



Universidade de São Paulo
Escola de Engenharia de Lorena
Departamento de Biotecnologia



Curso: Engenharia Ambiental

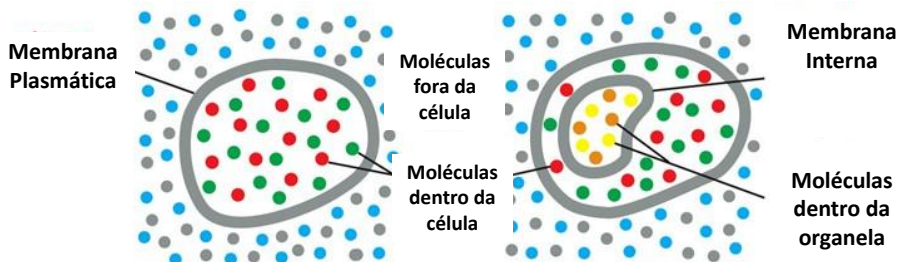
Organelas Celulares e endereçamento de proteínas

Prof: Tatiane da Franca Silva
tatianedafanca@usp.br

1

Componentes do Citoplasma Eucarioto

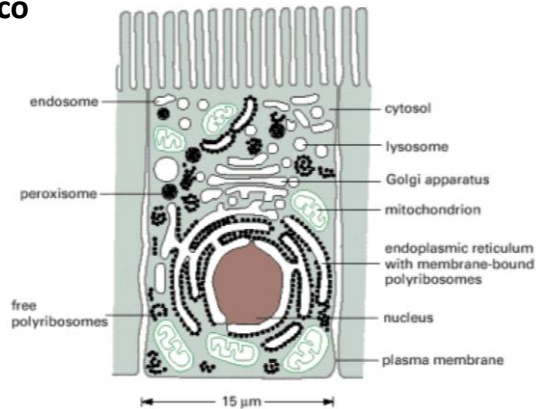
- ❖ **Citosol**: rico em água e substâncias (proteínas, íons, etc..). Onde ocorre a maioria das reações.
- ❖ **Organelas** : compartimentos celulares separados por membrana



2

Principais compartimentos intracelulares

- ❖ Núcleo
- ❖ Peroxissomo
- ❖ Retículo Endoplasmático
- ❖ Complexo de Golgi
- ❖ Endossomo
- ❖ Lisossomo
- ❖ Mitocôndria
- ❖ Cloroplasto
(Vegetal)



3

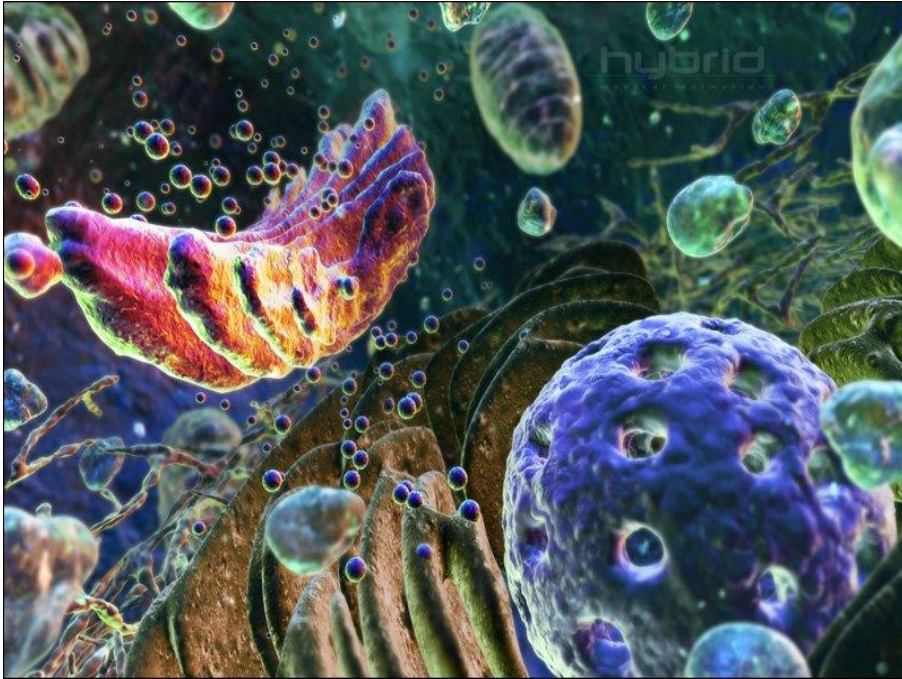
Componentes do Citoplasma Eucarioto

Tabela: Relação de volume ocupado pelas principais organelas celulares

INTRACELLULAR COMPARTMENT	PERCENTAGE OF TOTAL CELL VOLUME
Cytosol	54
Mitochondria	22
Rough ER cisternae	9
Smooth ER cisternae plus Golgi cisternae	6
Nucleus	6
Peroxisomes	1
Lysosomes	1
Endosomes	1

Alberts, B. et al. *Molecular Biology of The Cell*. 4 Ed.

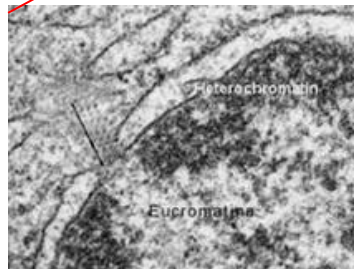
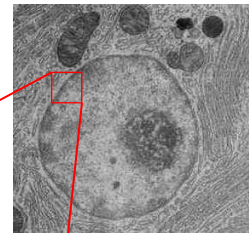
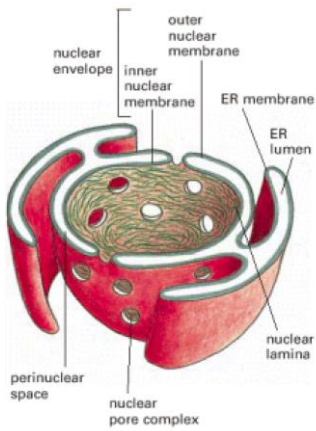
4



5

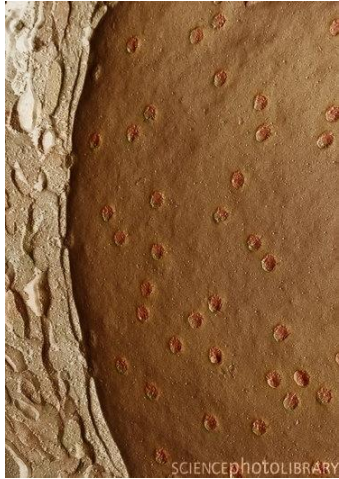
Núcleo

- ❖ Armazena o **Material genético**
- ❖ Membrana Nuclear: 2 membranas
- ❖ Espaço entre as membranas: **Perinuclear**

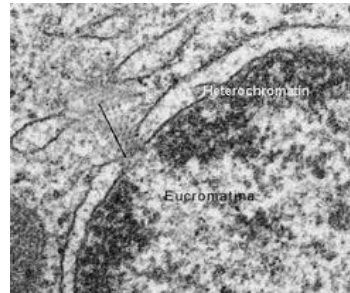
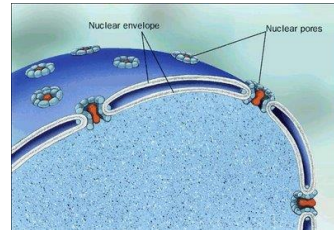


6

Poros interrompem a Membrana Nuclear



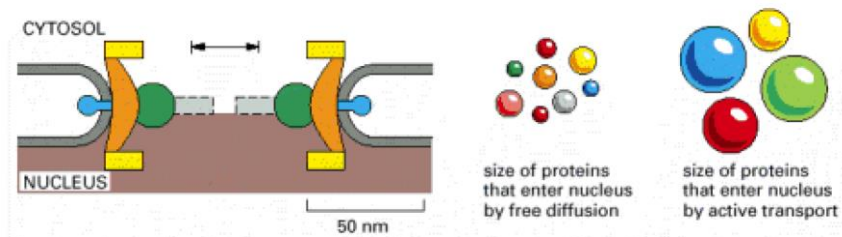
Microscopia de Varredura



7

Transporte Citosol-Núcleo

- ❖ PASSIVO: pequenas moléculas dissolvidas em água
- ❖ ATIVO: Necessitam de Proteínas de importação



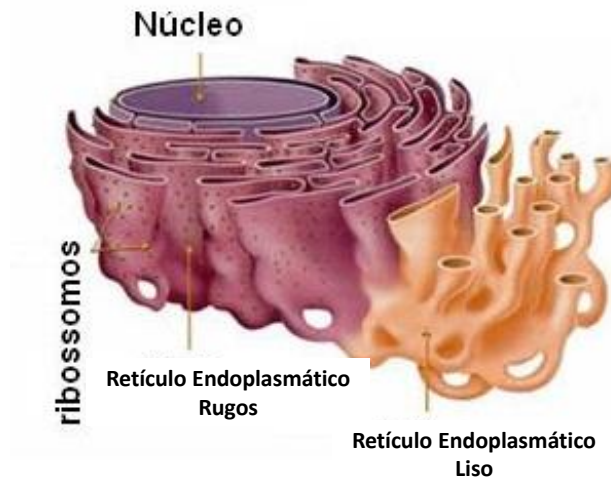
10



11

Organelas citoplasmáticas

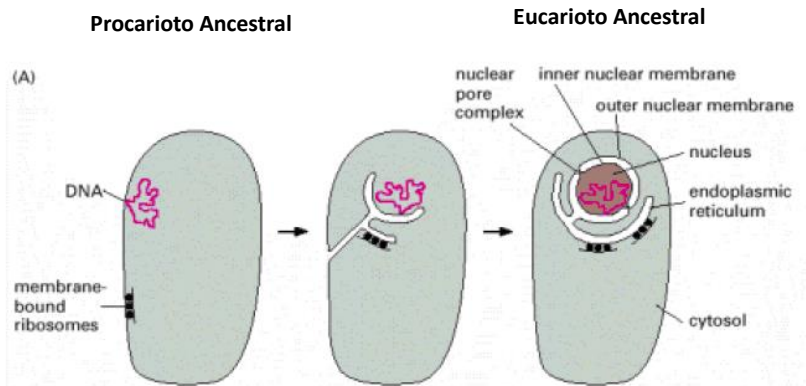
- ❖ Núcleo e Retículo Endoplasmático – continuidade de membrana.



12

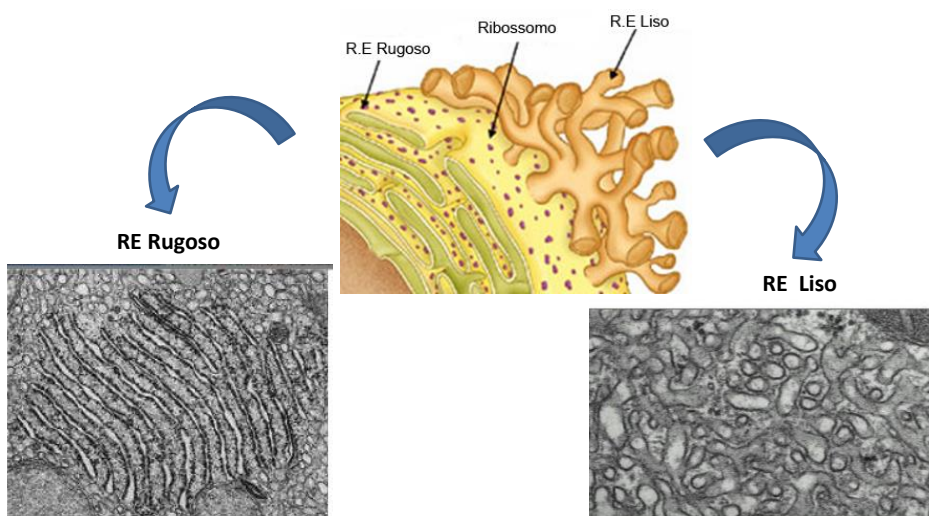
Organelas citoplasmáticas – Origem

- ❖ **Núcleo e Retículo Endoplasmático** – Teoria de invaginações da membrana plasmática

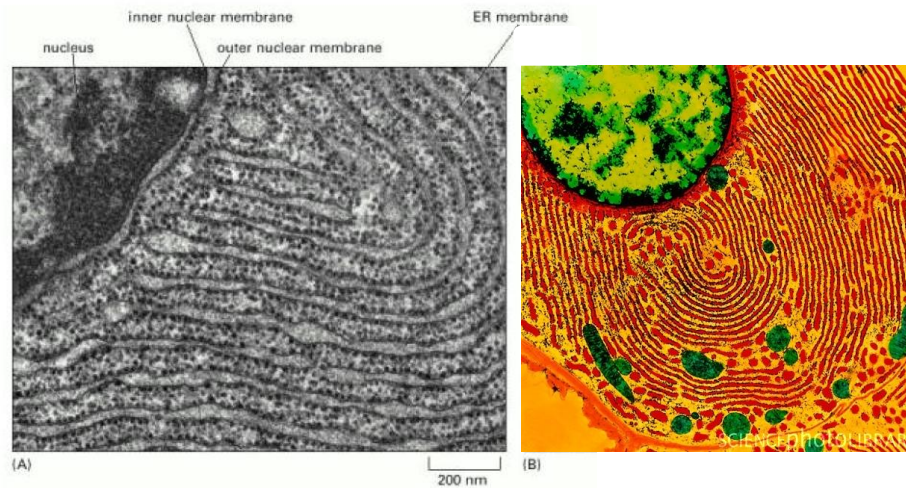


13

Retículo Endoplasmático



14

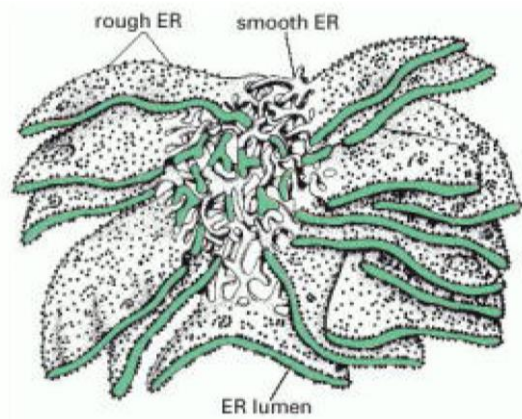


15

Retículo Endoplasmático

❖ RE Rugoso e RE Liso

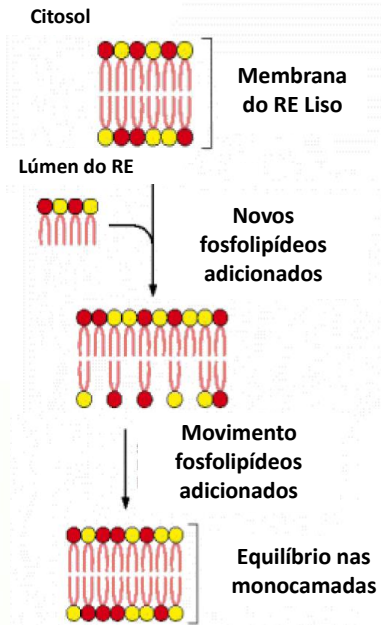
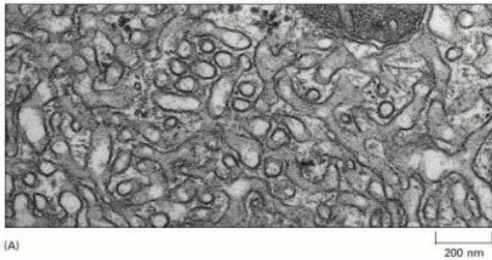
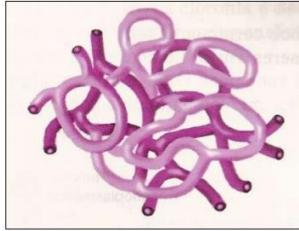
- Função na síntese de Proteína e Lipídeos



16

Retículo Endoplasmático Liso

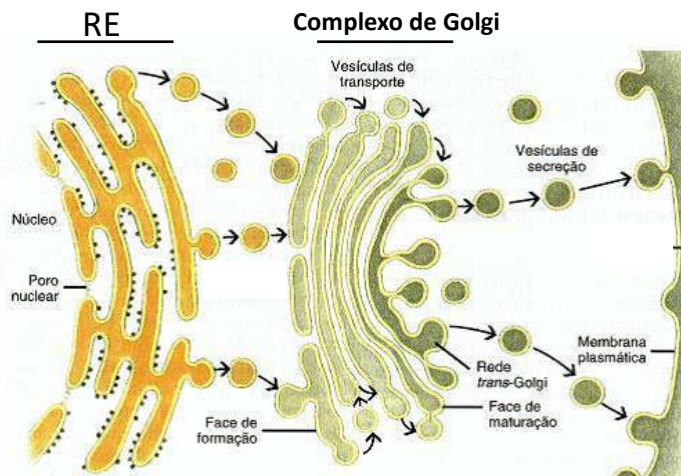
- ❖ Não possuem **Ribossomos** associados
- ❖ Sítio de síntese de **Bicamada Lipídica**



17

Complexo de Golgi ou Aparelho de Golgi

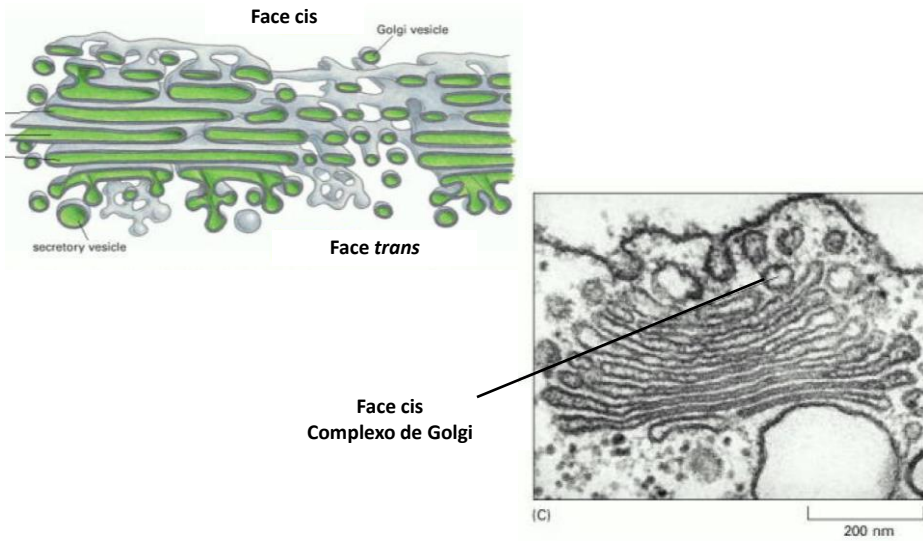
- ❖ Sistema central de distribuição na célula
- ❖ Síntese de **Oligossacarídeos**, modificações de substâncias-
Glicosilação



18

Complexo de Golgi

❖ Face *cis* (ou interna) e Face *trans* (ou externa)



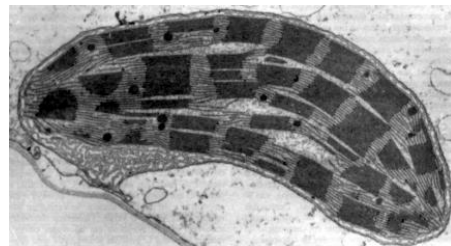
19

Mitocôndria e Cloroplasto

Mitocôndria



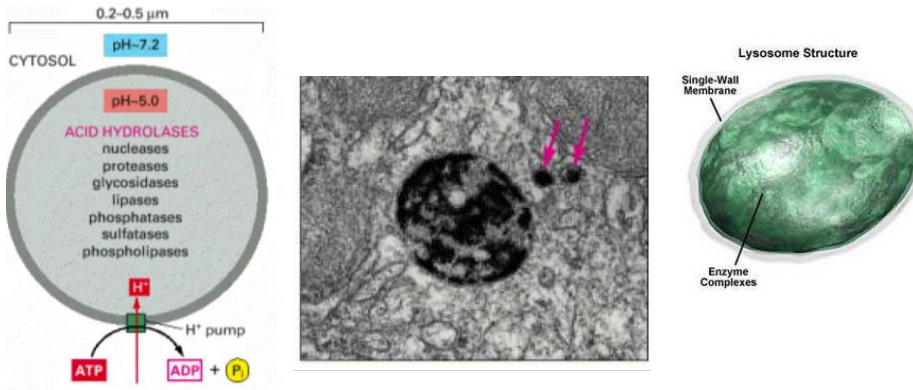
Cloroplasto



20

Lisossomo

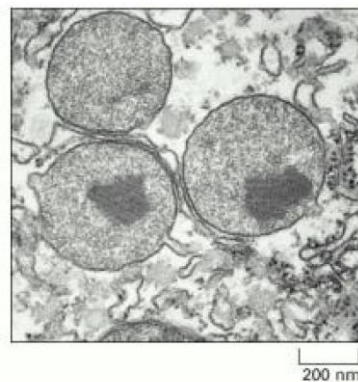
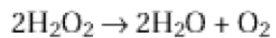
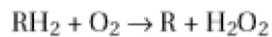
- ❖ Origem no **Complexo de Golgi**
- ❖ Sítio de digestão intracelular de macromoléculas
- ❖ Presença de diferentes **Enzimas hidrolíticas**



23

Peroxisomo

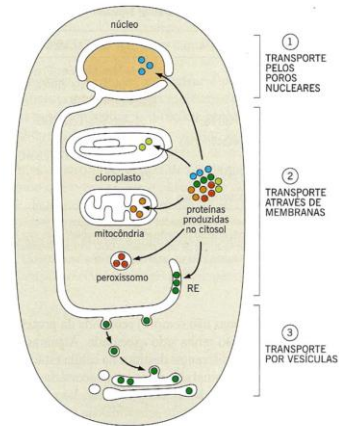
- ❖ Delimitado por uma **única membrana**
- ❖ Principais sítios de **utilização de O₂**
- ❖ Contém **Enzimas Oxidativas (ex: catalases)**
- ❖ Detoxificação



24

Tráficos de proteínas nas células

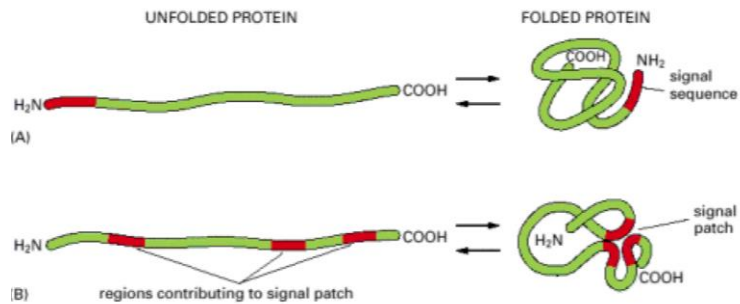
1. **Transporte mediado:** as proteínas se movimentam entre o citosol e o núcleo por meio dos poros nucleares (funcionam como portões seletivos).
2. **Transporte transmembrana:** *proteínas translocadoras* transportam diretamente proteínas entre citosol-organelas.
3. **Transporte vesicular:** carregam proteínas a partir do RE.



26

O que define o compartimento de destino?

- ❖ Sinais de Endereçamento específicos para cada organela
- ❖ Sequencia sinalizadora: **Peptídeo sinal**
- ❖ **Região sinalizadora**



27

❖ Diferentes Peptídeos Sinais dão o endereçamento correto

Table 12-3. Some Typical Signal Sequences

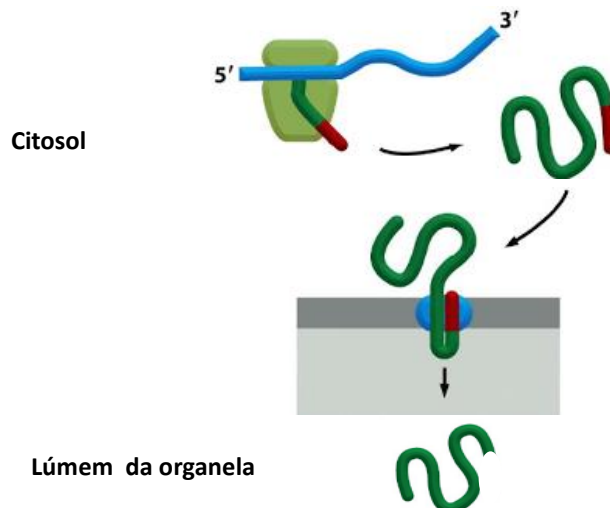
FUNCTION OF SIGNAL SEQUENCE	EXAMPLE OF SIGNAL SEQUENCE
Import into nucleus	-Pro-Pro-Lys-Lys-Lys-Arg-Lys-Val-
Export from nucleus	-Leu-Ala-Leu-Lys-Leu-Ala-Gly-Leu-Asp-Ile-
Import into mitochondria	*H ₃ N-Met-Leu-Ser-Leu-Arg-Gln-Ser-Ile-Arg-Phe-Phe-Lys-Pro-Ala-Thr-Arg-Thr-Leu-Cys-Ser-Ser-Arg-Tyr-Leu-Leu-
Import into plastid	*H ₃ N-Met-Val-Ala-Met-Ala-Met-Ala-Ser-Leu-Gln-Ser-Ser-Met-Ser-Ser-Leu-Ser-Leu-Ser-Ser-Asn-Ser-Phe-Leu-Gly-Gln-Pro-Leu-Ser-Pro-Ile-Thr-Leu-Ser-Pro-Phe-Leu-Gln-Gly-
Import into peroxisomes	-Ser-Lys-Leu-COO ⁻
Import into ER	*H ₃ N-Met-Met-Ser-Phe-Val-Ser-Leu-Leu-Leu-Val-Gly-Ile-Leu-Phe-Trp-Ala-Thr-Glu-Ala-Glu-Gln-Leu-Thr-Lys-Cys-Glu-Val-Phe-Gln-
Return to ER	-Lys-Asp-Glu-Leu-COO ⁻

Some characteristic features of the different classes of signal sequences are highlighted in color. Where they are known to be important for the function of the signal sequence, positively charged amino acids are shown in *red* and negatively charged amino acids are shown in *green*. Similarly, important hydrophobic amino acids are shown in *yellow* and hydroxylated amino acids are shown in *blue*. *H₃N indicates the N-terminus of a protein; COO⁻ indicates the C-terminus.

28

Translocação de Proteínas

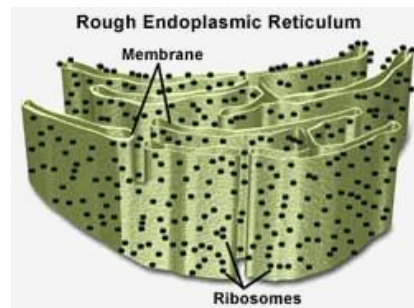
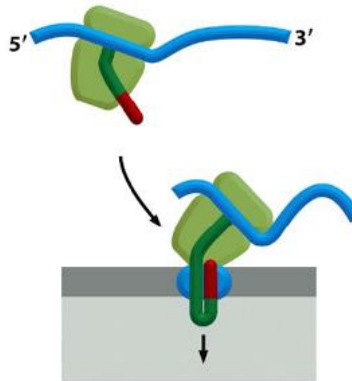
- ❖ Citosol → Núcleo, Mitocôndria, Cloroplasto, Peroxissomo
- ❖ Translocadas após a Tradução



30

Translocação de Proteínas – Retículo Endoplasmático

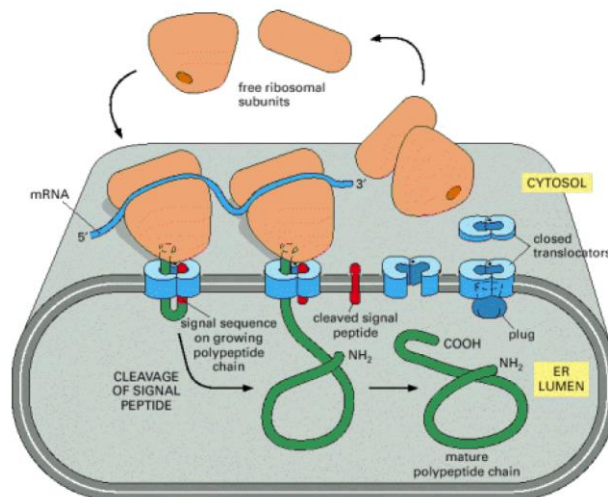
- ❖ Citosol → Retículo Endoplasmático
- ❖ Associação dos ribossomos com a membrana do Retículo Endoplasmático. **Translocadas durante a tradução.**



33

Retículo Endoplasmático Rugoso

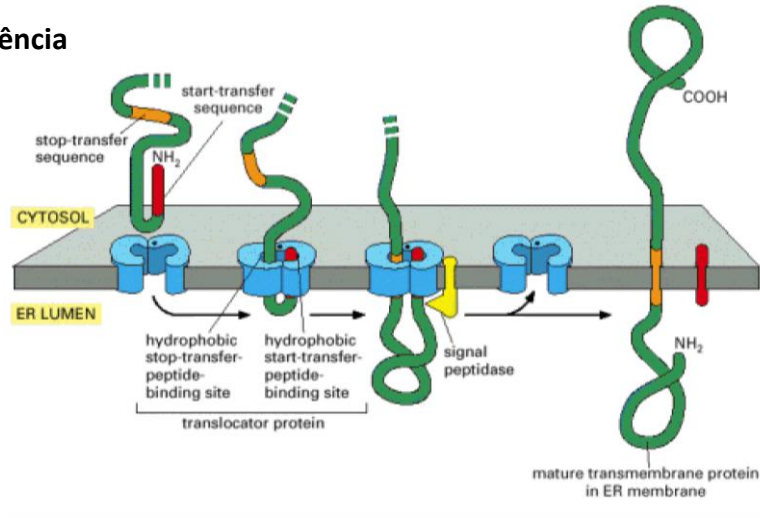
- ❖ Síntese de proteínas para a **Secreção**
- ❖ Clivagem de peptídeo sinal



34

Retículo Endoplasmático Rugoso

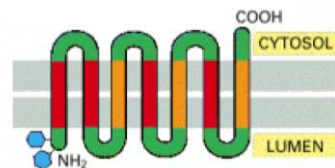
- ❖ Síntese de **Proteínas Transmembranas**
- ❖ Presença de **Peptídeo sinal** e **Peptídeo de parada de transferência**



35

Retículo Endoplasmático Rugoso

- ❖ **Proteínas Transmembranas** com várias **passagens** pela membrana
- ❖ Mais de um **Peptídeo sinais** e de **parada de transferência**

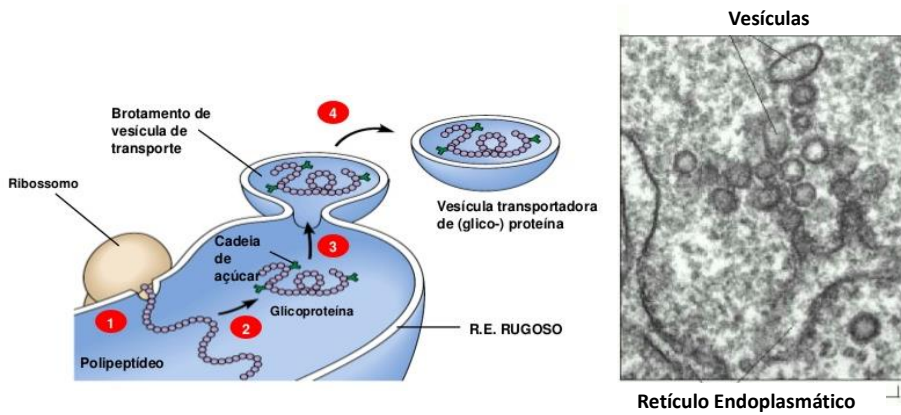


36

Transporte Vesicular

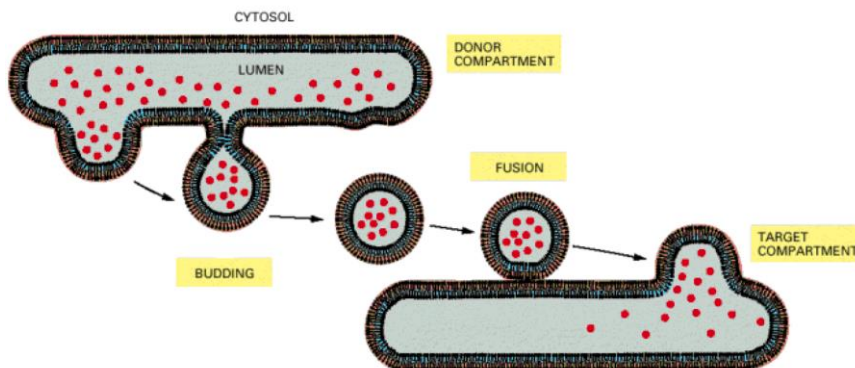
❖ **Retículo Endoplasmático**

❖ **Vesículas transportam** suas produções para o **Complexo de Golgi**



37

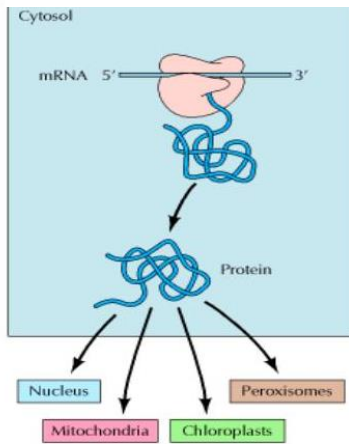
Transporte Vesicular



38

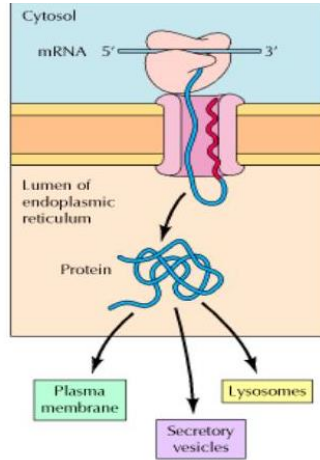
Distribuição de proteínas

Ribossomos livres no Citosol



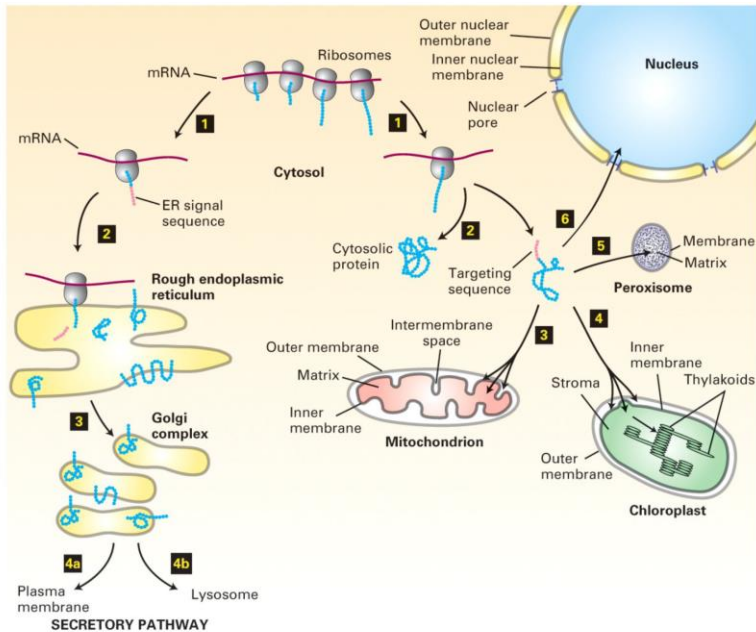
Transporte Transmembrana

Ribossomos na membrana do RE



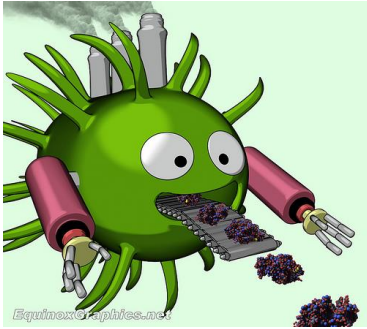
Transporte Vesicular

40



41

Cell Factories



42