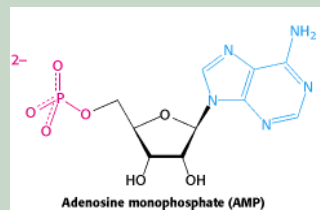
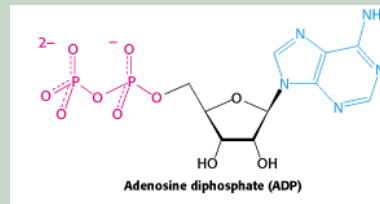
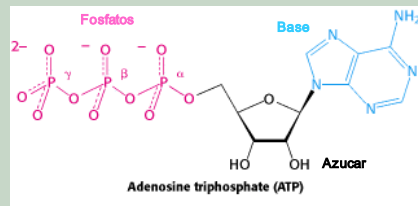


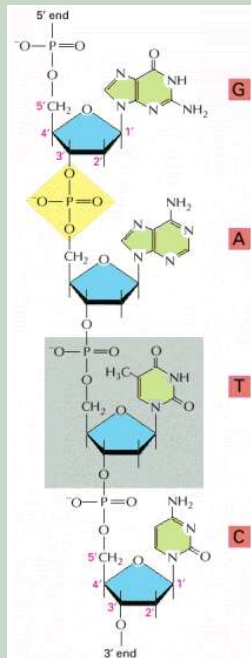
INTRODUCCION A LA BIOLOGIA CELULAR Y MOLECULAR

- MACROMOLECULAS -

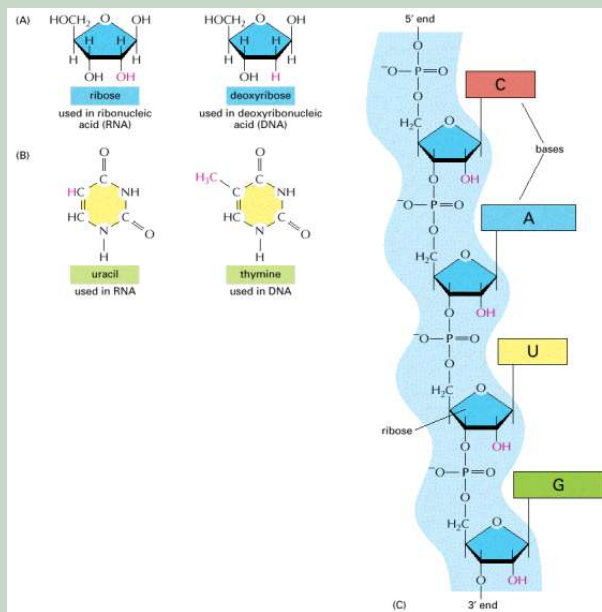
Acidos nucleicos - ADN



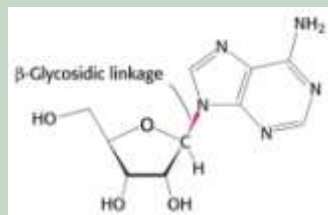
Ácidos nucleicos - ADN



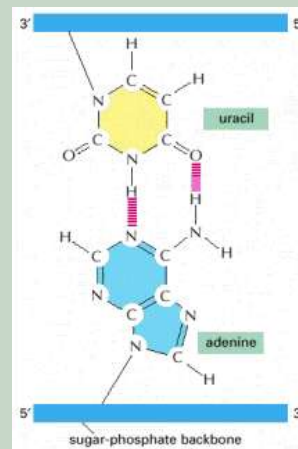
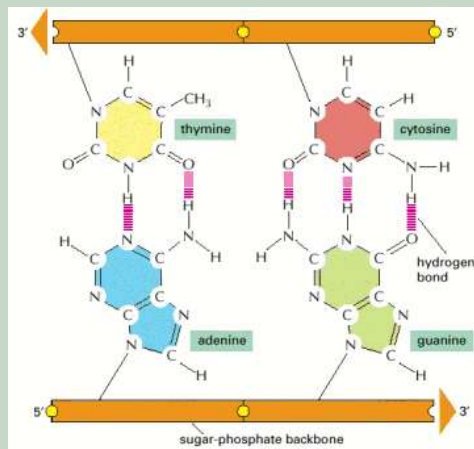
Ácidos nucleicos



	Bases			
	Purines		Pyrimidines	
	Adenine (A)	Guanine (G)	Cytosine (C)	Uracil (U) Thymine (T)
Nucleosides $\left\{ \begin{array}{l} \text{in RNA} \\ \text{in DNA} \end{array} \right.$	Adenosine Deoxyadenosine	Guanosine Deoxyguanosine	Cytidine Deoxycytidine	Uridine Deoxythymidine
Nucleotides $\left\{ \begin{array}{l} \text{in RNA} \\ \text{in DNA} \end{array} \right.$	Adenylyate Deoxyadenylate	Guanlylate Deoxyguanylate	Cytidylate Deoxycytidylate	Uridylate Thymidylate
Nucleoside monophosphates	AMP	GMP	CMP	UMP
Nucleoside diphosphates	ADP	GDP	CDP	UDP
Nucleoside triphosphates	ATP	GTP	CTP	UTP
Deoxynucleoside mono-, di-, and triphosphates	dAMP, etc.			



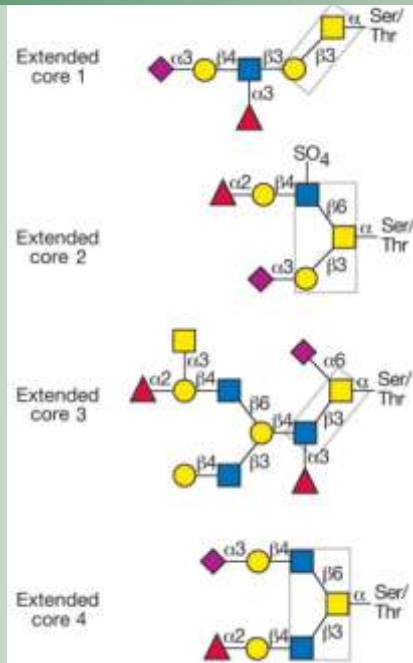
Acidos nucleicos – Complementaridad de bases



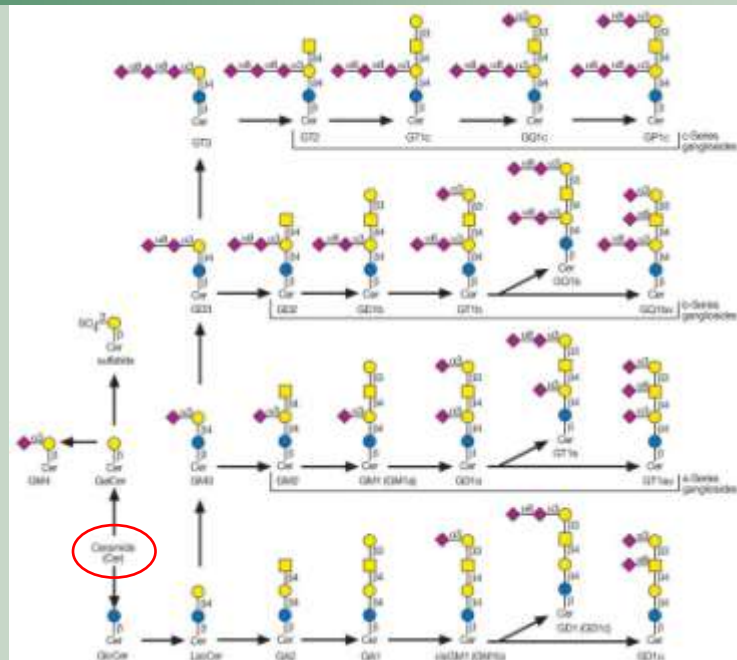
The diagram illustrates the structure of three types of biomolecules: N-Glycan, O-Glycan, and Glycolipid. Each structure is composed of a core of blue squares (GlcNAc) and green circles (Mannose) branching out to yellow circles (Galactose). The N-Glycan is attached to Asn (Asparagine), the O-Glycan to Ser/Thr (Serine/Threonine), and the Glycolipid to Cer (Ceramide). The branching patterns are labeled with numbers 1 through 14, indicating the specific sugar residues.



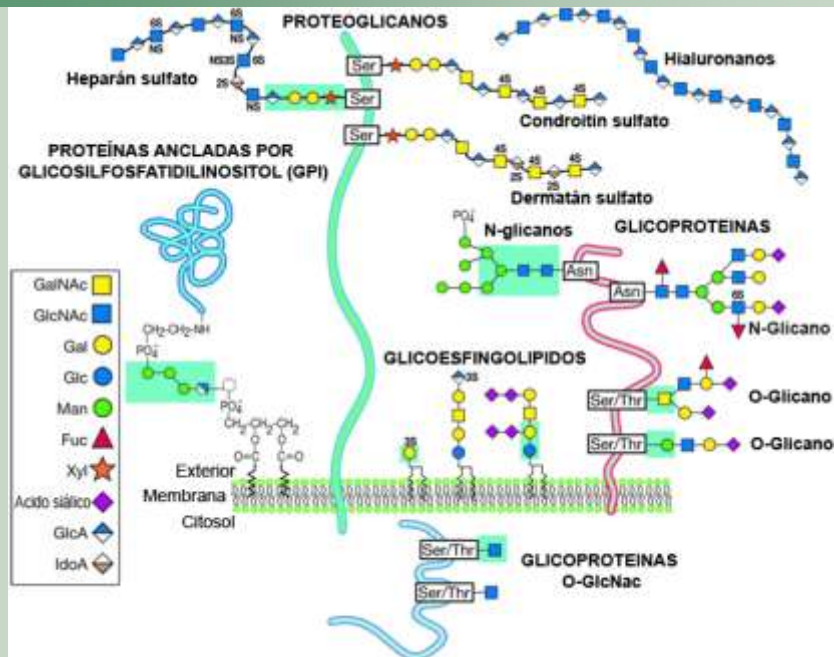
O-Glicanos



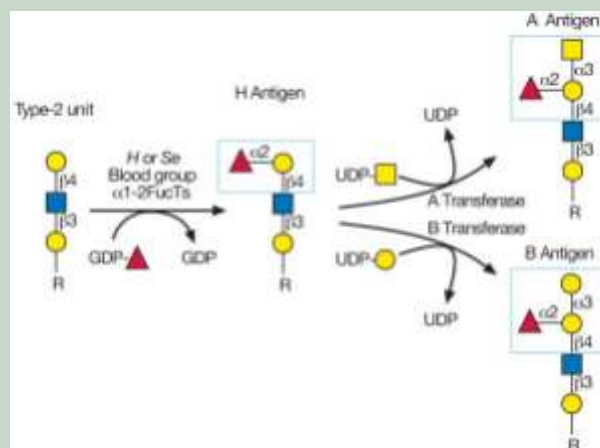
Glicoesfingolípidos



Glicanos



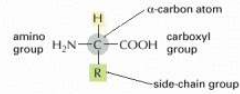
Antígenos ABO



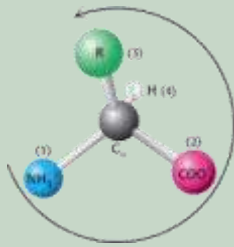
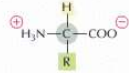
Aminoácidos

THE AMINO ACID

The general formula of an amino acid is

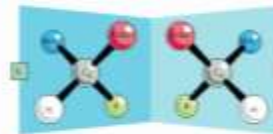


R is commonly one of 20 different side chains.
At pH 7 both the amino and carboxyl groups are ionized.



OPTICAL ISOMERS

The α -carbon atom is asymmetric, which allows for two mirror images (or stereoisomers, L and D).



Proteins consist exclusively of L-amino acids.

Aminoácidos

Neutral amino acids



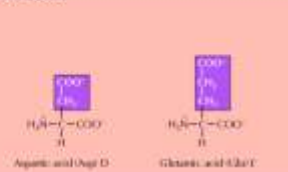
Polar amino acids



Basic amino acids



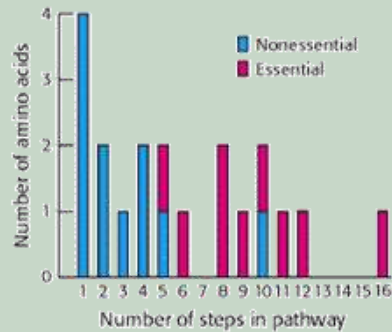
Acidic amino acids



Aminoácidos

Table 24.3. Basic set of 20 amino acids

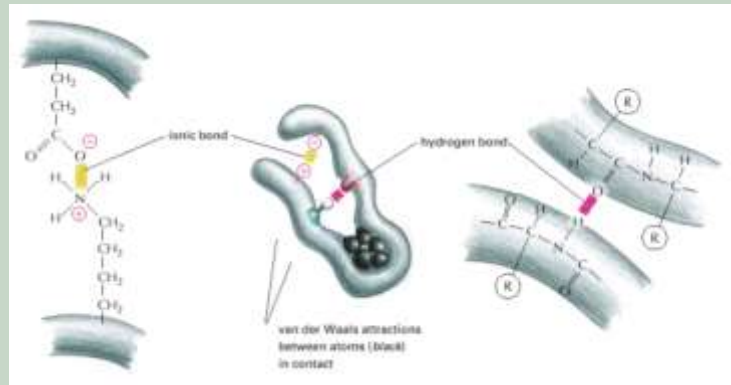
Nonessential	Essential
Alanine	Histidine
Arginine	Isoleucine
Asparagine	Leucine
Aspartate	Lysine
Cysteine	Methionine
Glutamate	Phenylalanine
Glutamine	Threonine
Glycine	Tryptophan
Proline	Valine
Serine	
Tyrosine	



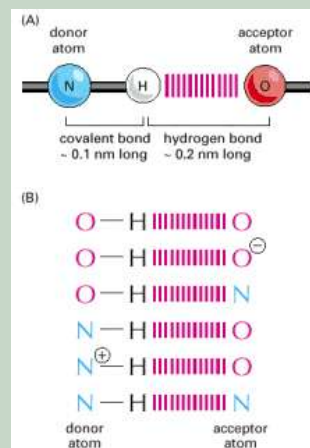
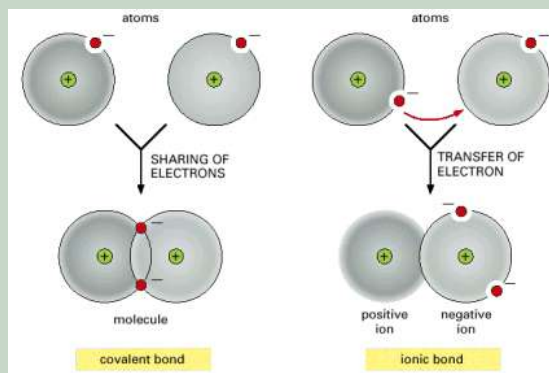
Aminoácidos no naturales

Name	Formula	Biochemical Source, Function
β -Alanine	$\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{COO}^-$	Found in the vitamin pantoic acid and in some important natural peptides
α -Amino	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}-\text{C}=\text{N}^+\text{H}_2 \\ \\ \text{CH}_2 \end{array}$	In polypeptides in some bacterial cell walls
γ -Aminobutyric acid	$\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COO}^-$	Brain, other animal tissues; functions as neurotransmitter
α -Glutamic acid	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}-\text{C}=\text{N}^+\text{H}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2-\text{COO}^- \end{array}$	In polypeptides in some bacterial cell walls
α -Homoserine	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_2\text{N}-\text{C}-\text{H} \\ \\ \text{CH}_2-\text{CH}_2\text{OH} \end{array}$	Many tissues; an intermediate in amino acid metabolism
α -Ornithine	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_2\text{N}-\text{C}-\text{H} \\ \\ \text{CH}_2-\text{CH}_2-\text{CH}_2\text{NH}_2 \end{array}$	Many tissues; an intermediate in arginine synthesis
Serine	$\begin{array}{c} \text{COO}^- \\ \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{COO}^- \\ \\ \text{H} \end{array}$	Many tissues; intermediate in amino acid synthesis
α -Thyronine	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_2\text{N}-\text{C}-\text{H} \\ \\ \text{CH}_2-\text{C}_6\text{H}_3\text{I}_2-\text{O}-\text{C}_6\text{H}_3\text{I}_2-\text{OH} \end{array}$	Thyroid gland; is thyroid hormone (L-thyronine)

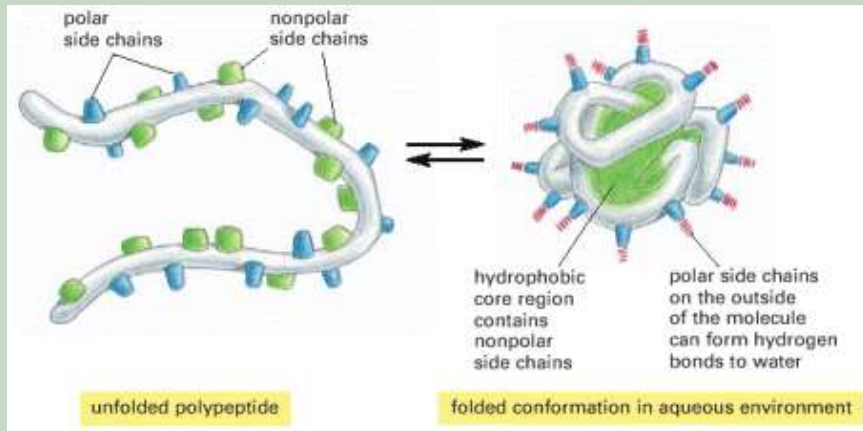
Uniones débiles



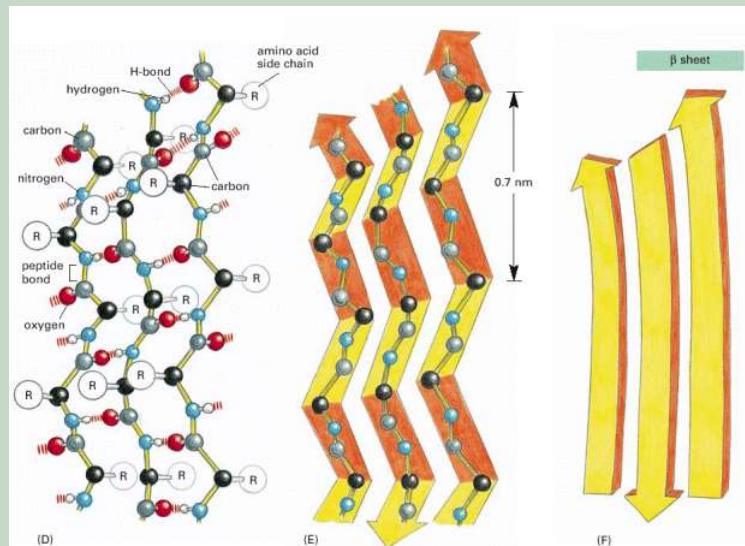
Uniones moleculares



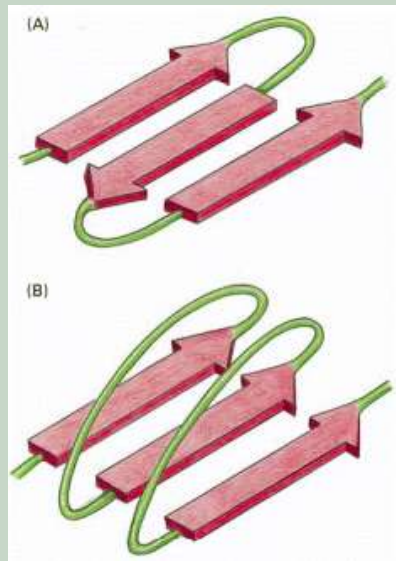
Plegamiento



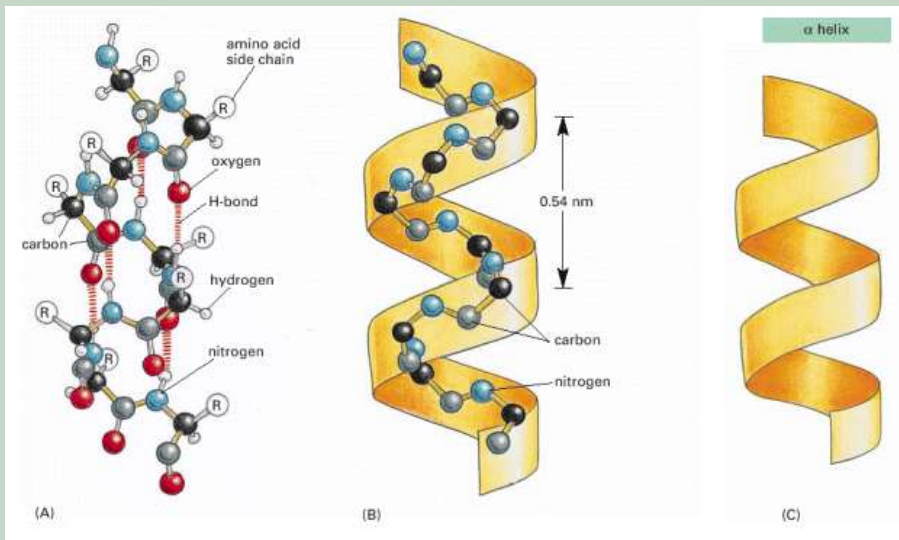
Laminas β



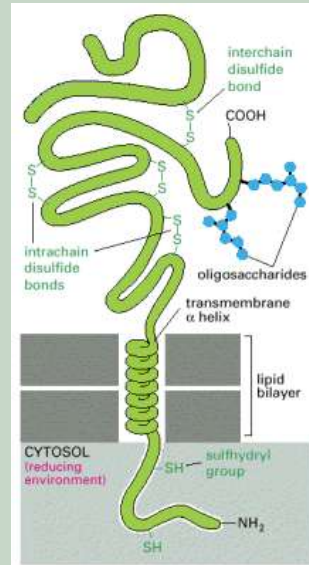
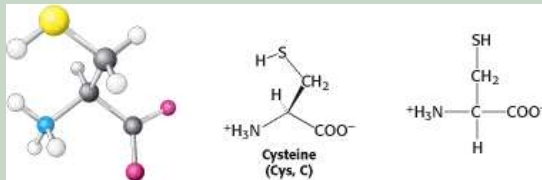
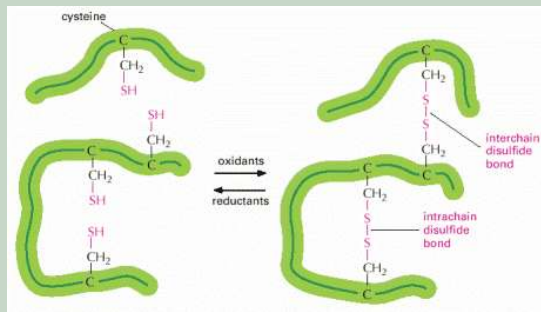
Laminas β



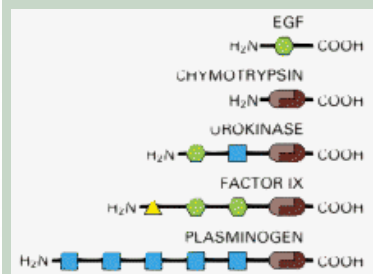
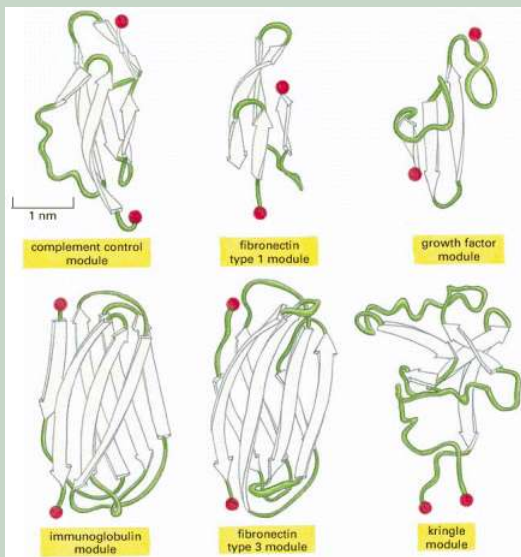
Hélices α



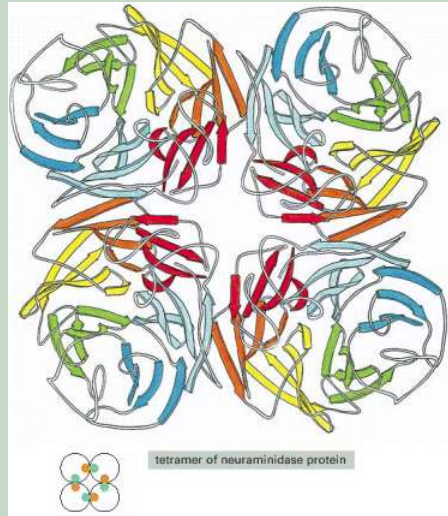
Puentes disulfuro



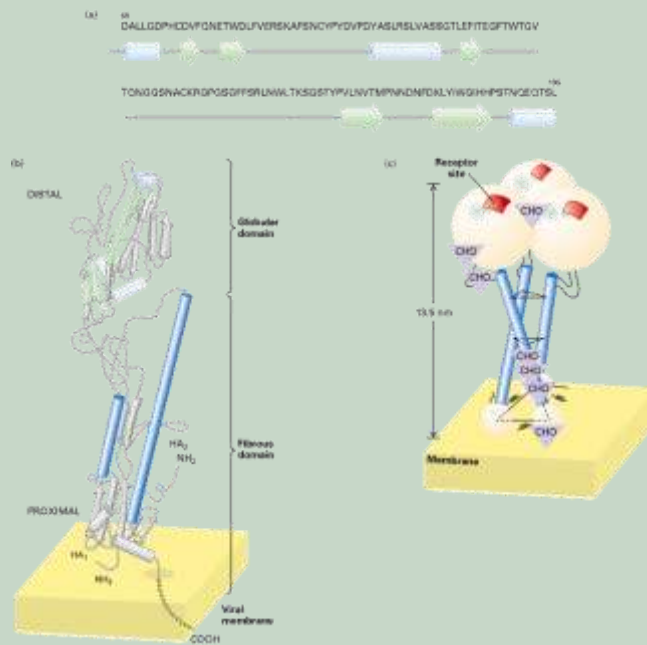
Dominios



Subunidades

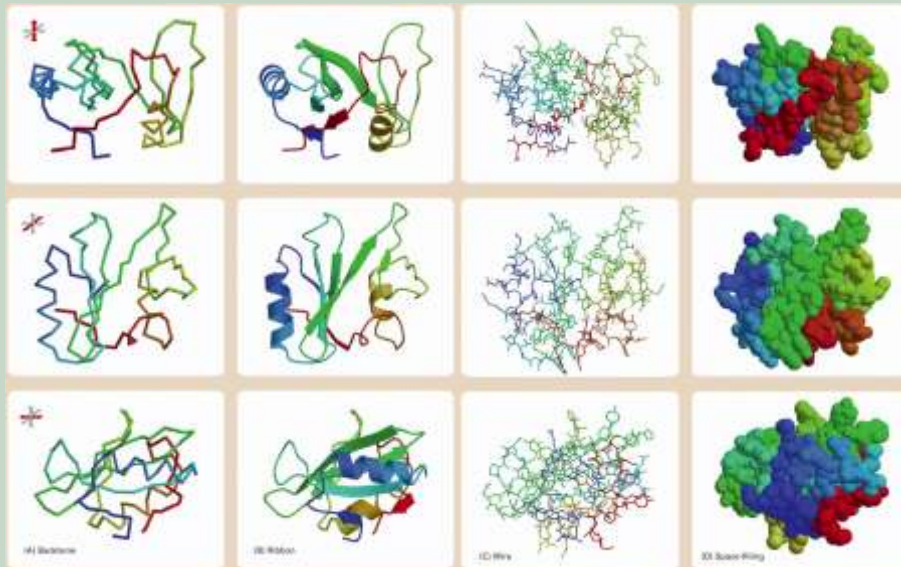


Los cuatro niveles estructurales

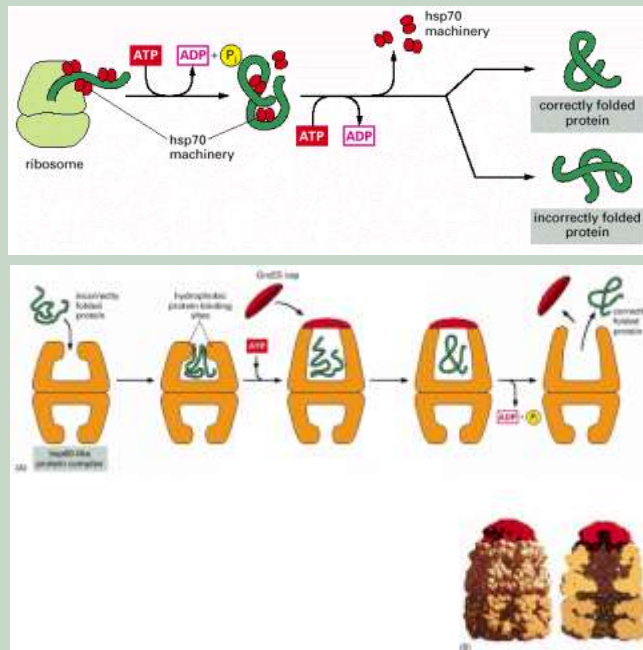


Hemagglutina de Influenza

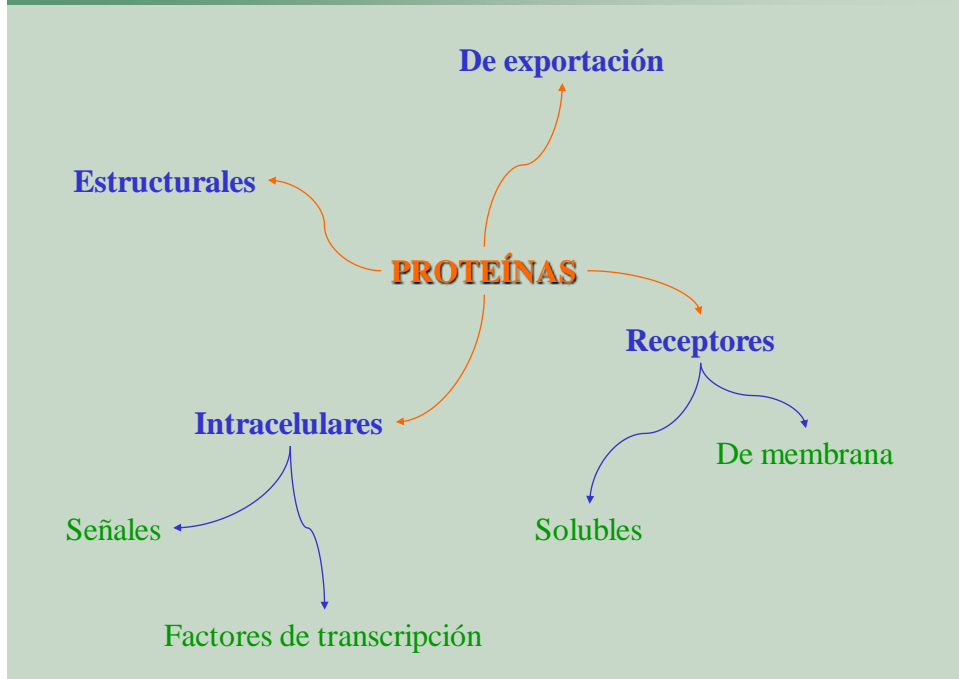
Representación



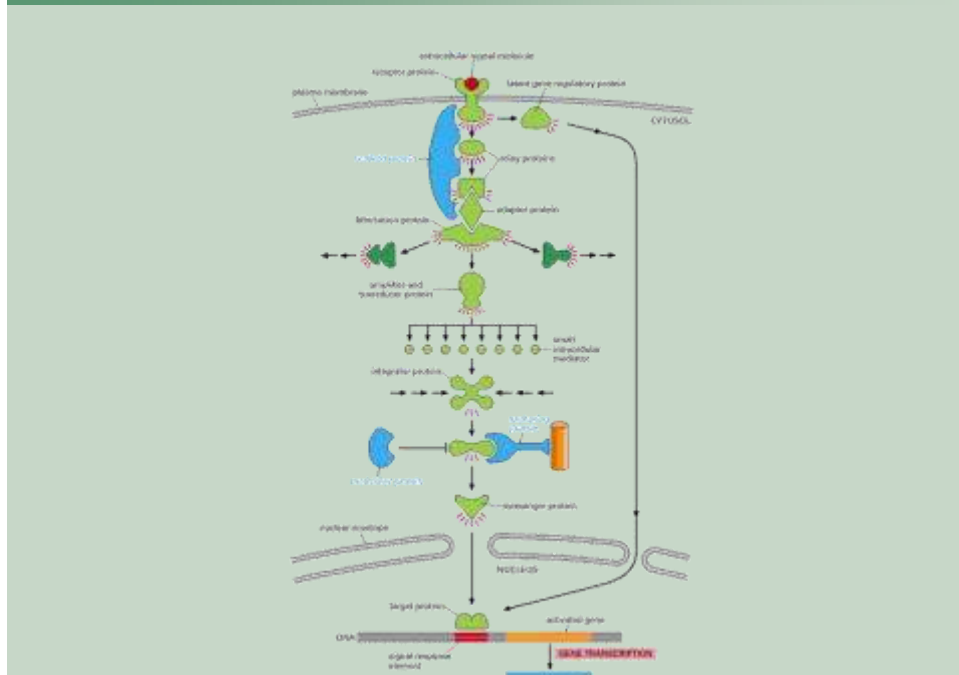
Plegamiento



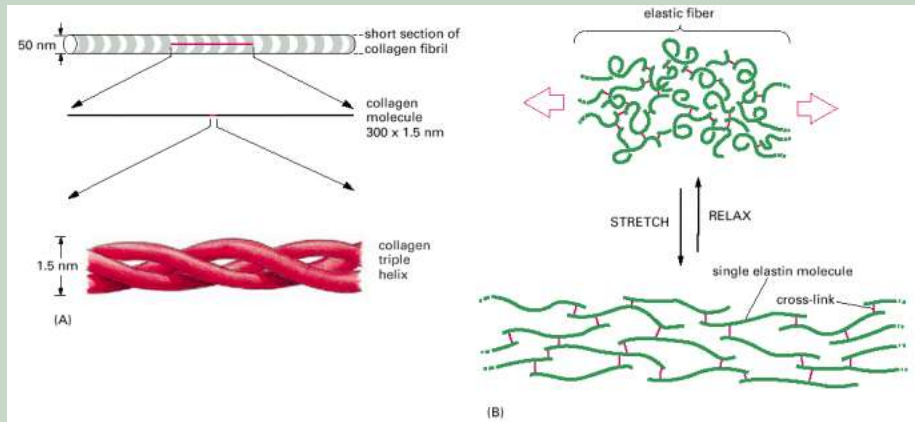
Las proteínas...



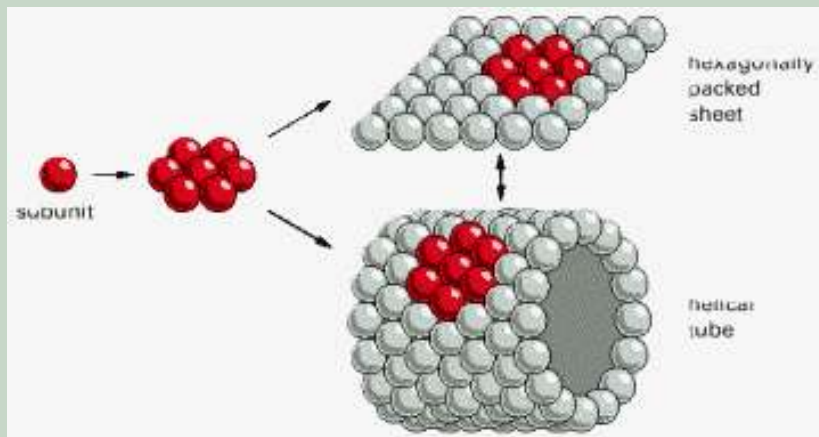
Las proteínas...



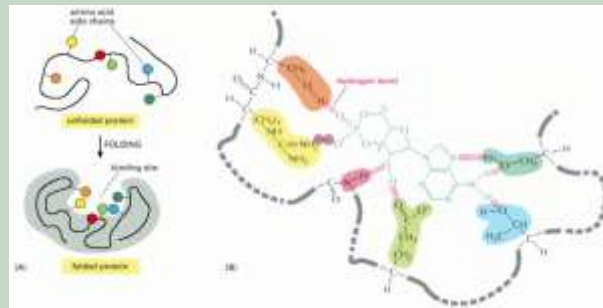
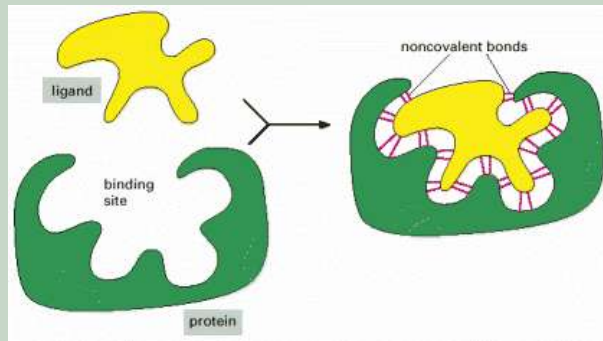
Proteínas estructurales - fibrosas



Proteínas estructurales - globulares

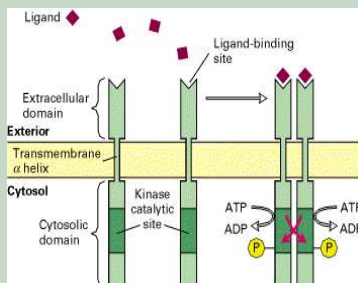


Interacciones ligando - proteína

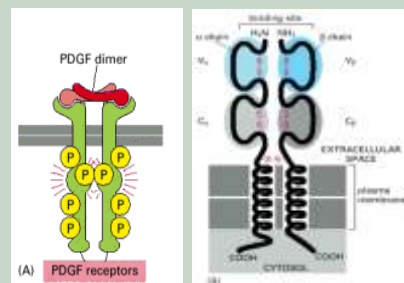


Receptores de membrana

Monoméricos



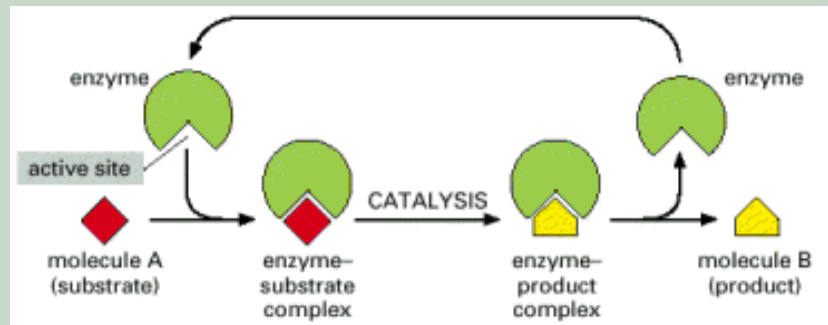
Diméricos



(A) homodiméricos

(B) heterodiméricos

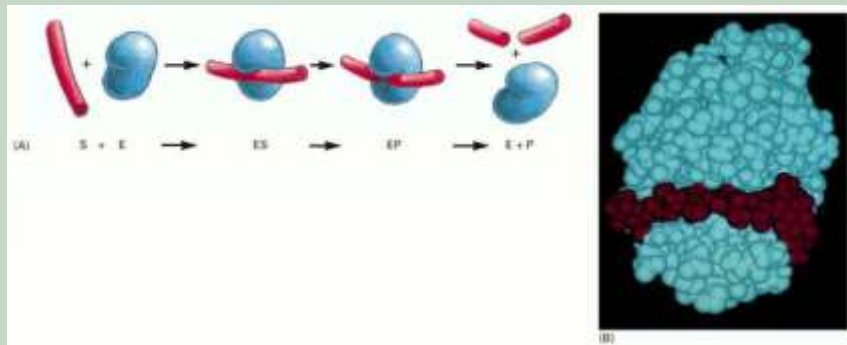
Enzimas



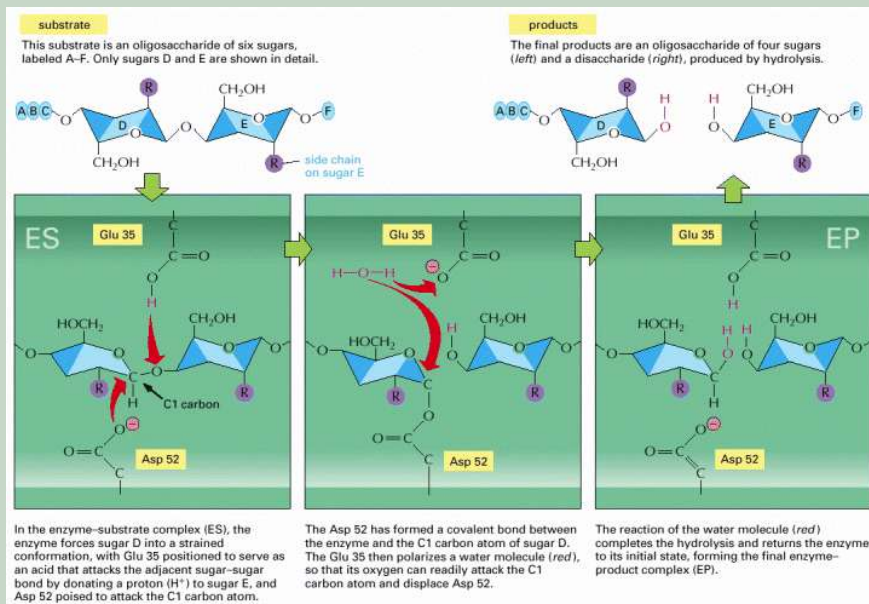
Enzimas

ENZYME	REACTION CATALYZED
Hydrolases	general term for enzymes that catalyze a hydrolytic cleavage reaction.
Nucleases	break down nucleic acids by hydrolyzing bonds between nucleotides.
Proteases	break down proteins by hydrolyzing bonds between amino acids.
Synthases	general name used for enzymes that synthesize molecules in anabolic reactions by condensing two smaller molecules together.
Isomerases	catalyze the rearrangement of bonds within a single molecule.
Polymerases	catalyze polymerization reactions such as the synthesis of DNA and RNA.
Kinases	catalyze the addition of phosphate groups to molecules. Protein kinases are an important group of kinases that attach phosphate groups to proteins.
Phosphatases	catalyze the hydrolytic removal of a phosphate group from a molecule.
Oxido-Reductases	general name for enzymes that catalyze reactions in which one molecule is oxidized while the other is reduced. Enzymes of this type are often called <i>oxidases</i> , <i>reductases</i> , and <i>dehydrogenases</i> .
ATPases	hydrolyze ATP. Many proteins with a wide range of roles have an energy-harnessing ATPase activity as part of their function, for example, motor proteins such as <i>myosins</i> and membrane transport proteins such as the <i>sodium-potassium pump</i> .

Enzimas



Enzimas – mecanismo de acción



Proteínas y aditivos funcionales

Cofactores o Co-enzimas

Un cofactor es un componente no proteico, termoestable y de bajo peso molecular, necesario para la acción de una enzima. El cofactor se une a una estructura proteica denominada apoenzima, y a este complejo se le denomina holoenzima. Entre los cofactores mencionables se encuentran: Iones metálicos (Fe^{2+} , Cu^{2+} , K^+ , Mn^{2+} , Mg^{2+} , entre otros) y moléculas orgánicas

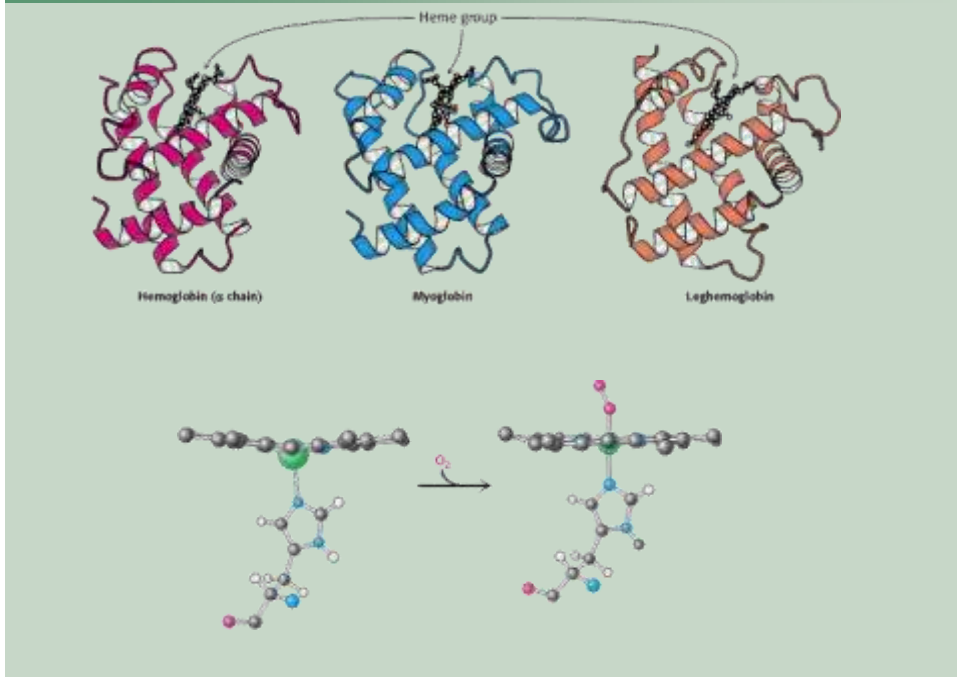
Grupos prostéticos

Un grupo prostético es el componente no aminoacídico que forma parte de la estructura de algunas proteínas y que se halla fuertemente unido al resto de la molécula. Las proteínas con grupo prostético reciben el nombre de heteroproteínas (o proteínas conjugadas).

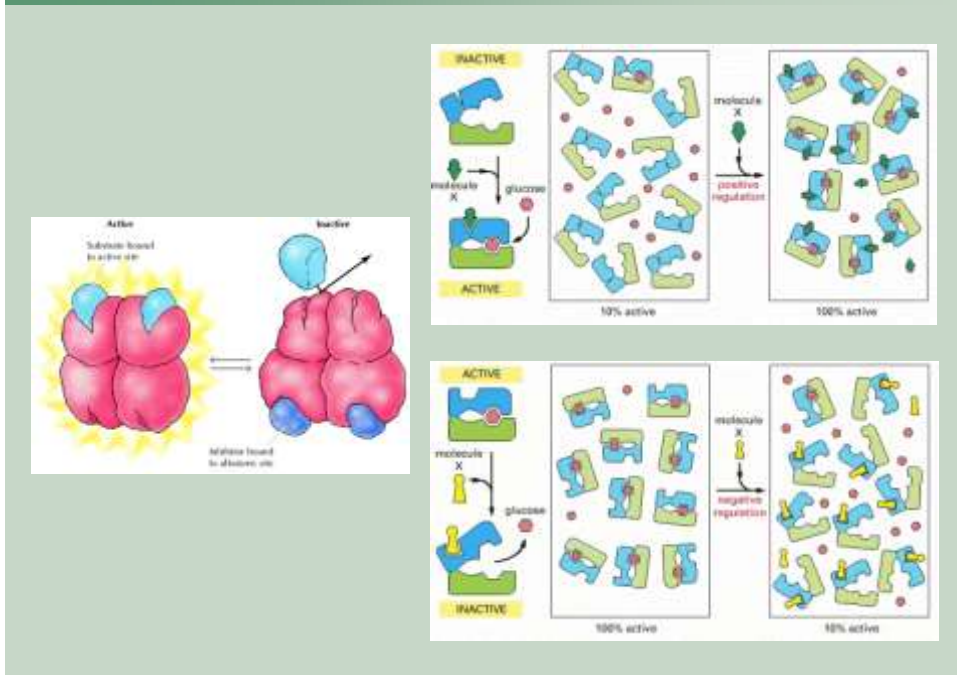
Enzimas - Coenzimas

VITAMIN	COENZYME	ENZYME-CATALYZED REACTIONS REQUIRING THESE COENZYMES
Thiamine (vitamin B_1)	thiamine pyrophosphate	activation and transfer of aldehydes
Riboflavin (vitamin B_2)	FADH	oxidation-reduction
Niacin	NADH, NADPH	oxidation-reduction
Pantothenic acid	coenzyme A	acyl group activation and transfer
Pyridoxine	pyridoxal phosphate	reactions involving amino acid activation
Biotin	biotin	CO_2 activation and transfer
Lipoic acid	lipoamide	acyl group activation; oxidation-reduction
Folic acid	tetrahydrofolate	activation and transfer of single carbon groups
Vitamin B_{12}	cobalamin coenzymes	isomerization and methyl group transfers

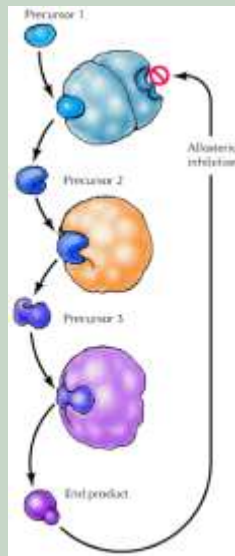
Grupo prostético (Hemo)



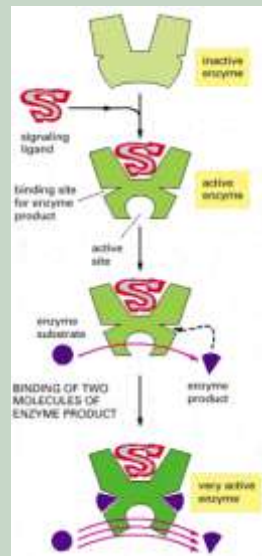
Alosterismo



Regulación por producto final

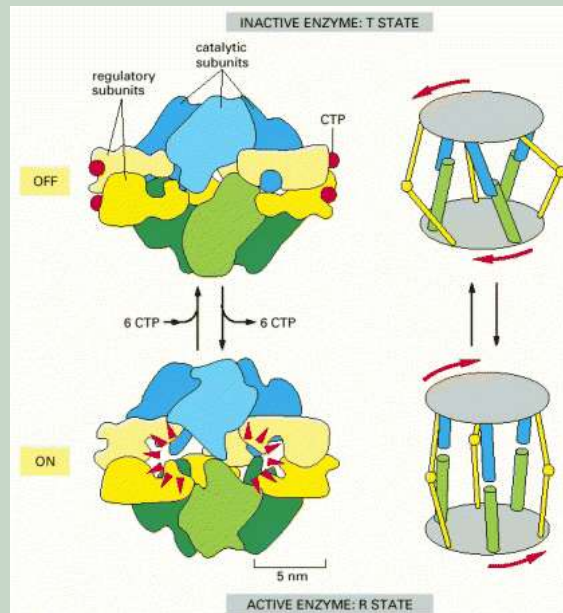


Negativa

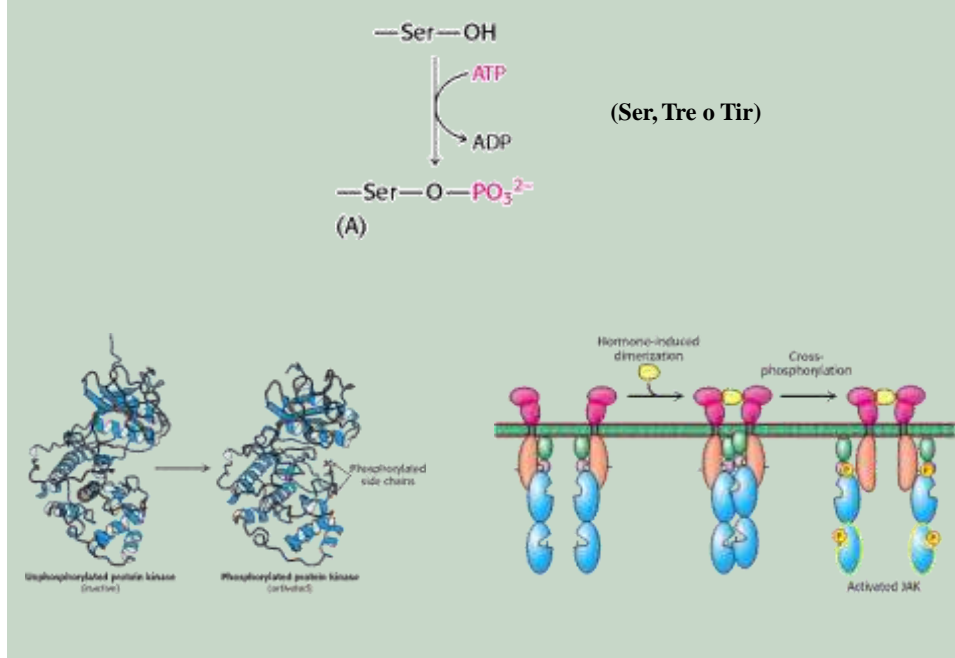


positiva

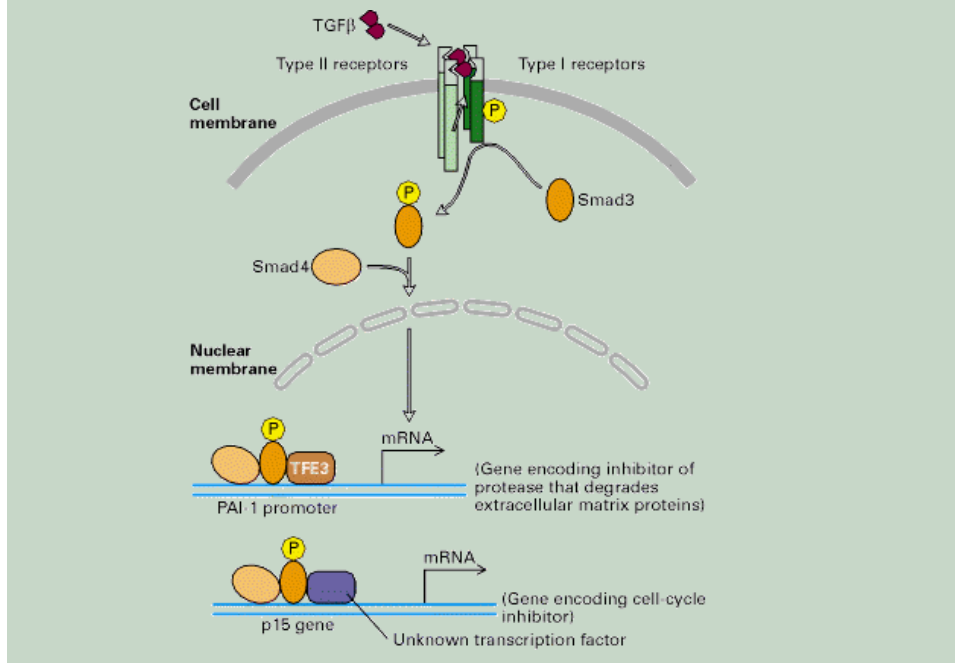
Alosterismo - Aspartato transcarbamilasa



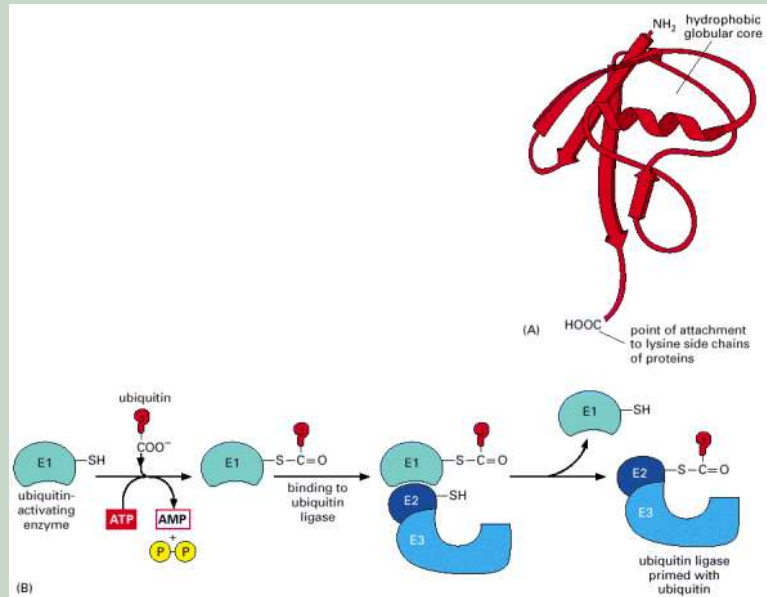
Fosforilación



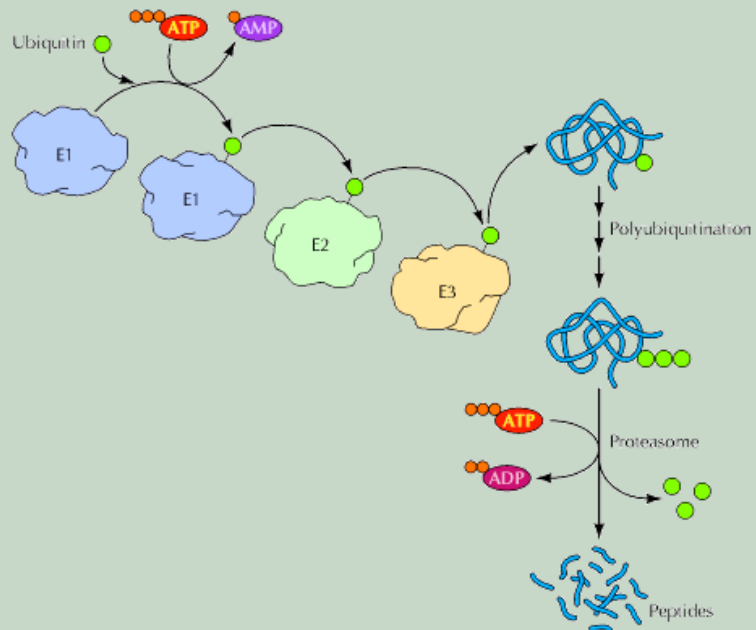
Fosforilación



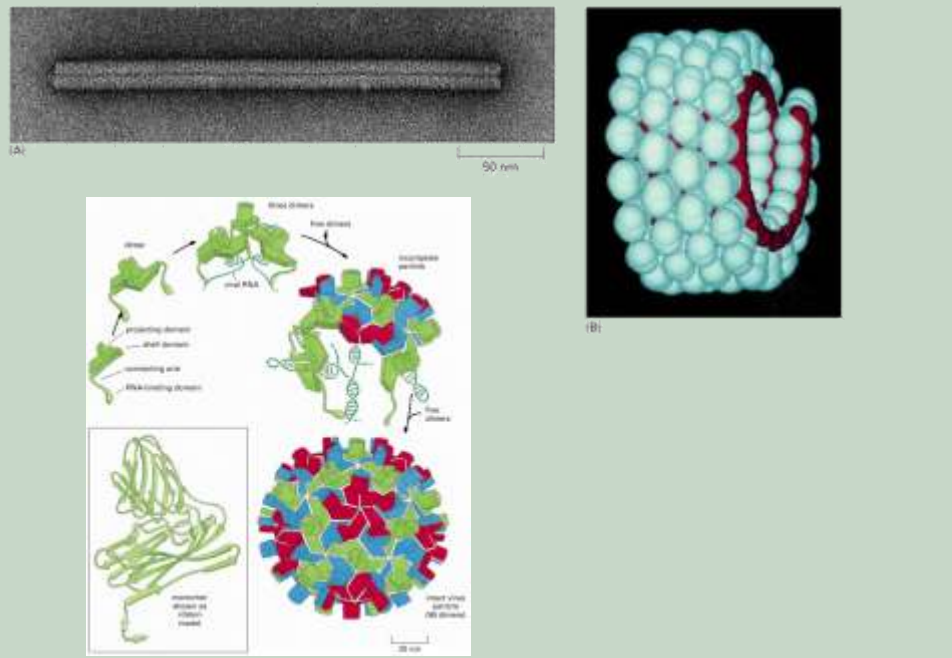
Degradación



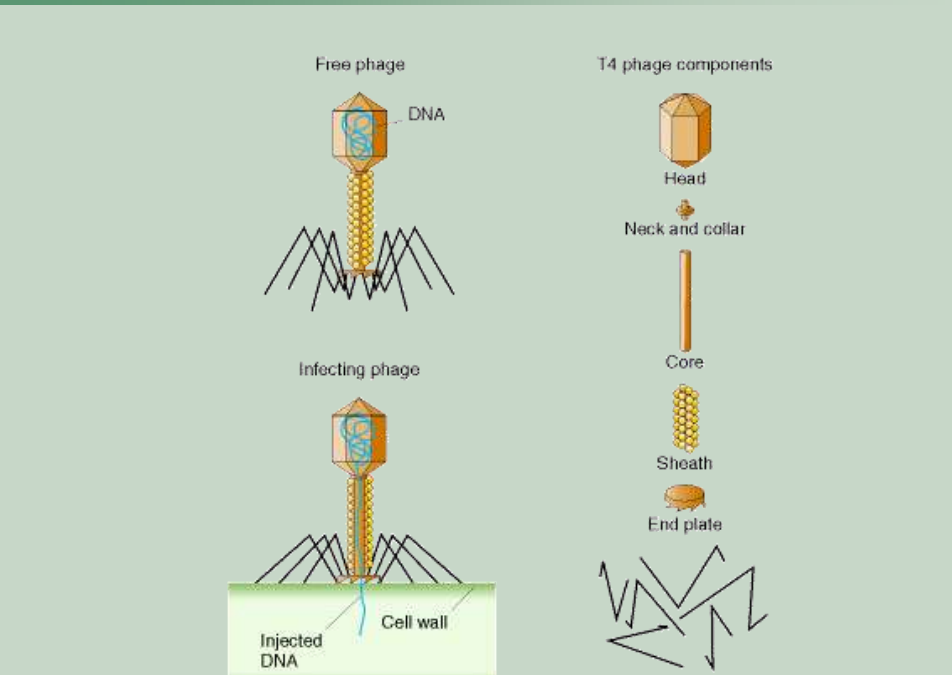
Degradación



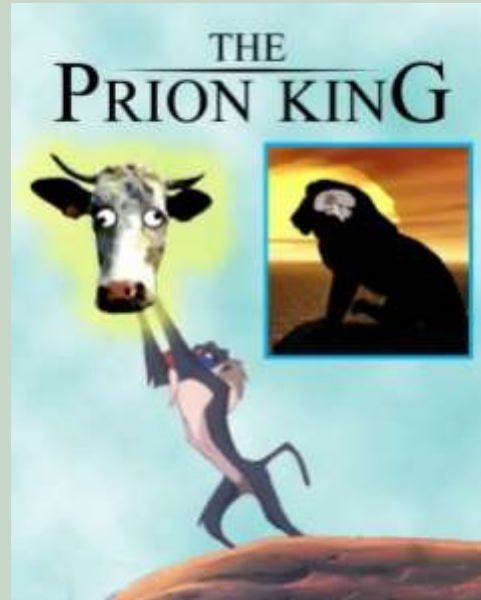
Virus



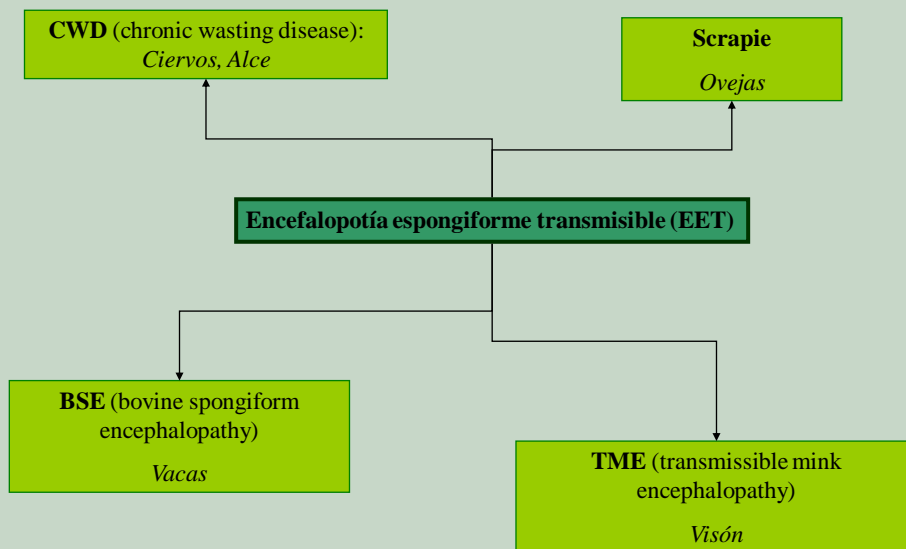
Bacteriophages

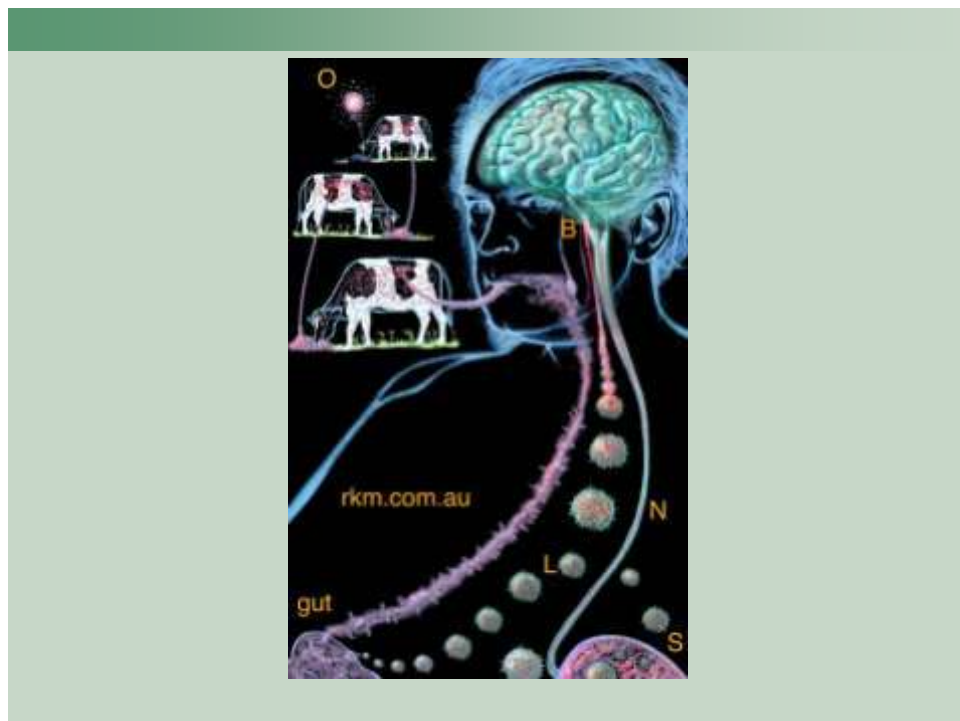
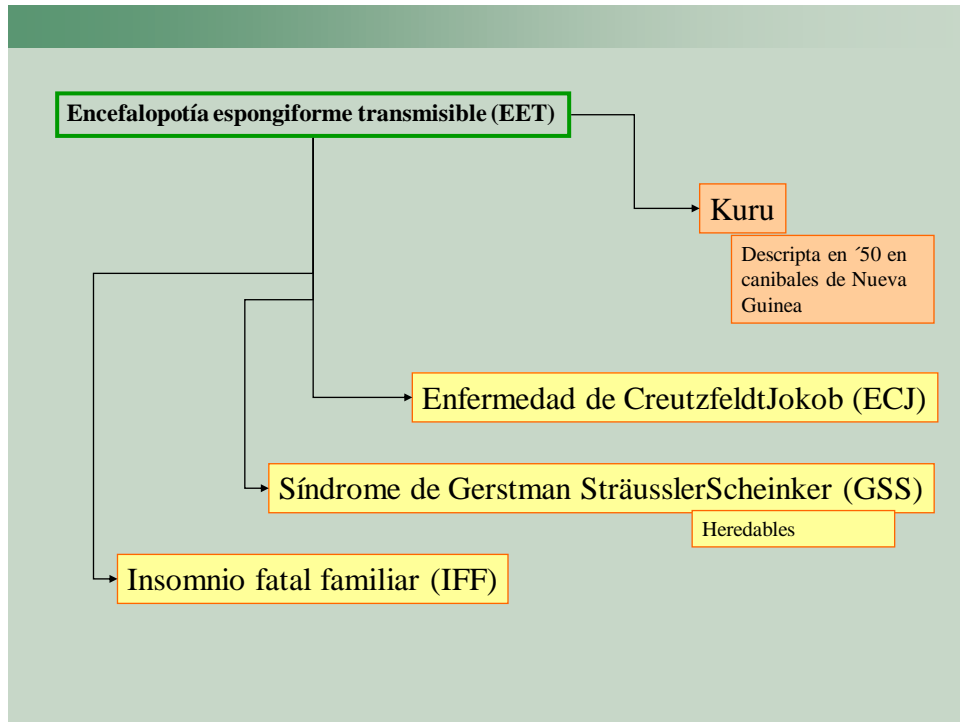


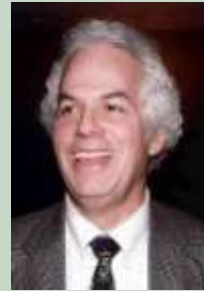
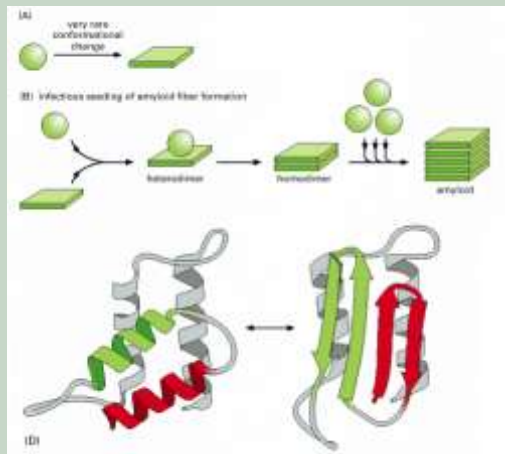
Priones



Priones







Stanley B. Prusiner



Proc. Natl. Acad. Sci. USA
Vol. 95, pp. 13363–13383, November 1998
Nobel Lecture

Prions

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ABSTRACT Prions are unprecedented infectious pathogens that cause a group of invariably fatal neurodegenerative diseases by an entirely novel mechanism. Prion diseases may present as genetic, infectious, or sporadic disorders, all of which involve modification of the prion protein (PrP). Bovine spongiform encephalopathy (BSE), scrapie of sheep, and Creutzfeldt-Jakob disease (CJD) of humans are among the most notable prion diseases. Prions are transmissible particles that are devoid of nucleic acid and seem to be composed exclusively of a modified protein (PrP^{Sc}). The normal, cellular PrP (PrP^C) is converted into PrP^{Sc} through a posttranslational process during which it acquires a high β -sheet content. The species of a particular prion is encoded by the sequence of the chromosomal PrP gene of the mammals in which it last replicated. In contrast to pathogens carrying a nucleic acid genome, prions appear to encipher strain-specific properties in the tertiary structure of PrP^{Sc}. Transgenic studies argue that PrP^{Sc} acts as a template upon which PrP^C is refolded into a nascent PrP^{Sc} molecule through a process facilitated by another protein. Miniprions generated in transgenic mice expressing PrP, in which nearly half of the residues were deleted, exhibit unique biological properties and should facilitate structural studies of PrP^{Sc}. While knowledge about prions has profound implications for studies of the structural plasticity of proteins, investigations of prion diseases suggest that new strategies for the prevention and treatment of these disorders may also find application in the more common degenerative diseases.

more frequently than other Israelis (13). This finding prompted some investigators to propose that the Libyan Jews had contracted CJD by eating lightly cooked brain from scrapie-infected sheep when they lived in Tripoli prior to emigration. Subsequently, the Libyan Jewish patients were all found to carry a mutation at codon 200 in their prion protein (PrP) gene (14–16).

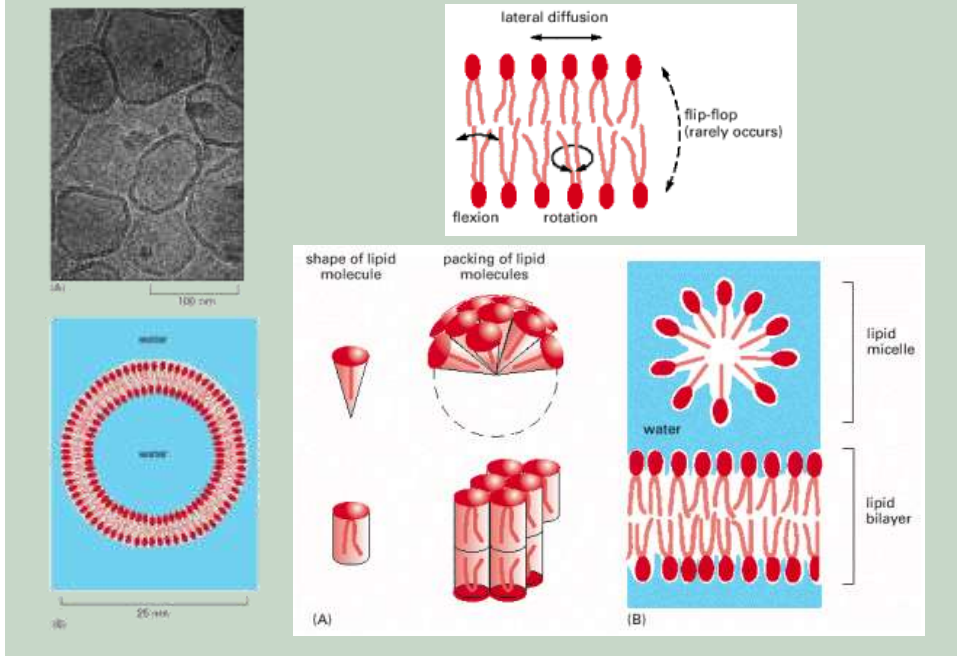
My own interest in the subject began with a patient dying of CJD in the fall of 1972. At that time, I was beginning a residency in neurology and was most impressed by a disease process that could kill my patient in 2 months by destroying her brain while her body remained unaffected by this process. No febrile response, no leukocytosis or pleocytosis, no humoral immune response, and yet I was told that she was infected with a “slow virus.”

Slow Viruses. The term “slow virus” had been coined by Bjorn Sigurdsson in 1954 while he was working in Iceland on scrapie and visna of sheep (17). Five years later, William Hadlow had suggested that kuru, a disease of New Guinea highlanders, was similar to scrapie and thus, it, too, was caused by a slow virus (18). Seven more years were to pass before the transmissibility of kuru was established by passing the disease to chimpanzees inoculated intracerebrally (19). Just as Hadlow had made the intellectual leap between scrapie and kuru, Igor Klatzo made a similar connection between kuru and CJD (20). In both instances, these neuropathologists were struck by the similarities in light microscopic pathology of the central nervous system (CNS) that kuru exhibited with scrapie

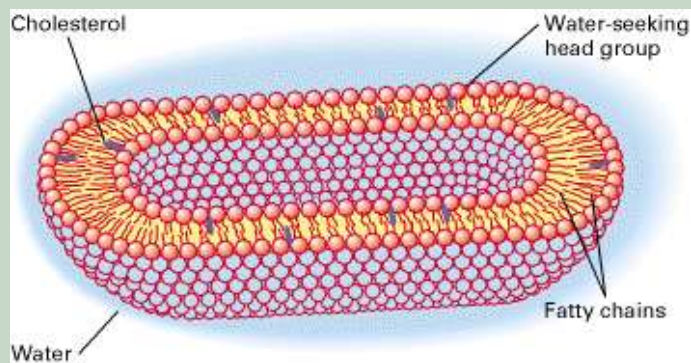
INTRODUCCION A LA BIOLOGIA CELULAR Y MOLECULAR

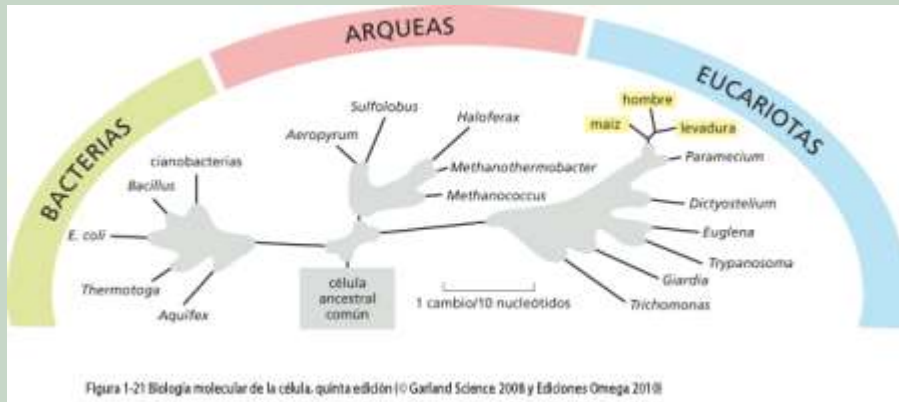
- BIOLOGIA CELULAR -
Compartimentalización celular eucariota

Componentes de membrana

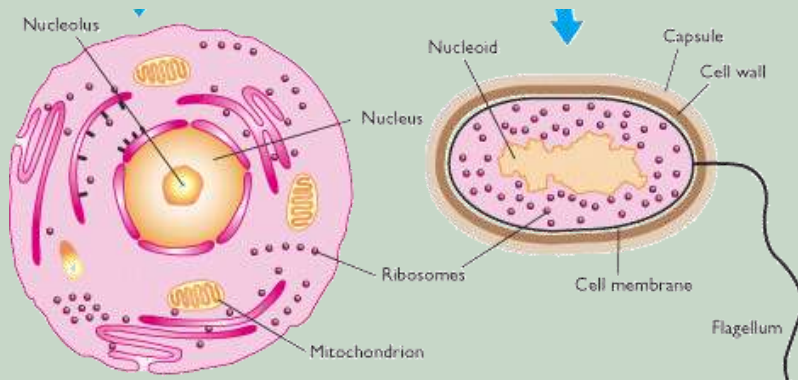


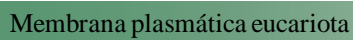
La membrana plasmática



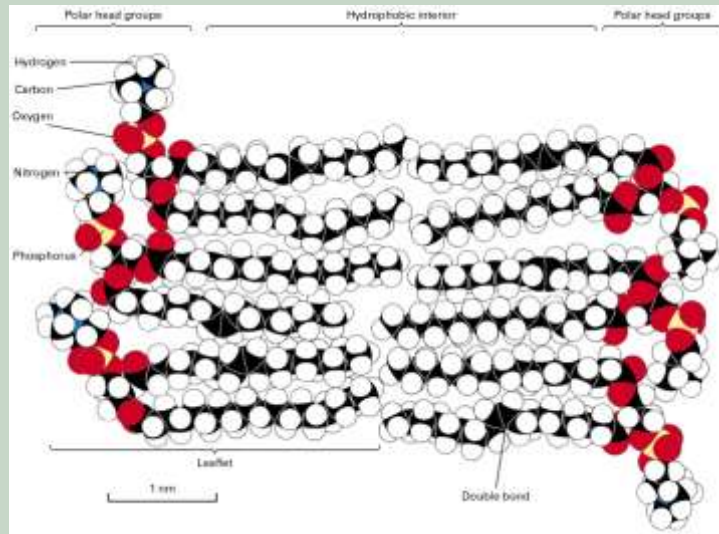


Eucariotas vs. Procariotas

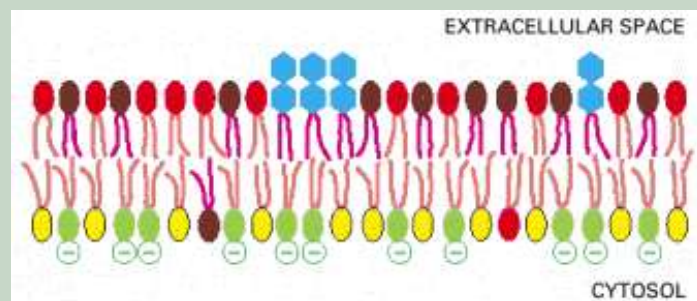
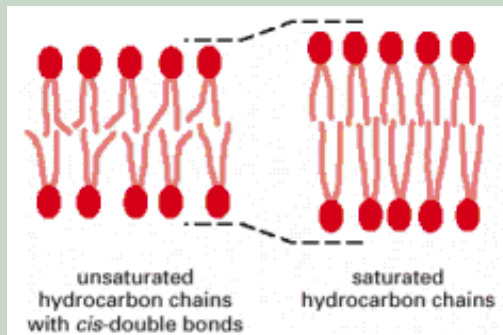




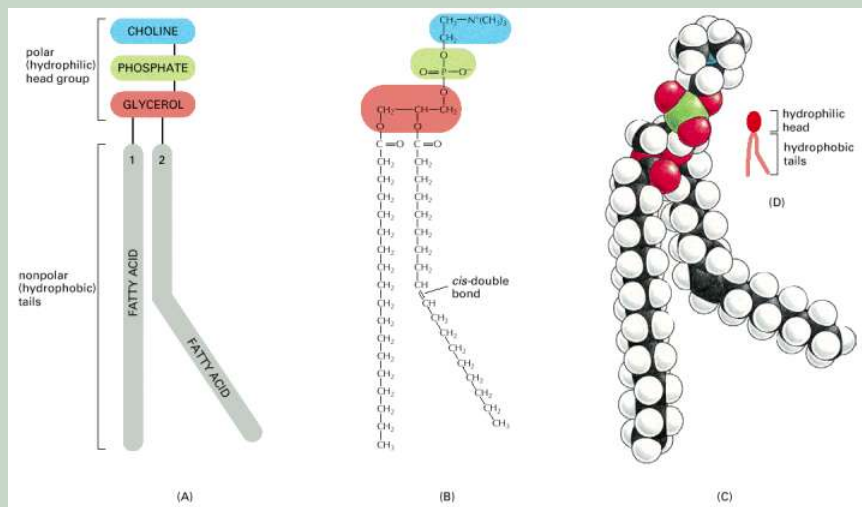
Membrana plasmática



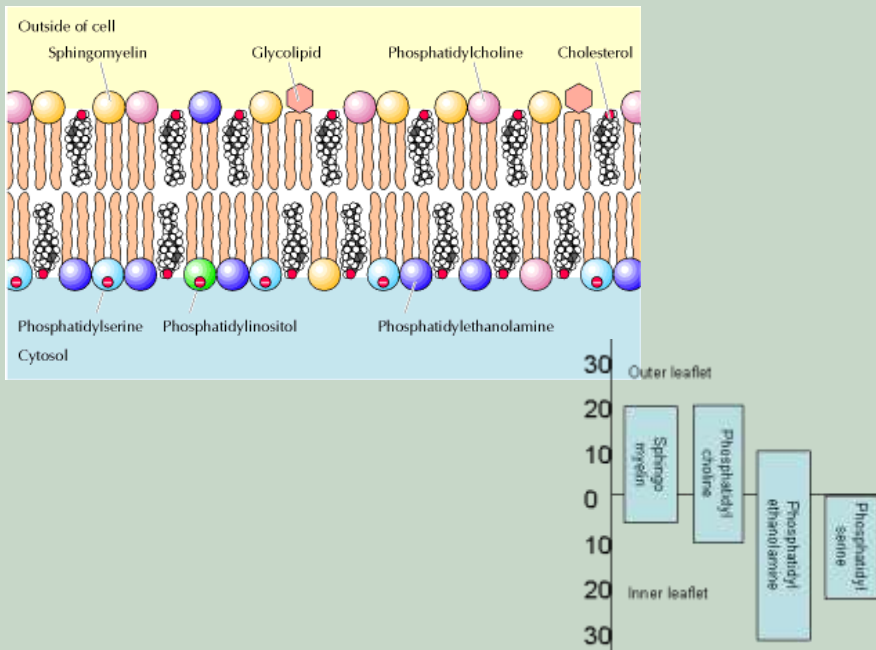
Arreglo de la membrana plasmática



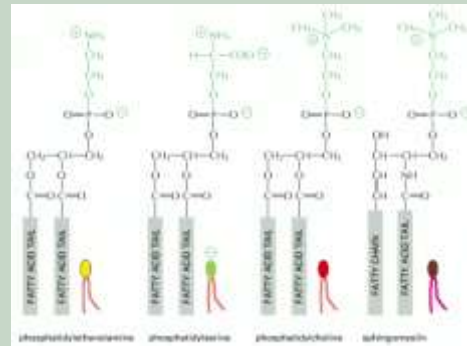
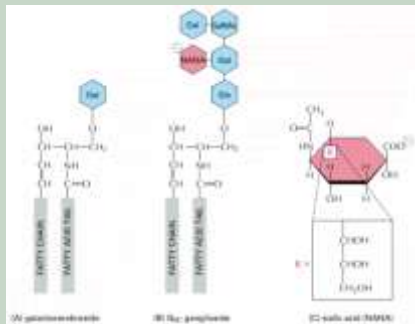
Fosfolípidos



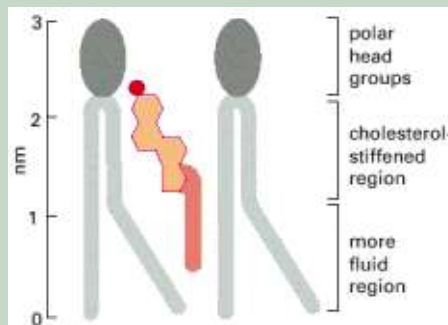
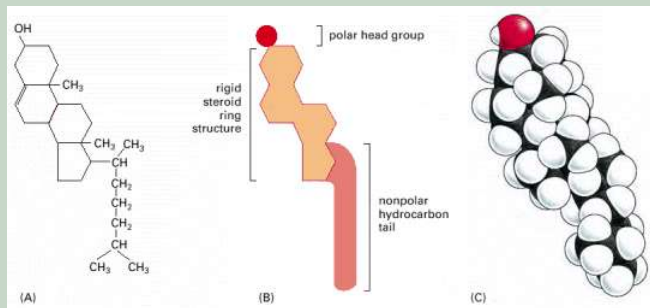
Membrana plasmática eucariota



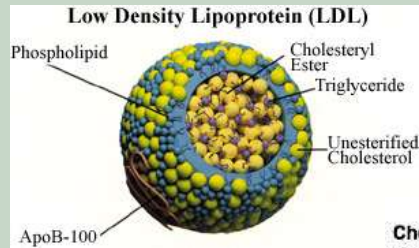
Fosfolípidos y Gangliósidos



Cholesterol

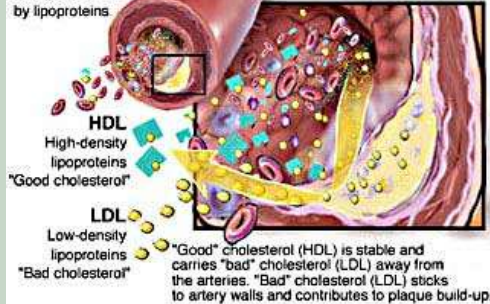


Colesterol



Cholesterol

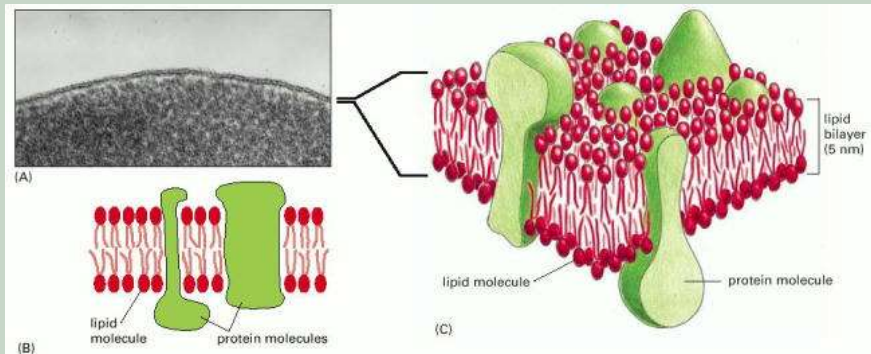
Cholesterol is a waxy fat carried through the bloodstream by lipoproteins.



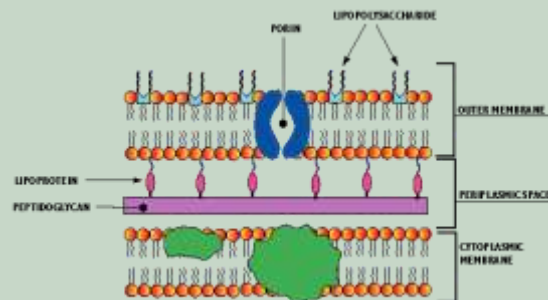
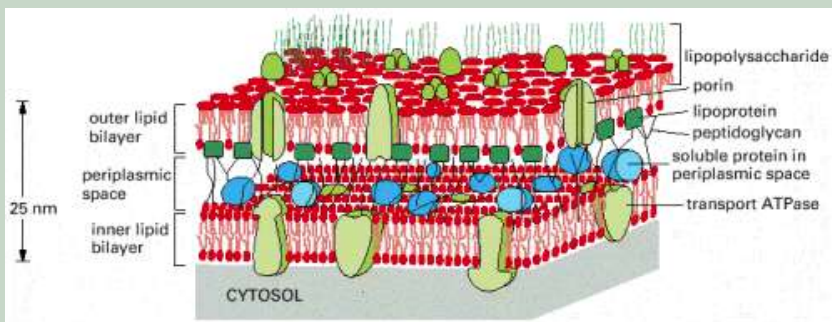
Composición de la membrana plasmática

LIPID	PERCENTAGE OF TOTAL LIPID BY WEIGHT					
	LIVER CELL PLASMA MEMBRANE	RED BLOOD CELL PLASMA MEMBRANE	MYELIN MEMBRANE	MITOCHONDRION (INNER AND OUTER MEMBRANES)	ENDOPLASMIC RETICULUM	<i>E. COLI</i> BACTERIUM
Cholesterol	17	23	22	3	6	0
Phosphatidylethanolamine	7	18	15	25	17	70
Phosphatidylserine	4	7	9	2	5	trace
Phosphatidylcholine	24	17	10	39	40	0
Sphingomyelin	19	18	8	0	5	0
Glycolipids	7	3	28	trace	trace	0
Others	22	13	8	21	27	30

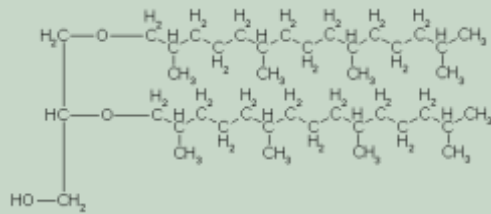
Membrana plasmática



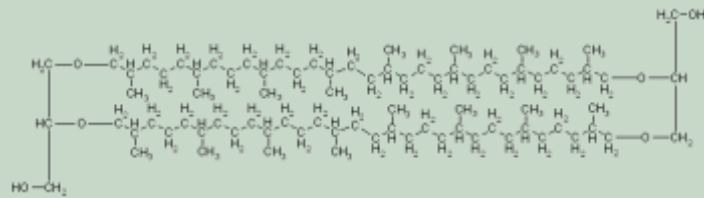
Membrana plasmática procariota



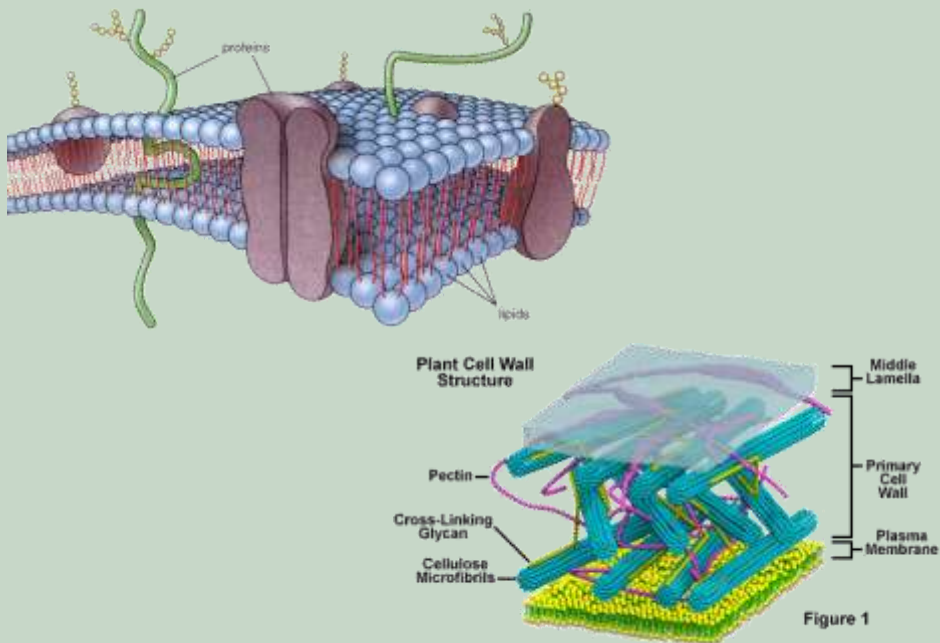
Lípidos de bacterias *Archae*



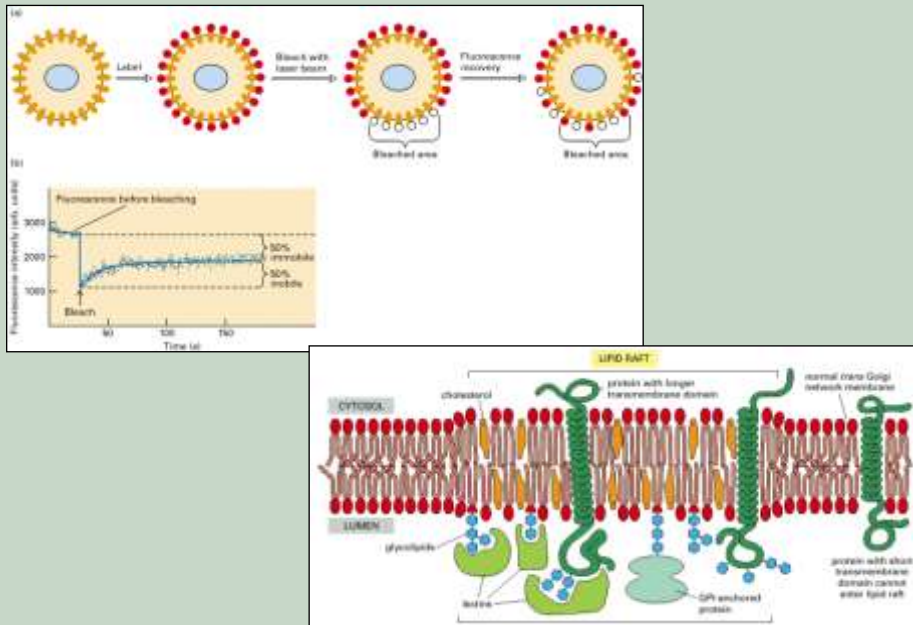
Lípido de membrana de bacteria *Archae*. Están unidas por uniones de tipo “ethers” (-O-) y no por uniones “ésteres” (-COO-). Las cadenas de ácido graso son terpenoides (polyisoprenos). No son Ácidos grasos reales sin grupos grandes en sus extremos.



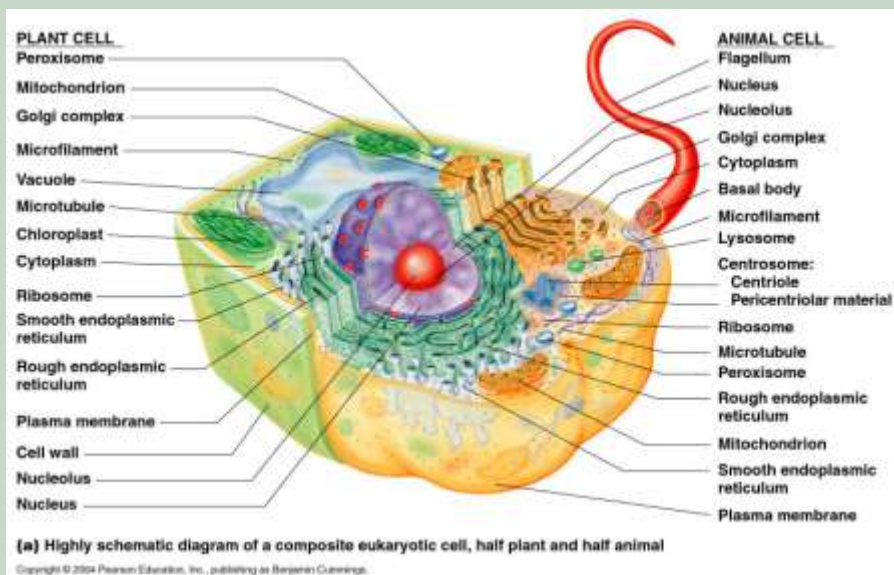
Membrana plasmática eucariotas



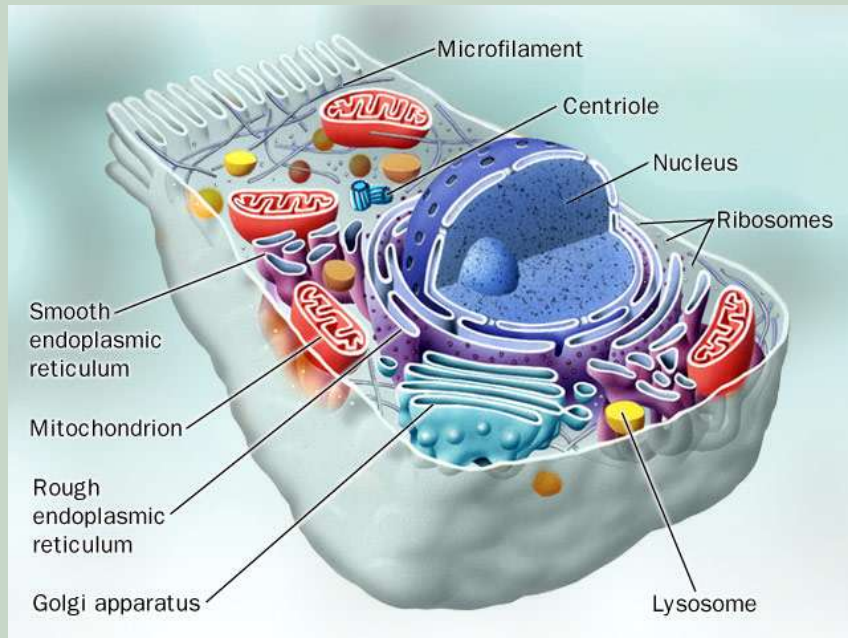
Mosaico Fluído y Rafts de membrana



Características de la célula eucariota



Características de la célula eucariota

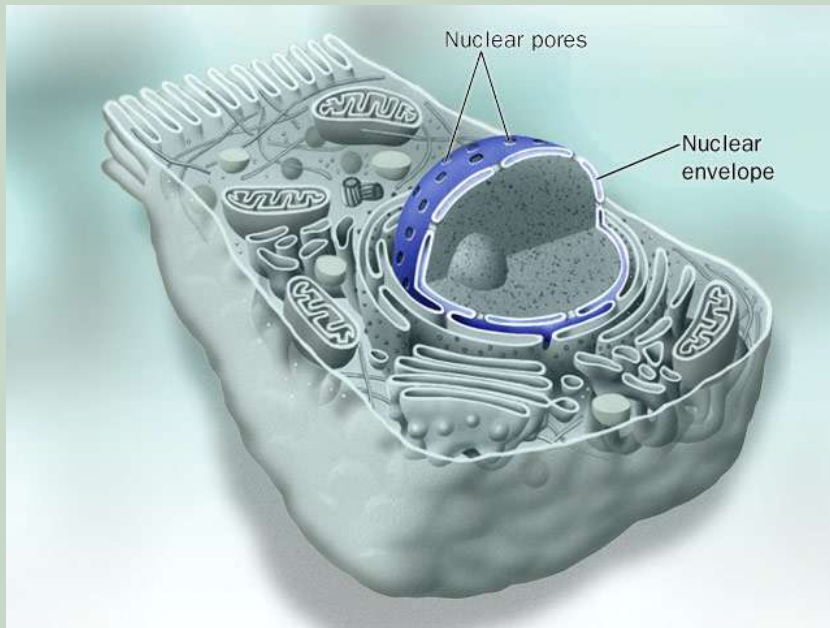


Compartimentos celulares

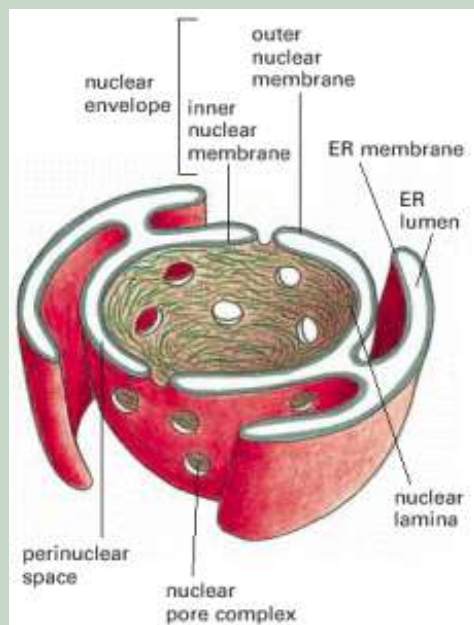
	% del total *
Citosol	57
Mitocondrias	22
RE rugoso	9
RE liso mas Golgi	6
Nucleo	6
Peroxisomas	1
Lisosomas	1
Endosomas	1

* hepatocito

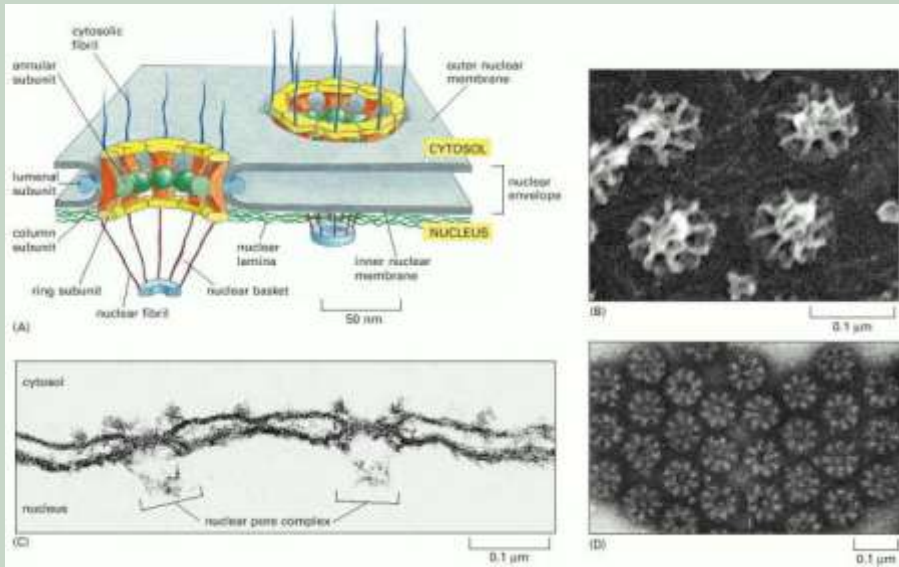
Núcleo



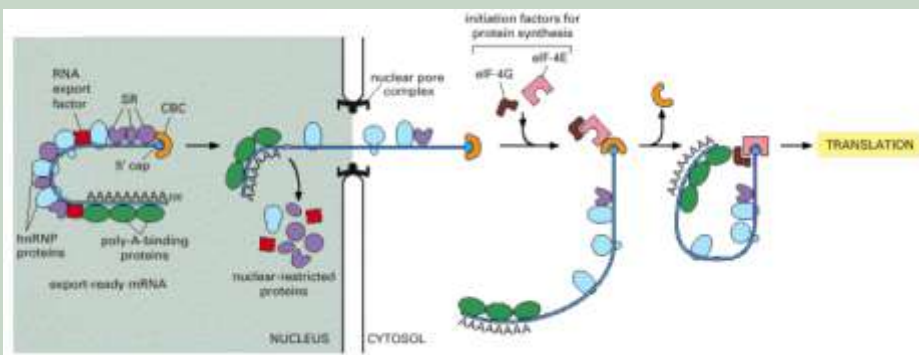
Núcleo



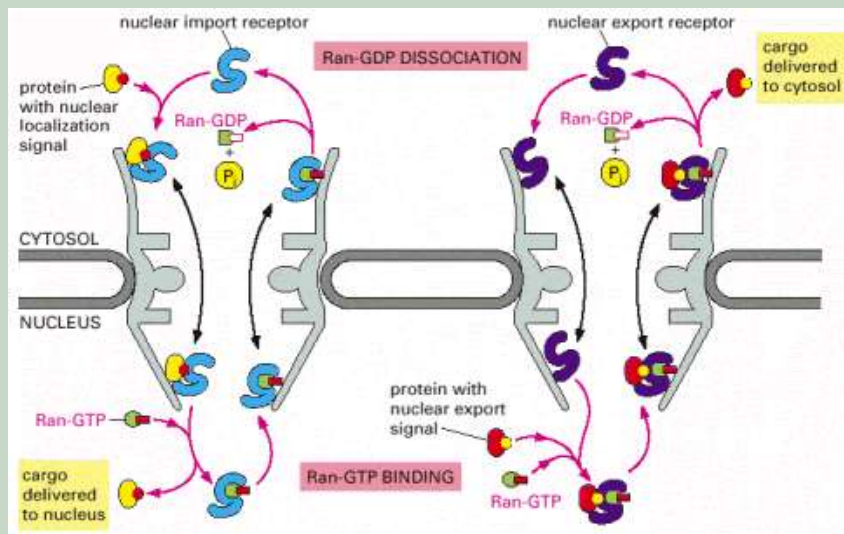
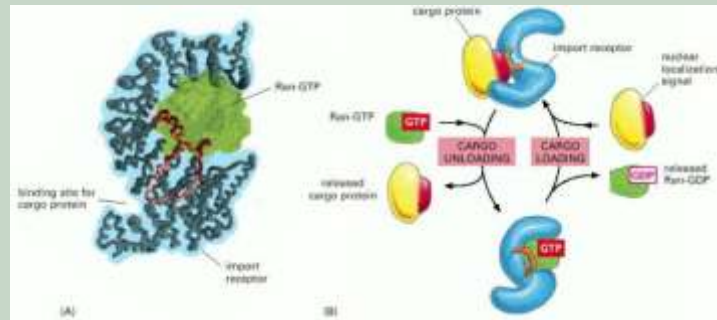
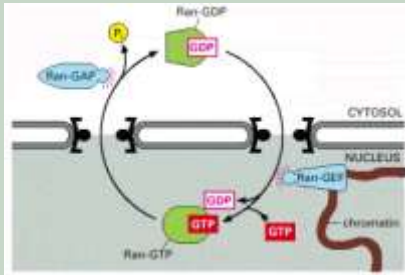
Poros nucleares



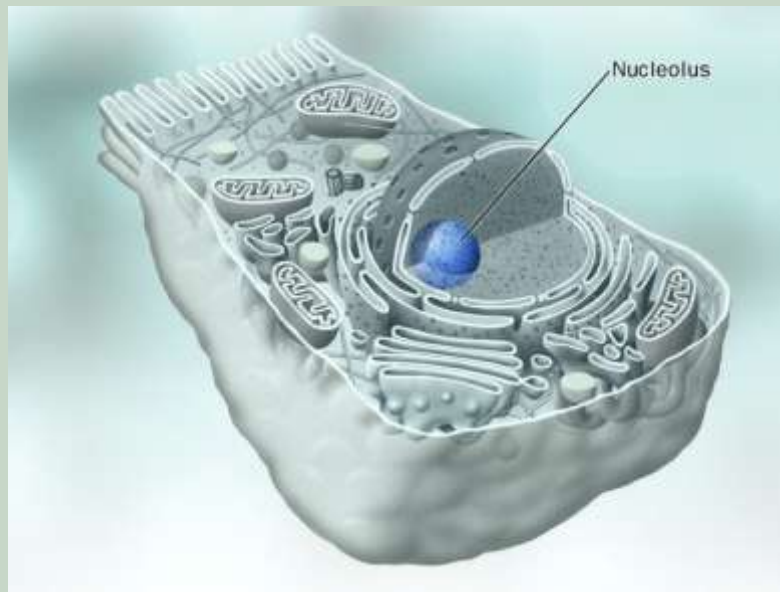
Núcleo - Transporte de mRNA



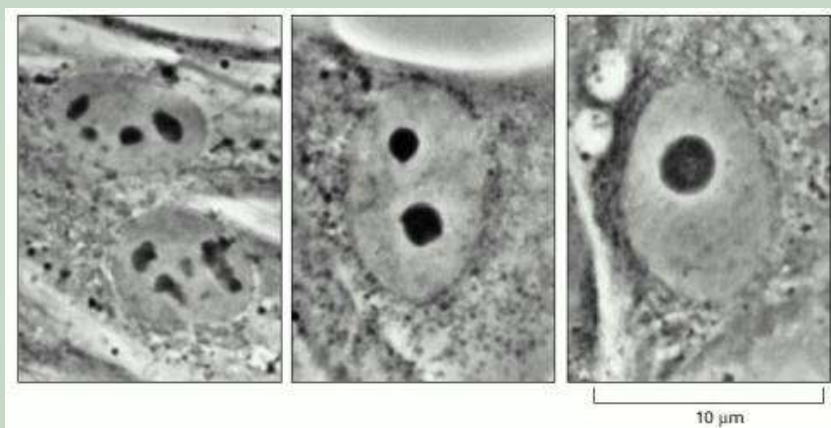
Núcleo - Transporte de proteínas



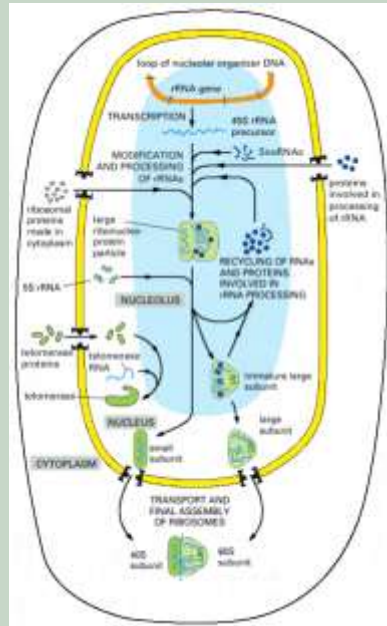
Nucleolo



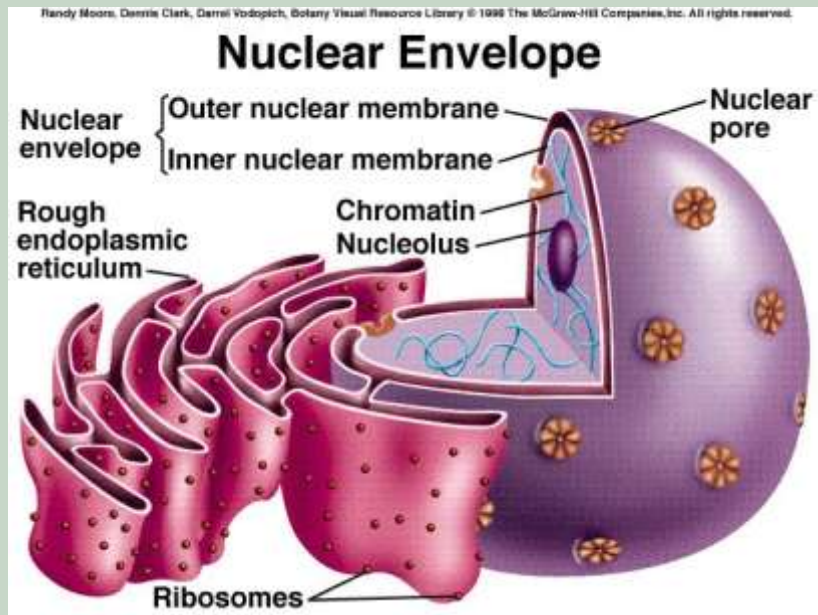
Nucleolo



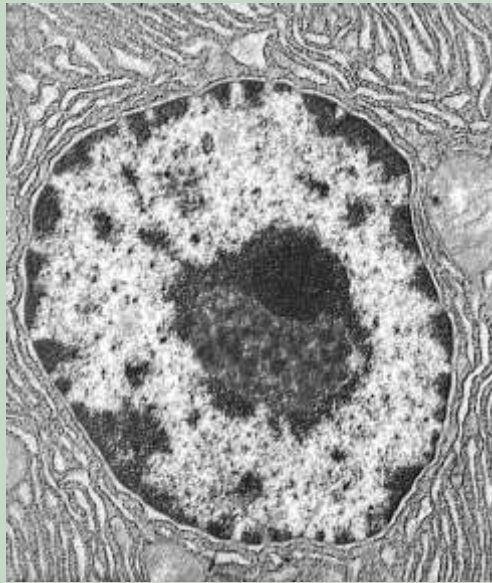
Nucleolo



Núcleo y RE



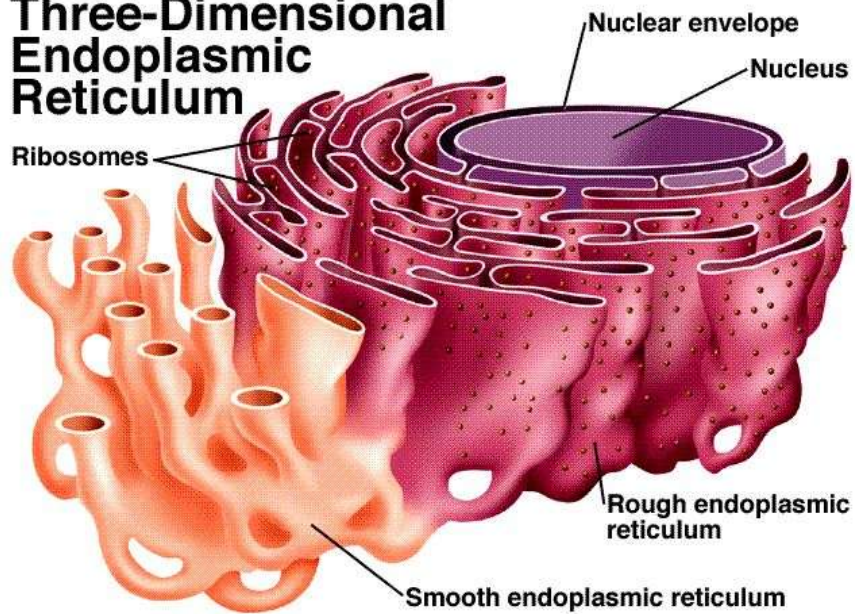
Núcleo y RE



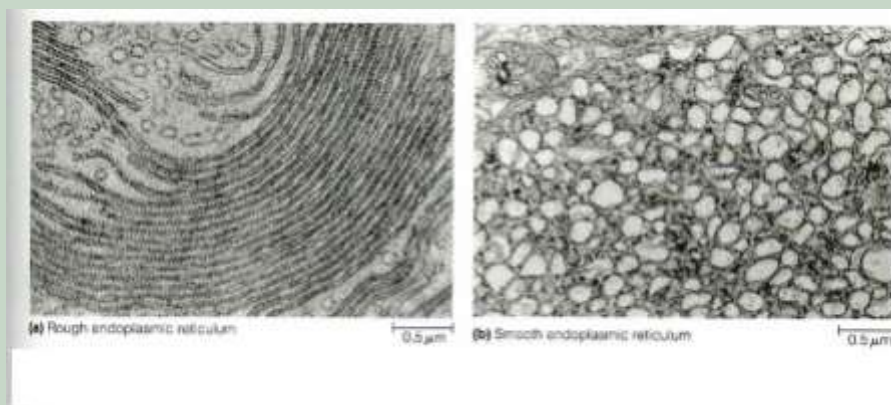
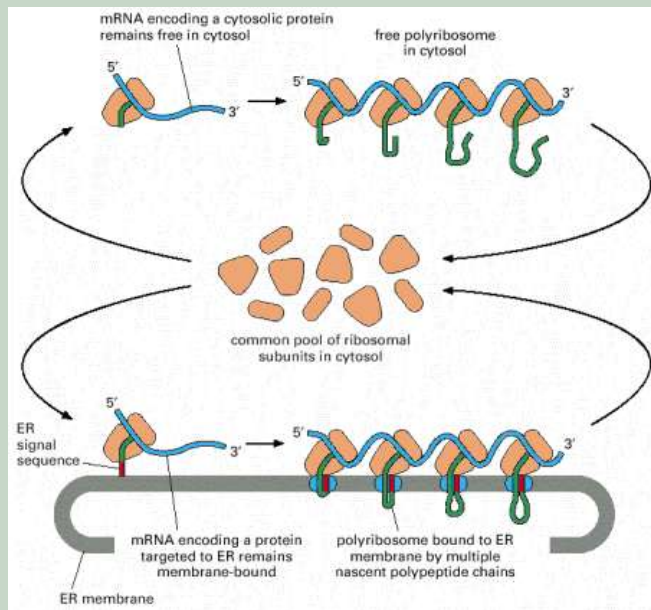
Retículo Endoplasmático

Randy Moore, Dennis Clark, and Darrell Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

Three-Dimensional Endoplasmic Reticulum



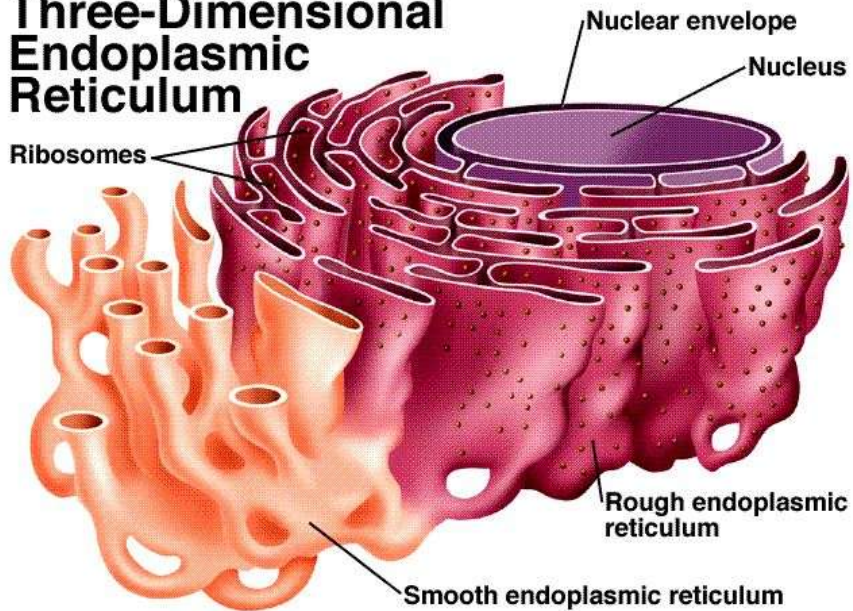
Retículo Endoplasmático Rugoso



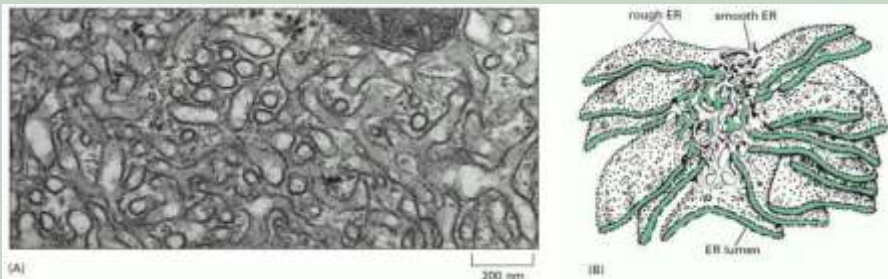
Retículo Endoplasmático

Randy Moore, Dennis Clark, and Darrell Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

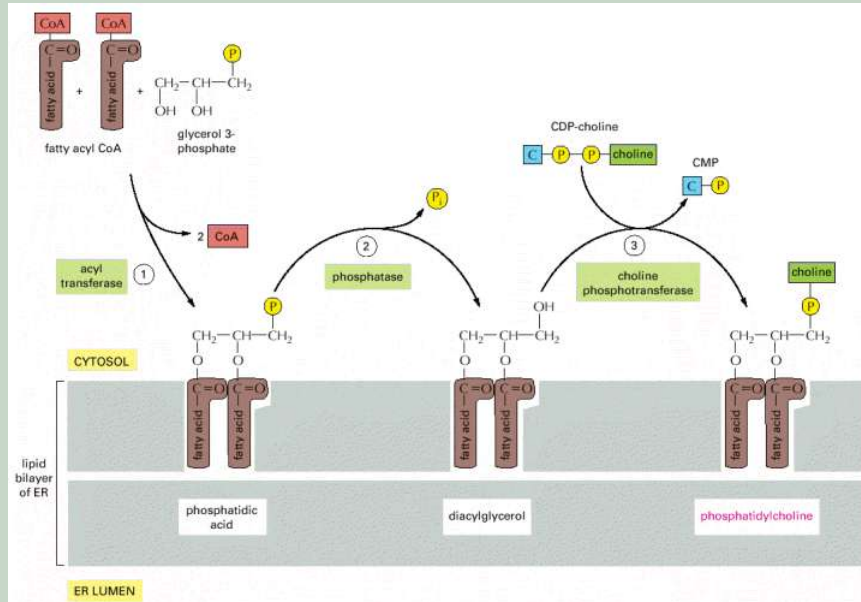
Three-Dimensional Endoplasmic Reticulum



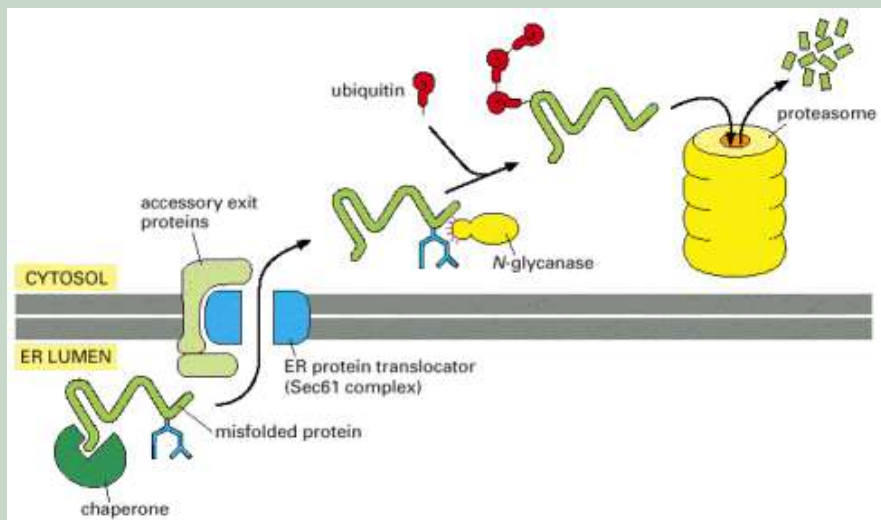
Retículo Endoplasmático Liso



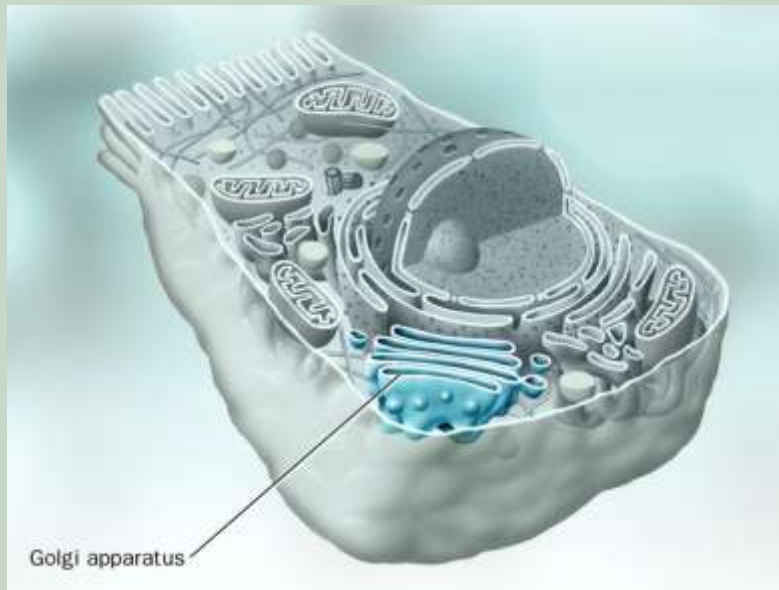
Síntesis de Fosfolípidos



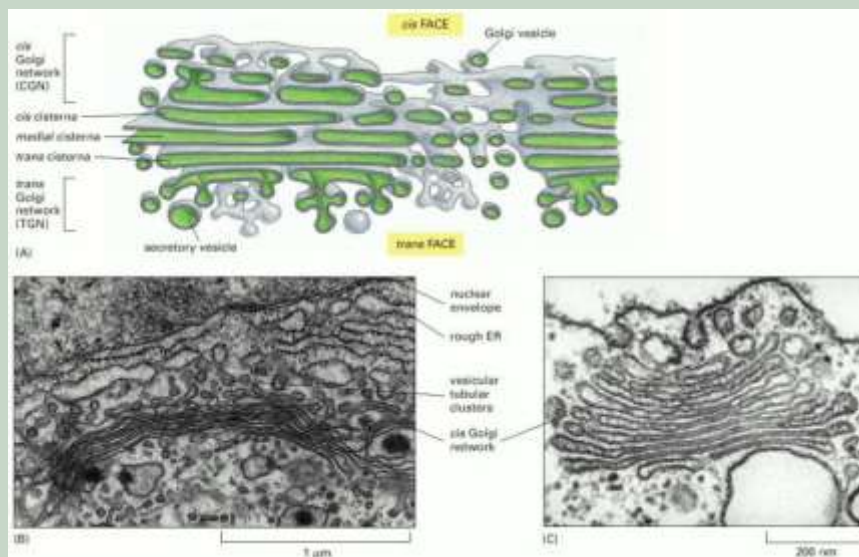
Degradación de péptidos



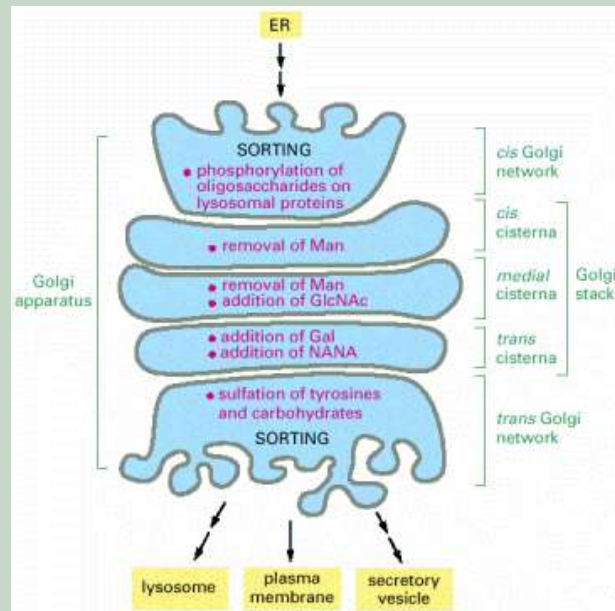
Aparato de Golgi



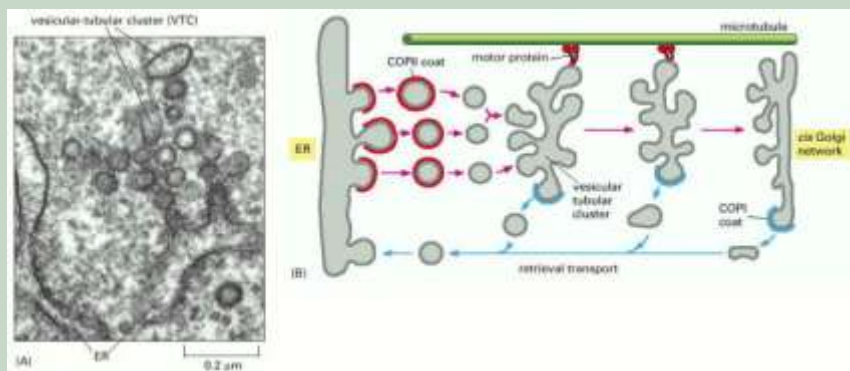
Aparato de Golgi



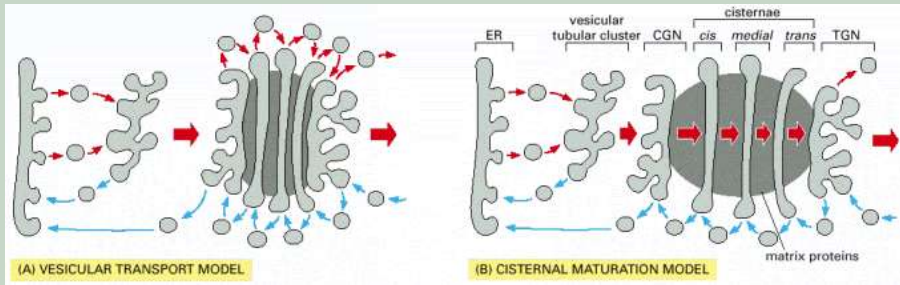
Aparato de Golgi



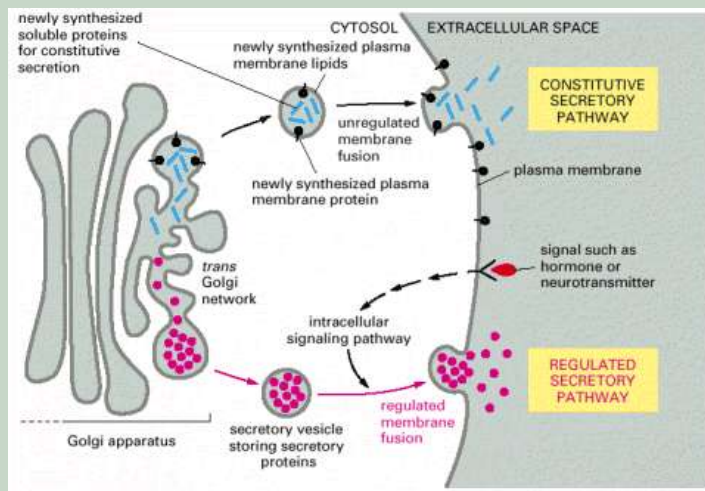
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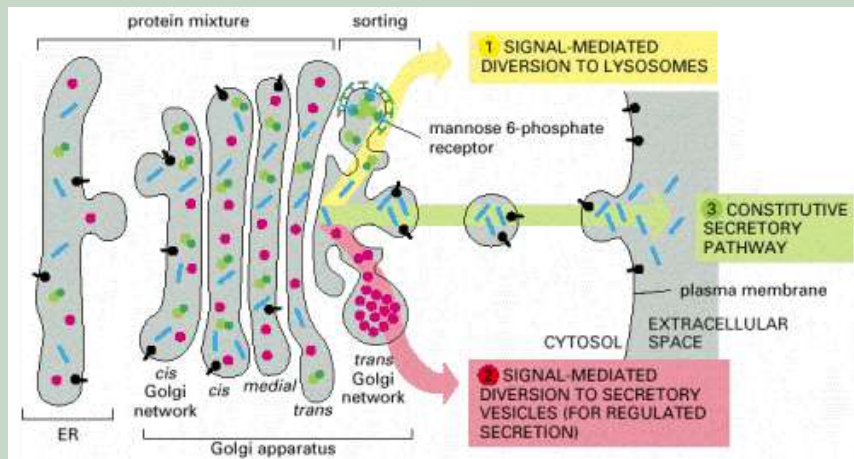
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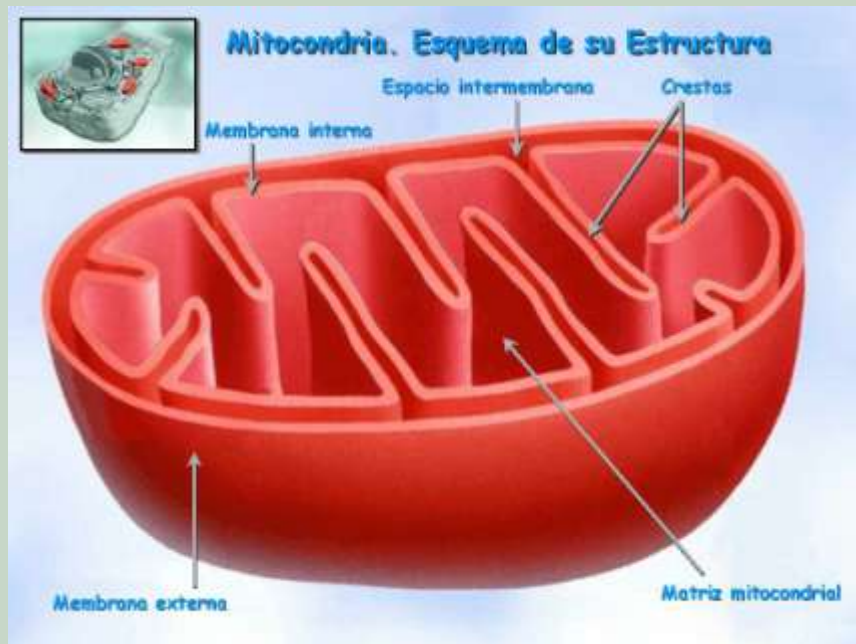
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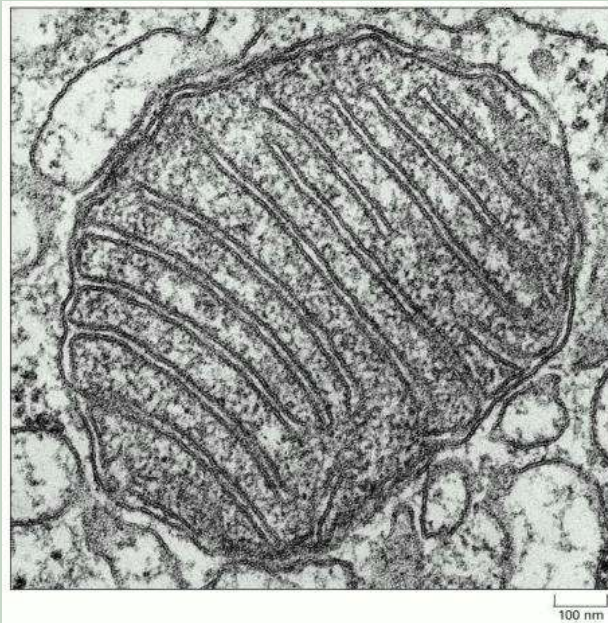
Aparato de Golgi



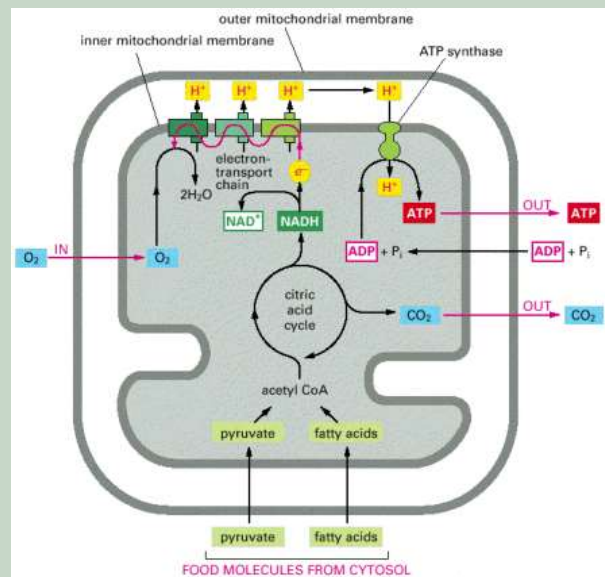
Mitocondrias



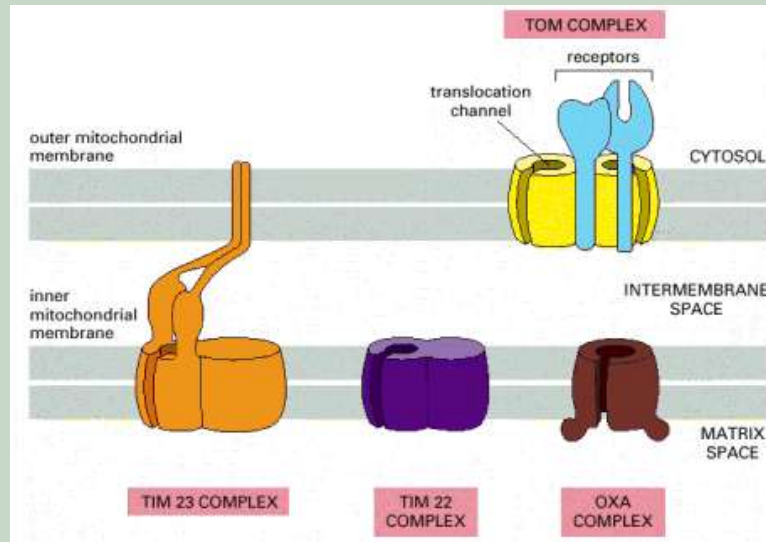
Mitocondrias



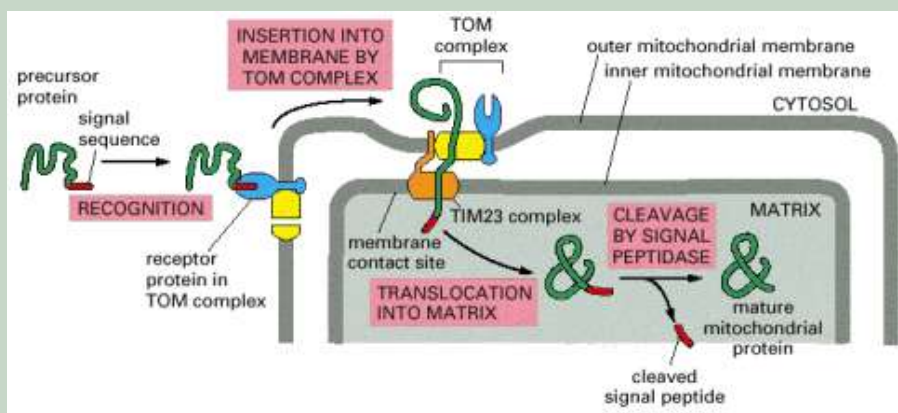
Mitocondrias - Función



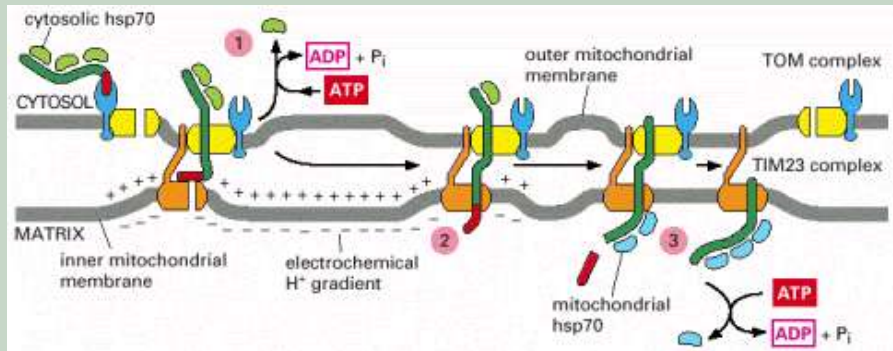
Mitocondrias – Transporte de péptidos



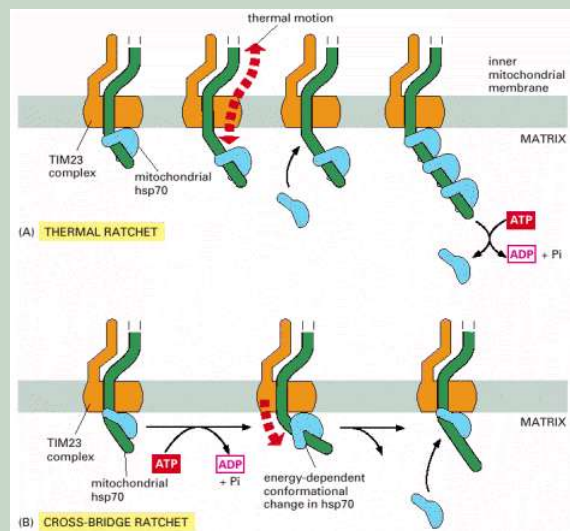
Mitocondrias – Transporte de péptidos



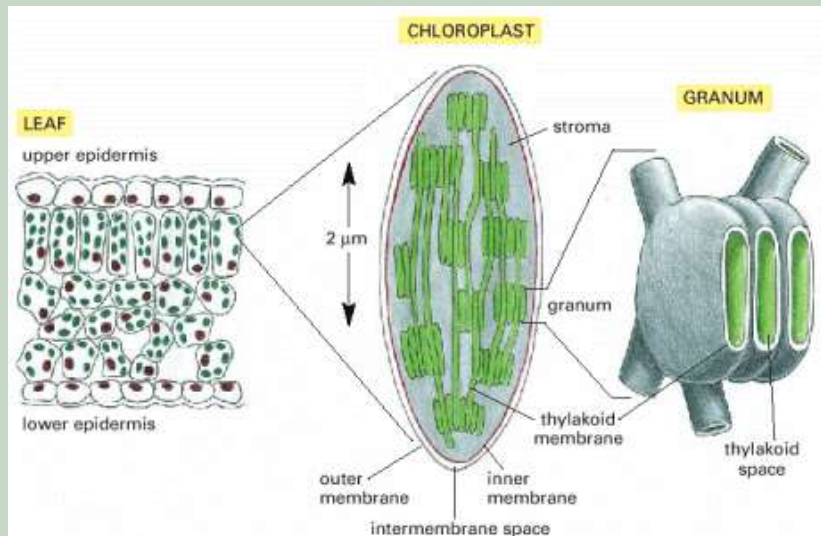
Mitocondrias – Transporte de péptidos



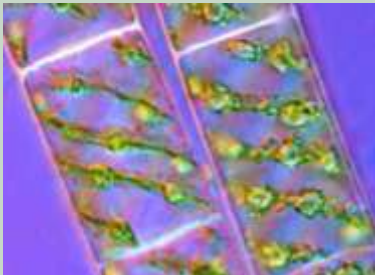
Mitocondrias – Transporte de péptidos



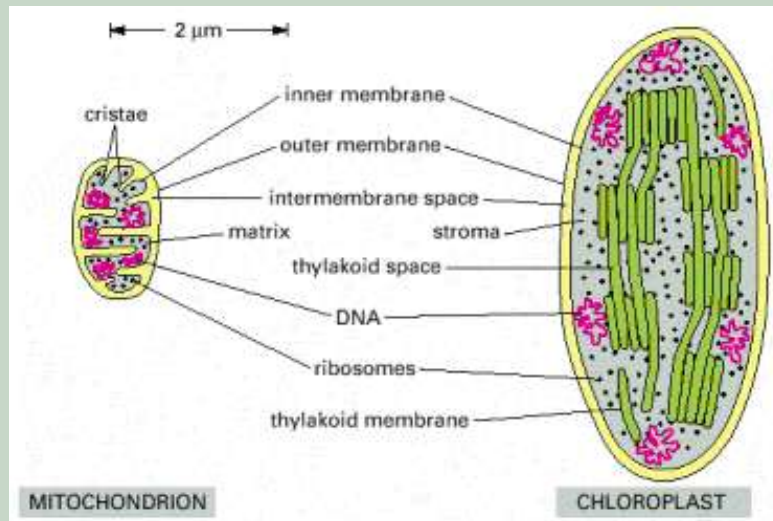
Cloroplastos



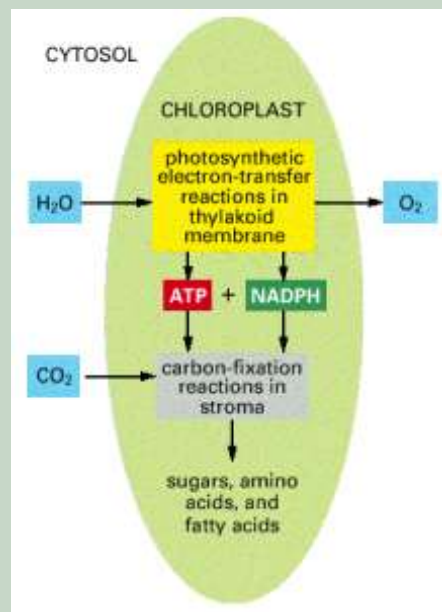
Cloroplastos



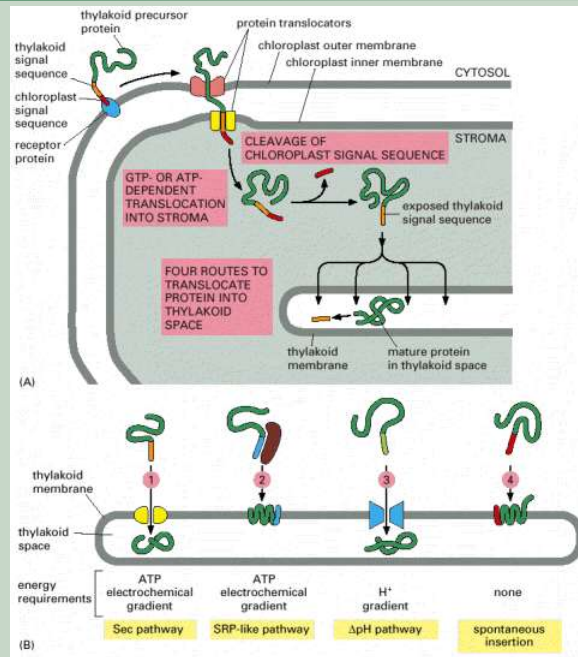
Cloroplastos



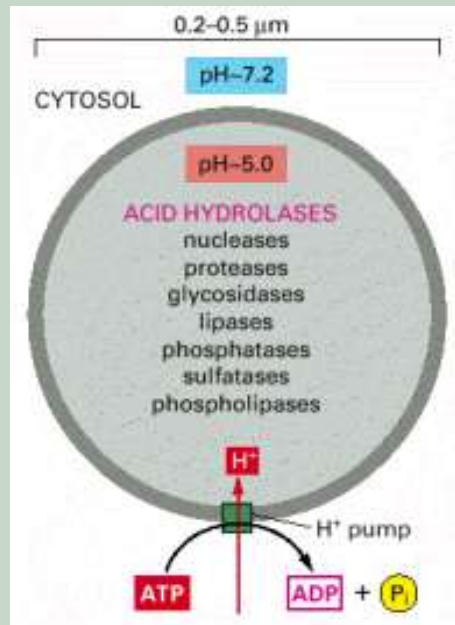
Cloroplastos - Función



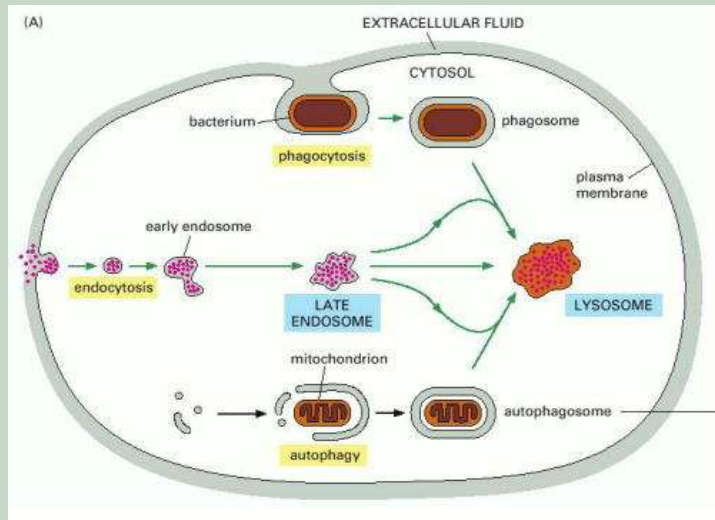
Cloroplastos – Transporte de péptidos



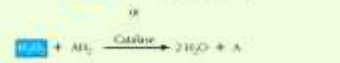
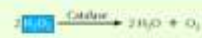
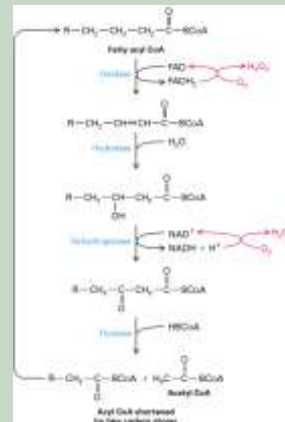
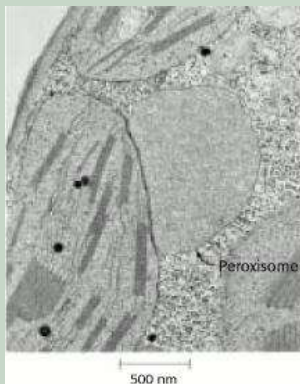
Lisosomas



Lisosomas



Peroxisomas



Teoría endosimbiótica



Lynn Margulis

years ago	Important Dates
4.5 Billion	Origin Of The Earth
3.5 Billion	Prokaryote Bacteria Dominate
2.5 Billion	Oxygen Accumulates In Atmosphere
1.5 Billion	Eukaryotes —First Nucleated Cell
0.5 Billion	Cambrian Explosion Of Multicellular Eukaryote Organisms

Figure 1-1

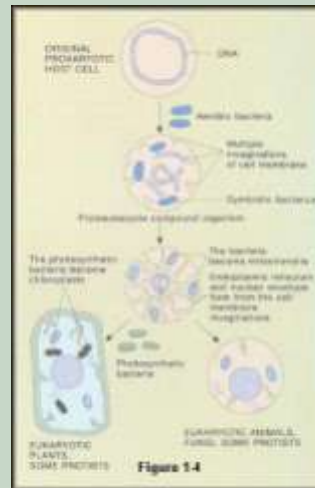


Figure 1-4

1. Sagan, I. *Theor Biol*, 1967 Mar;14(3):255-74.

Related Articles, Links

On the origin of mitosing cells

Sagan, I.

Department of Biology, Boston University, Massachusetts, USA.

A theory of the origin of eukaryotic cells ("higher" cells which divide by classical mitosis) is presented. By hypothesis, three fundamental organelles: the mitochondria, the photosynthetic plastids and the (9+2) basal bodies of flagella were themselves once free-living (prokaryotic) cells. The evolution of photosynthesis under the anaerobic conditions of the early atmosphere to form anaerobic bacteria, photosynthetic bacteria and eventually blue-green algae (and proto-plastids) is described. The subsequent evolution of aerobic metabolism in prokaryotes to form aerobic bacteria (protoflagella and proto-mitochondria) presumably occurred during the transition to the oxidizing atmosphere. Classical mitosis evolved in protozoan-type cells millions of years after the evolution of photosynthesis. A plausible scheme for the origin of classical mitosis in primitive amoeboid flagellates is presented. During the course of the evolution of mitosis, photosynthetic plastids (themselves derived from prokaryotes) were symbiotically acquired by some of these protozoans to form the eukaryotic algae and the green plants. The cytological, biochemical and paleontological evidence for this theory is presented, along with suggestions for further possible experimental verification. The implications of this scheme for the systematics of the lower organisms is discussed.

Teoría endosimbiótica

