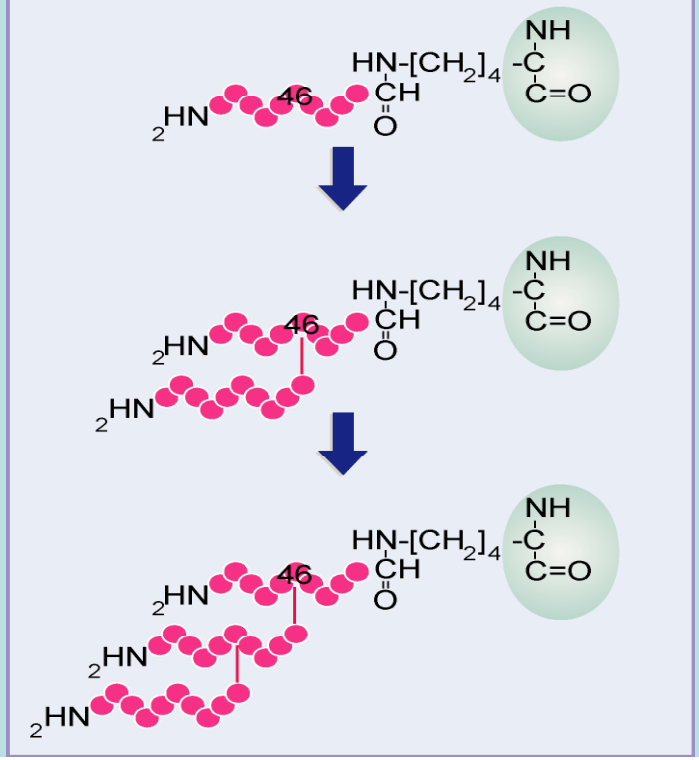
Degrade unneeded or damaged proteins by proteolysis

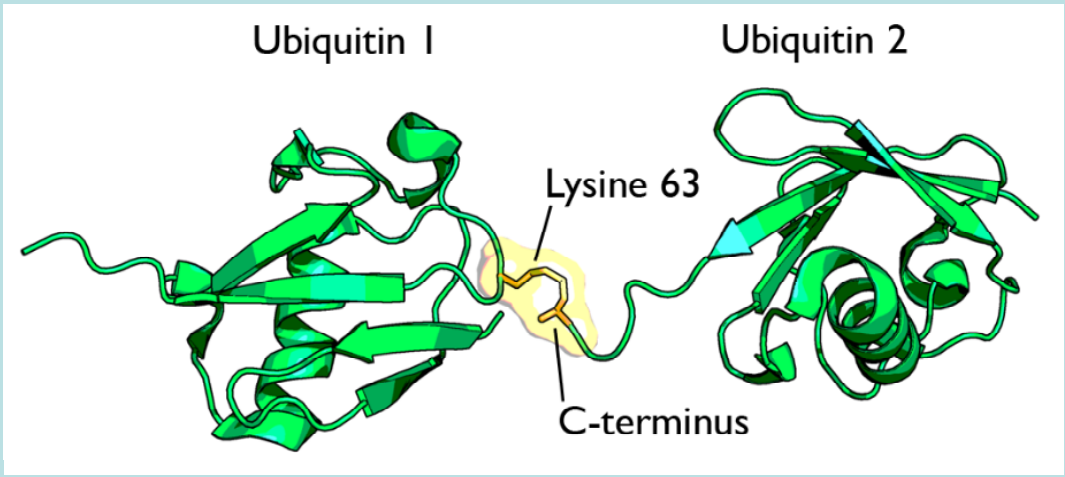
Ubiquitin is a highly-conserved regulatory protein that is *ubiquitously* expressed in eukaryotes. **Ubiquitination** (or **ubiquitylation**) refers to the post-translational modification of a protein by the covalent attachment (via an isopeptide bond) of one or more ubiquitin monomers. The most prominent function of ubiquitin is labeling proteins for proteasomal degradation. Besides this function, ubiquitination also controls the stability, function, and intracellular localization of a wide variety of proteins.

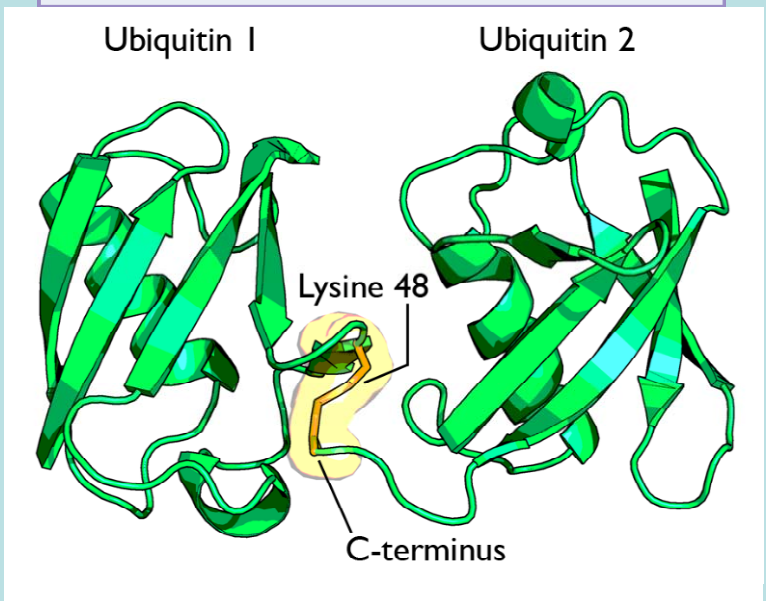




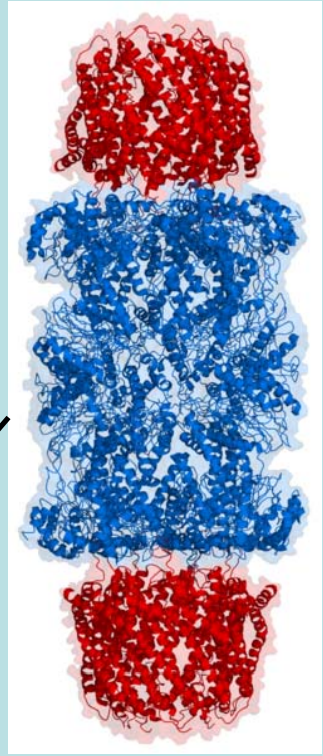
La poliubiquitina è costituita da unità collegate tramite Lys 46

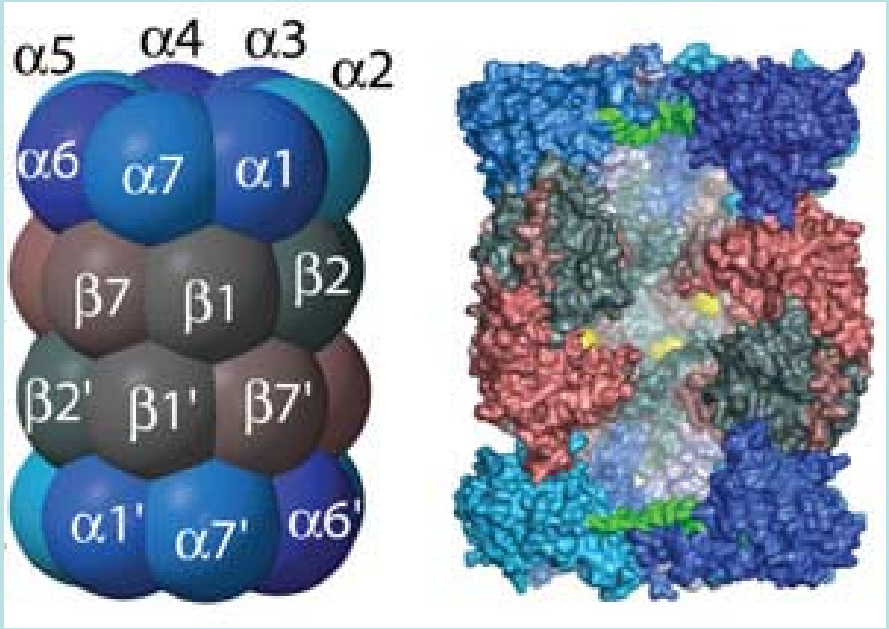


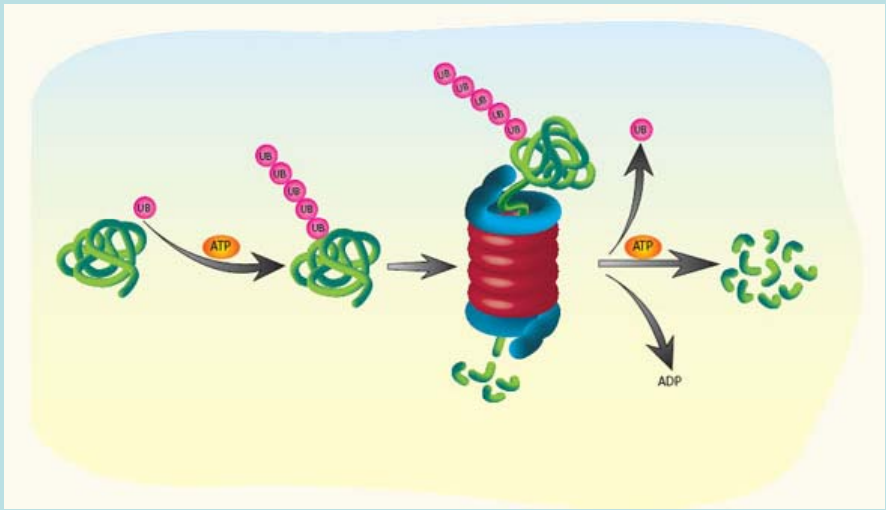




Proteasomes are large protein complexes inside all eukaryotes and archaea, as well as in some bacteria. In eukaryotes, they are located in the nucleus and the cytoplasm. The main function of the proteasome is to **degrade unneeded or damaged proteins by proteolysis**, a chemical reaction that breaks peptide bonds.








HHMI