

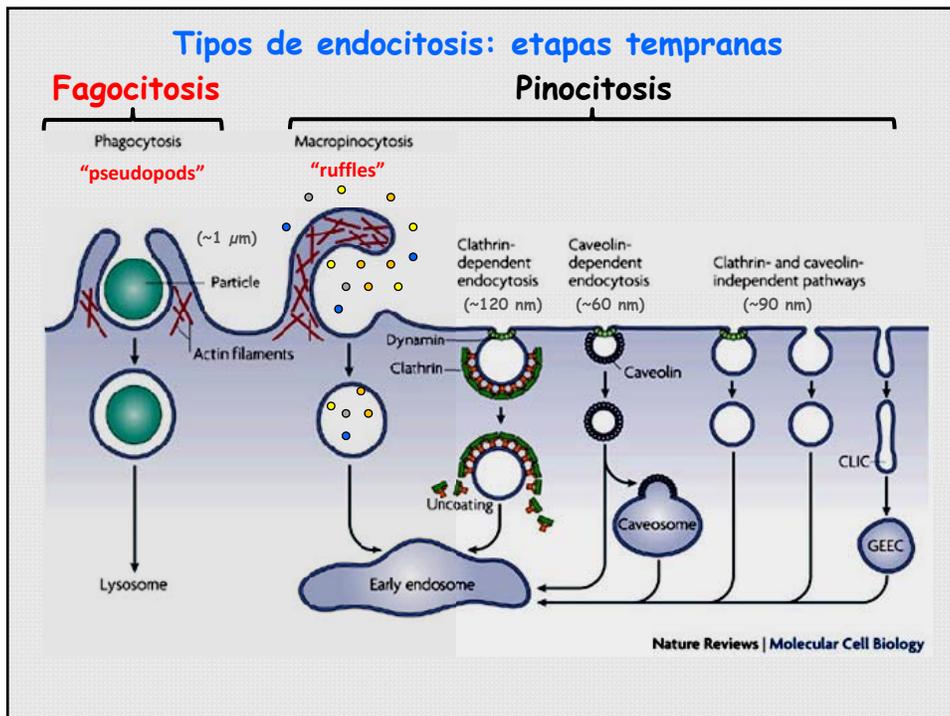
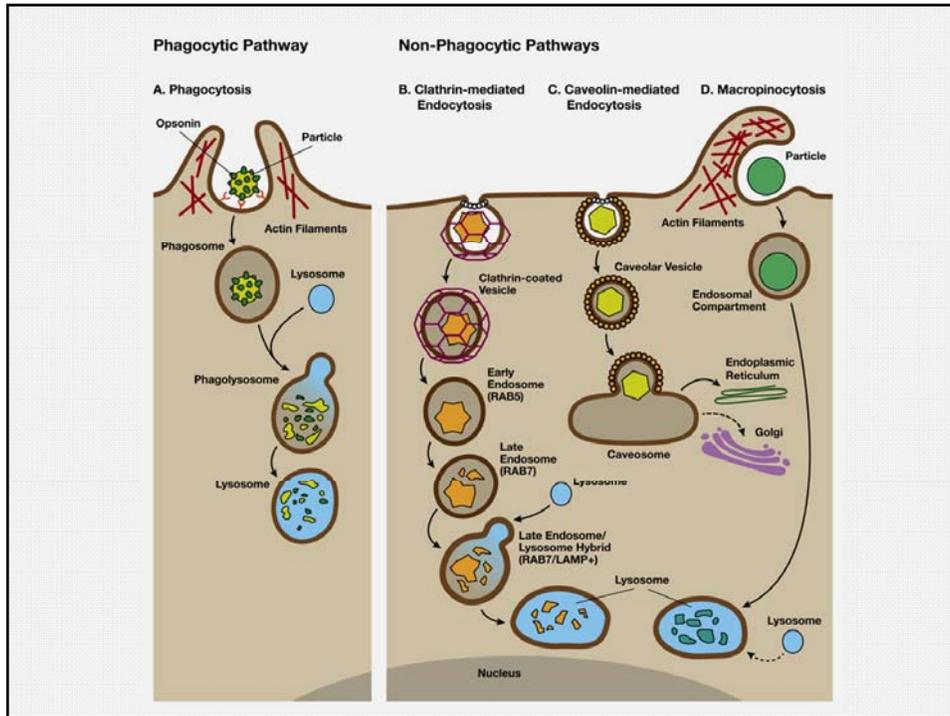
## ENDOCITOSIS

### Pinocitosis ("endocitosis")

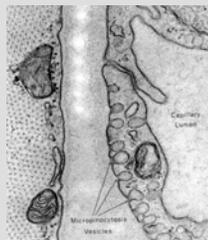
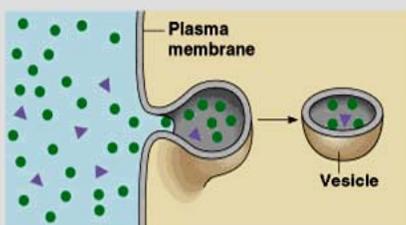
- fase fluida
- mediada por receptores (absortiva)

### Fagocitosis

- heterfagocitosis ("fagocitosis")
- autofagocitosis ("autofagia")

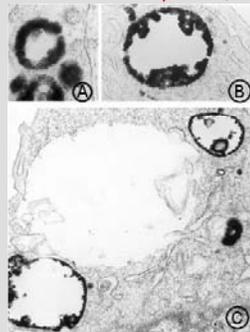


### Pinocytosis: endocitosis por fase fluida

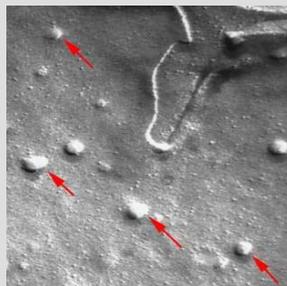


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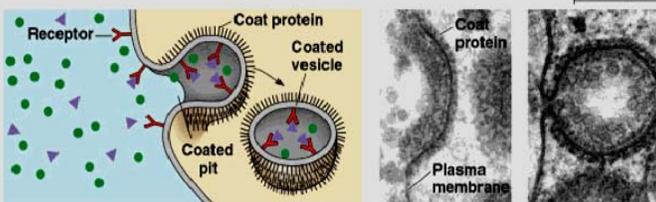
Microscopía electrónica de transmisión: endocitosis de HRP (peroxidasa de rábano picante)



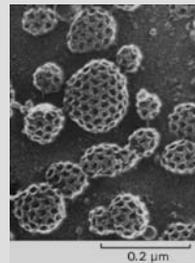
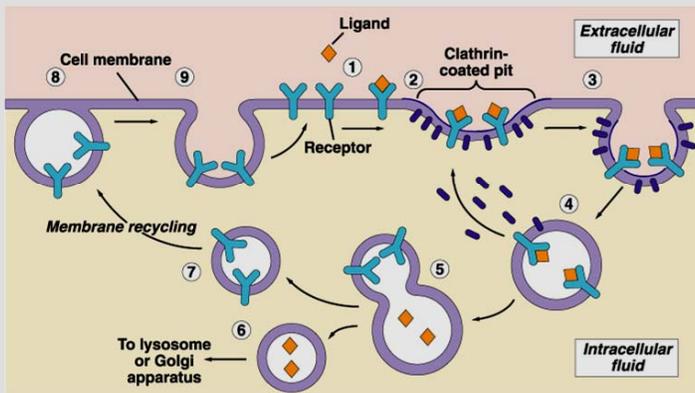
Crio fractura

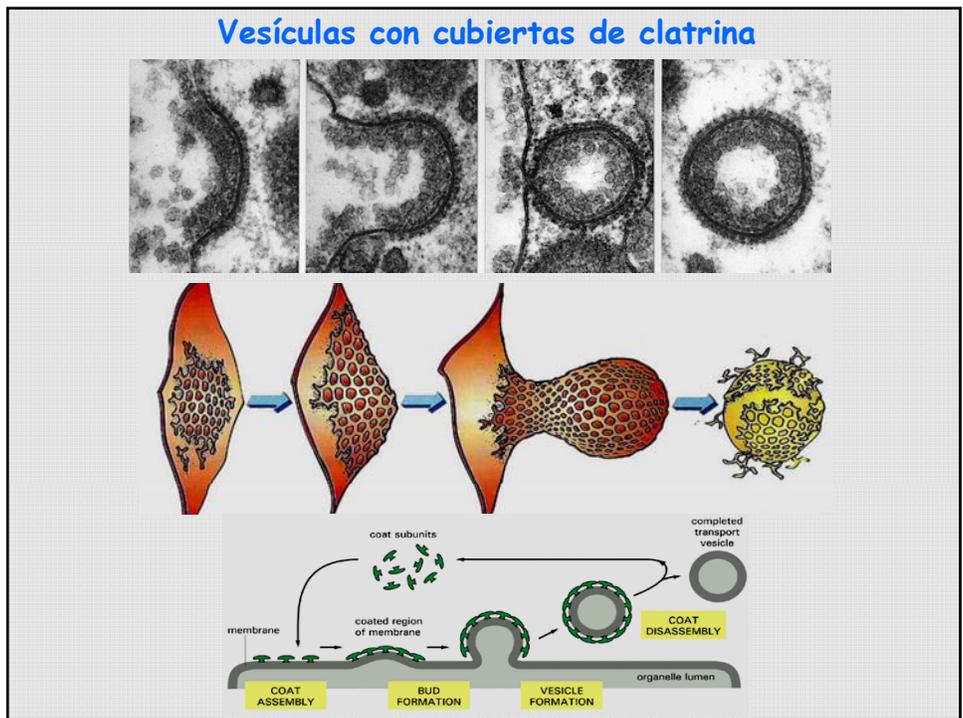
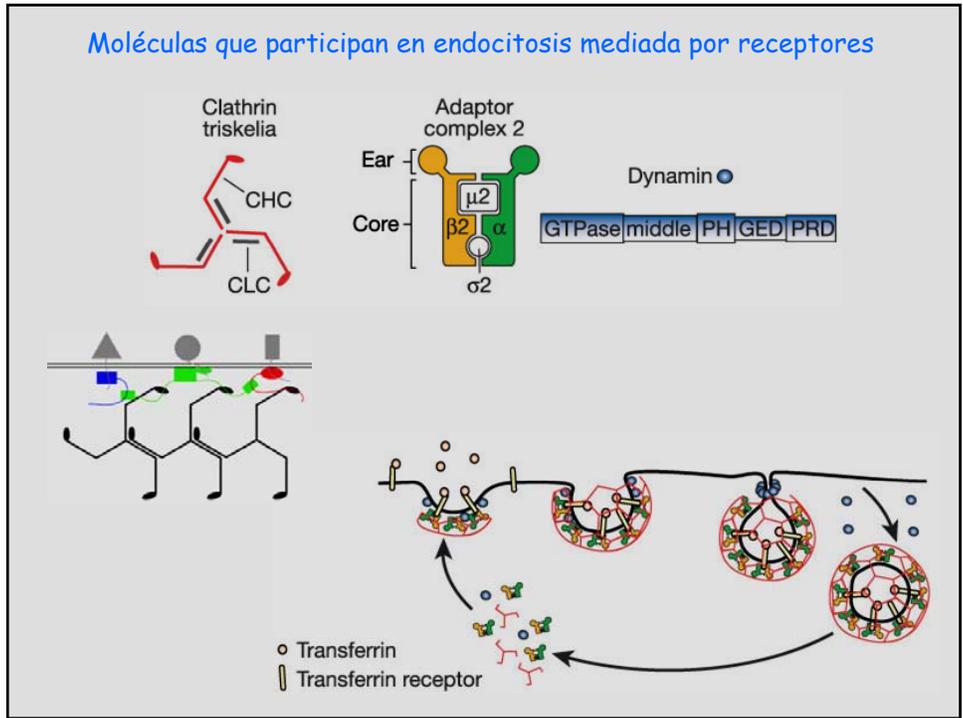


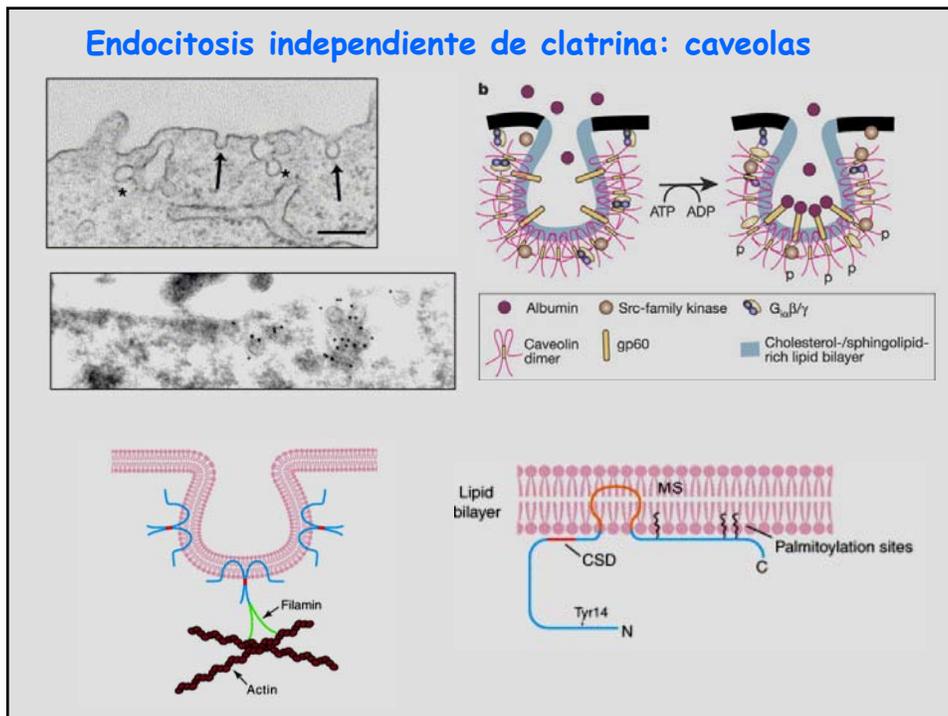
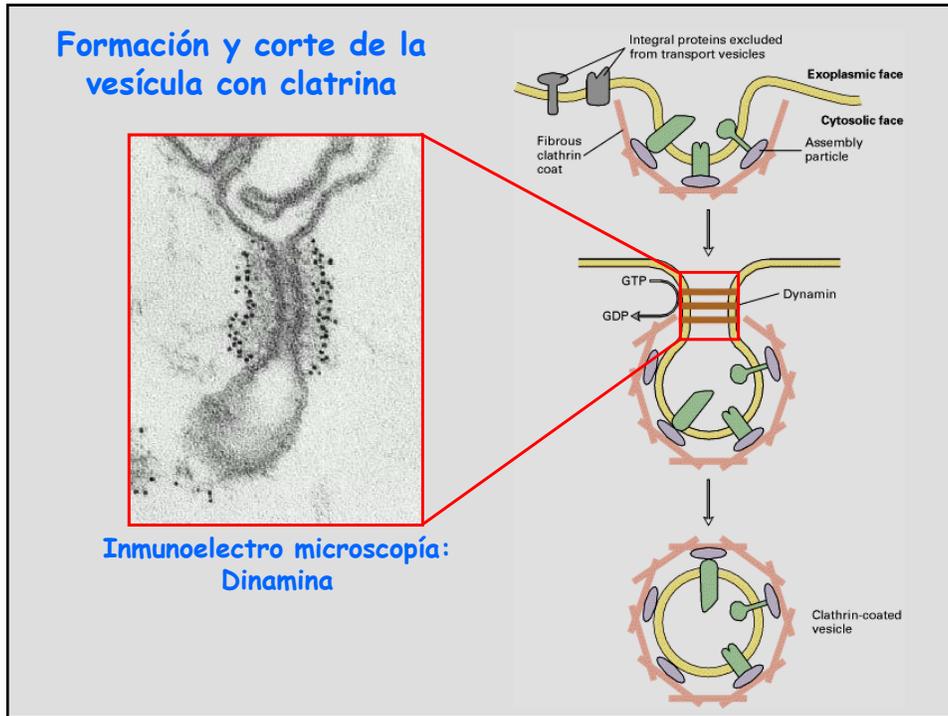
### Endocitosis mediada por receptores

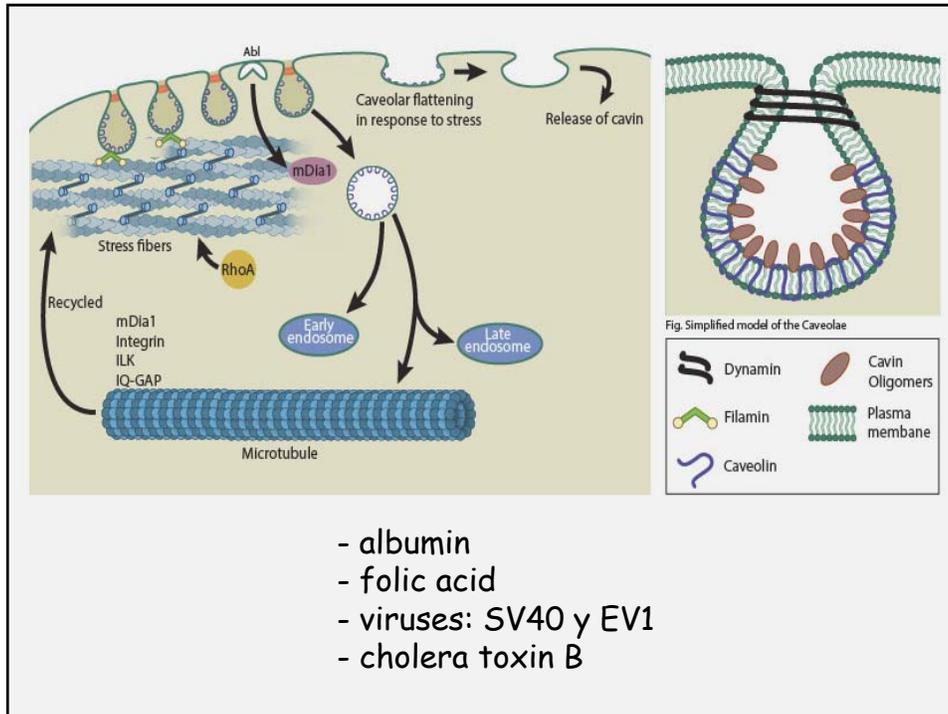


Receptor-mediated endocytosis Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.



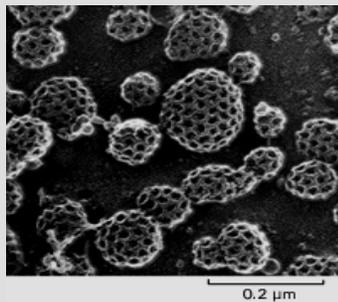




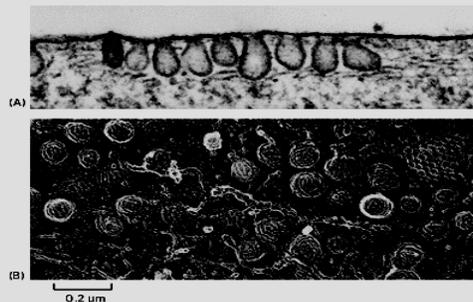


### Distintos tipos de vesículas endocíticas

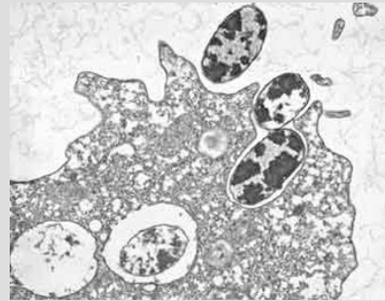
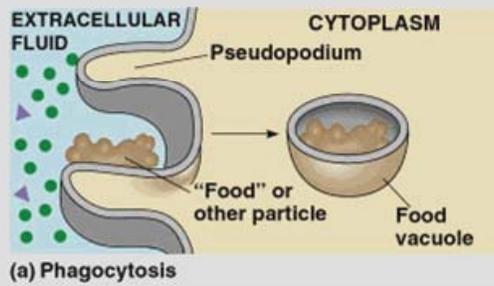
Vesículas con clatrina



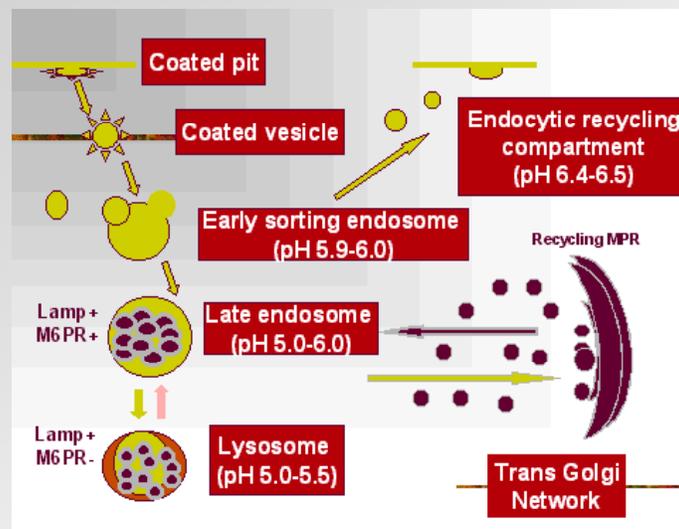
Vesículas con caveolina



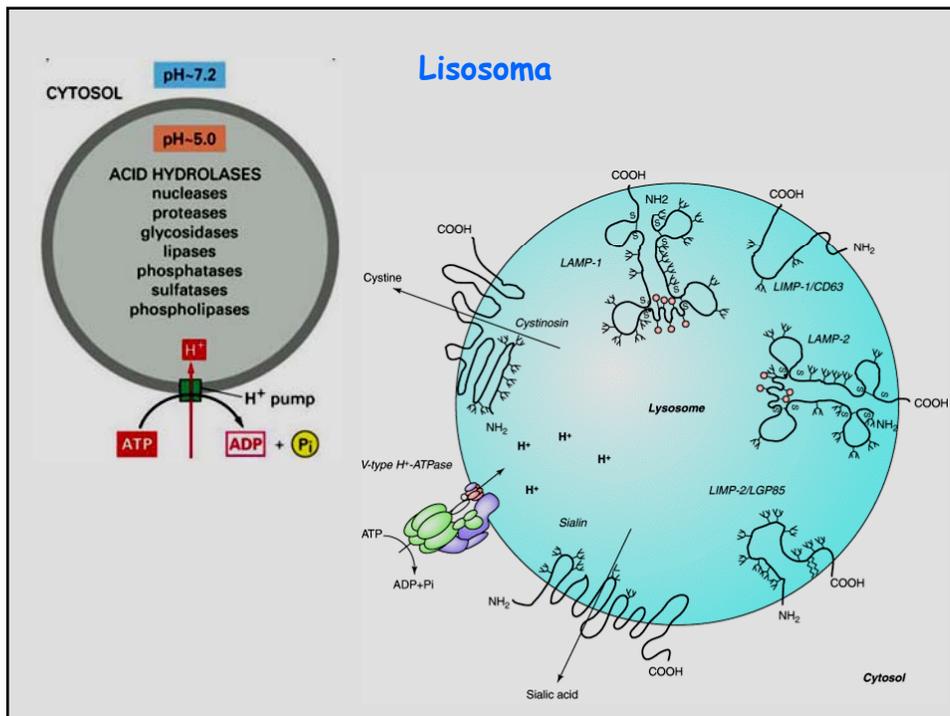
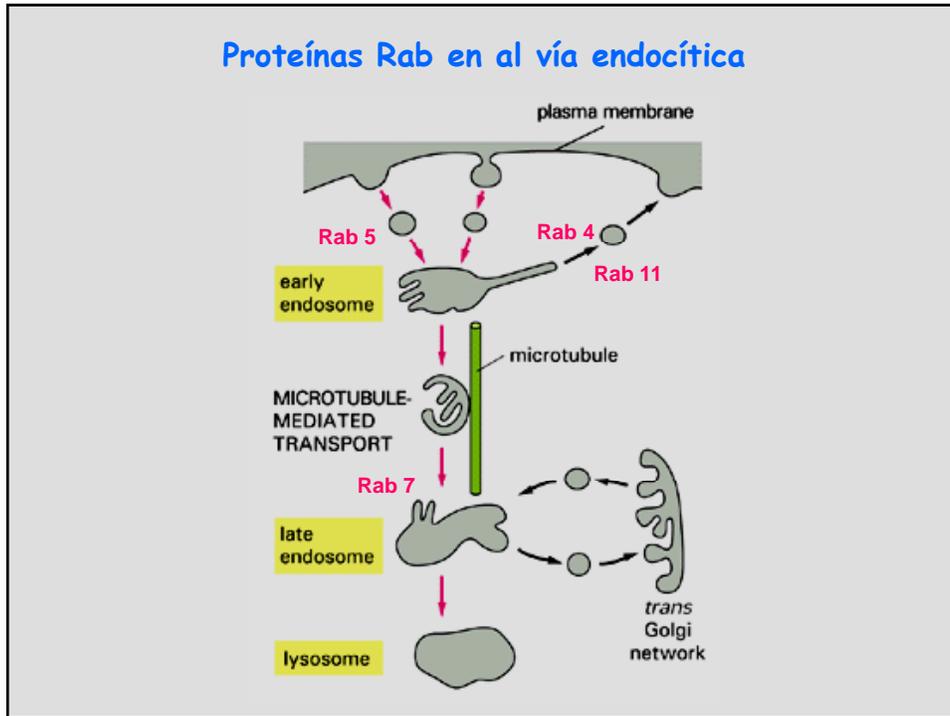
## Fagocitosis



## Transporte en la vía endocítica



### Proteínas Rab en al vía endocítica



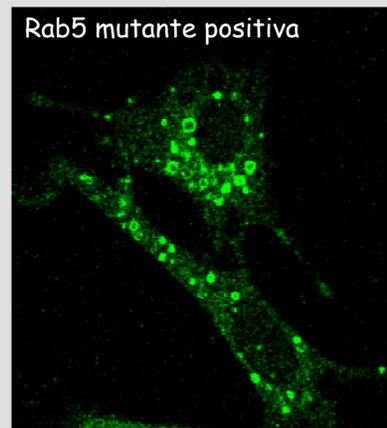
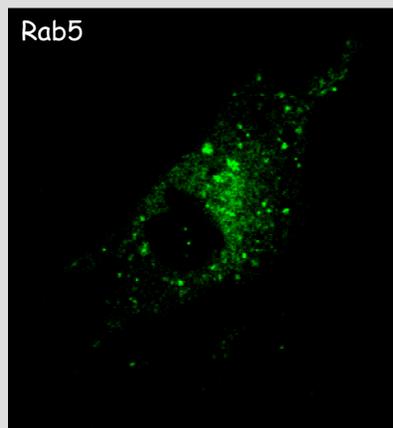
### Marcadores moleculares en la vía endocítica

Organelle	Markers	pH
Sorting endosome Early phagosome	EEA1 Rab5 PI(3)P Syntaxin 13 Transferrin VAMP-3	≈ 6.0
Late endosome Late phagosome	Rab7 Rab9 Mannose 6-phosphate receptor Syntaxin 7 LAMPs Lysobisphosphatidic acid	5.5 - 6.0
Lysosome Phagolysosome	LAMPs Mature cathepsin D Fluid-phase markers chased for ≥ 2 h	4.5 - 5.5

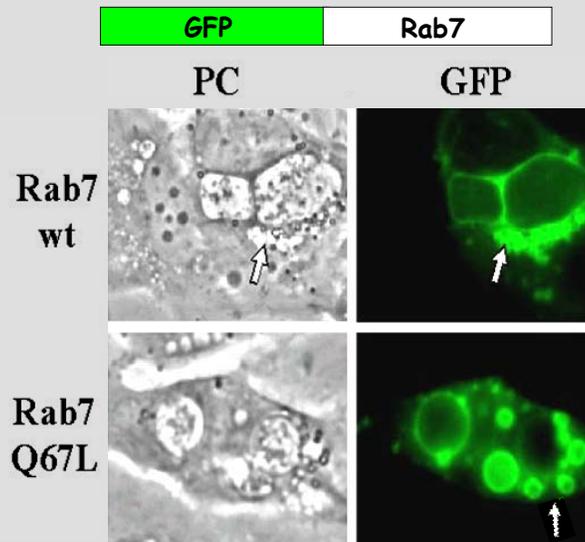
### Visualización de endosomas tempranos

GFP

Rab5



Visualización de fagosomas tardíos que contienen  
*Coxiella burnetii* (vacuola parasitófora)

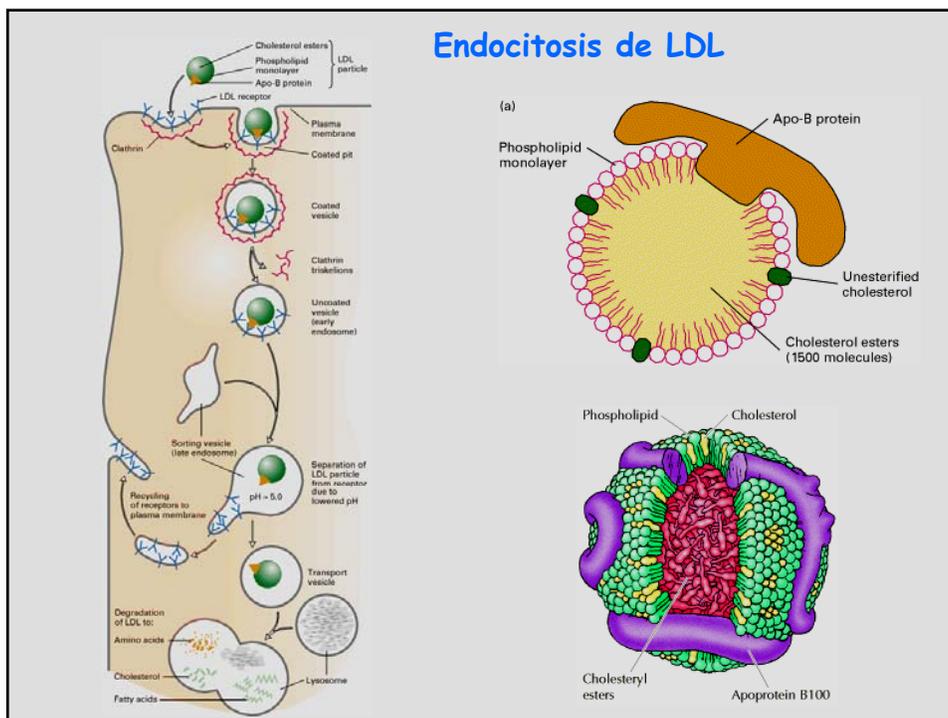


Endocitosis mediada por receptores

- Partículas de LDL (colesterol)
- Transferrina (hierro)
- Hormonas (insulina)
- Factores de crecimiento
- virus

## Endocitosis mediada por receptores

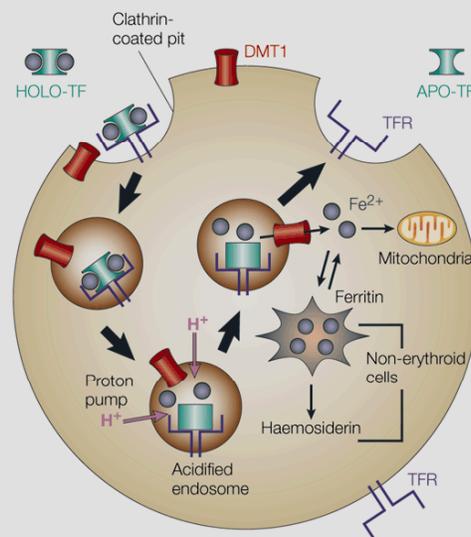
- **Partículas de LDL (colesterol)**
- **Transferrina (hierro)**
- **Hormonas (insulina)**
- **Factores de crecimiento**
- **virus**



## Endocitosis mediada por receptores

- Partículas de LDL (colesterol)
- Transferrina (hierro)
- Hormonas (insulina)
- Factores de crecimiento
- virus

## Endocitosis de Transferrina (hierro)

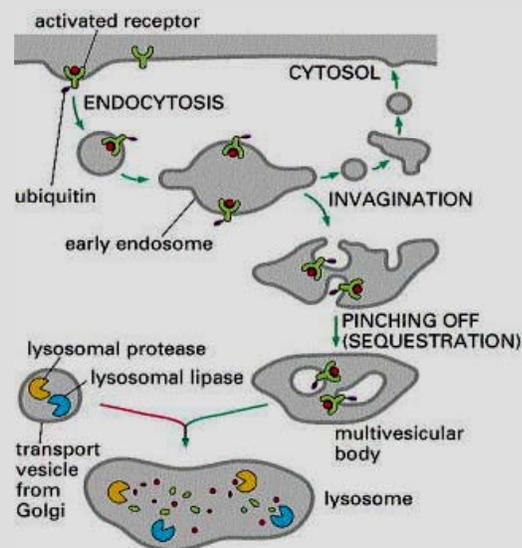


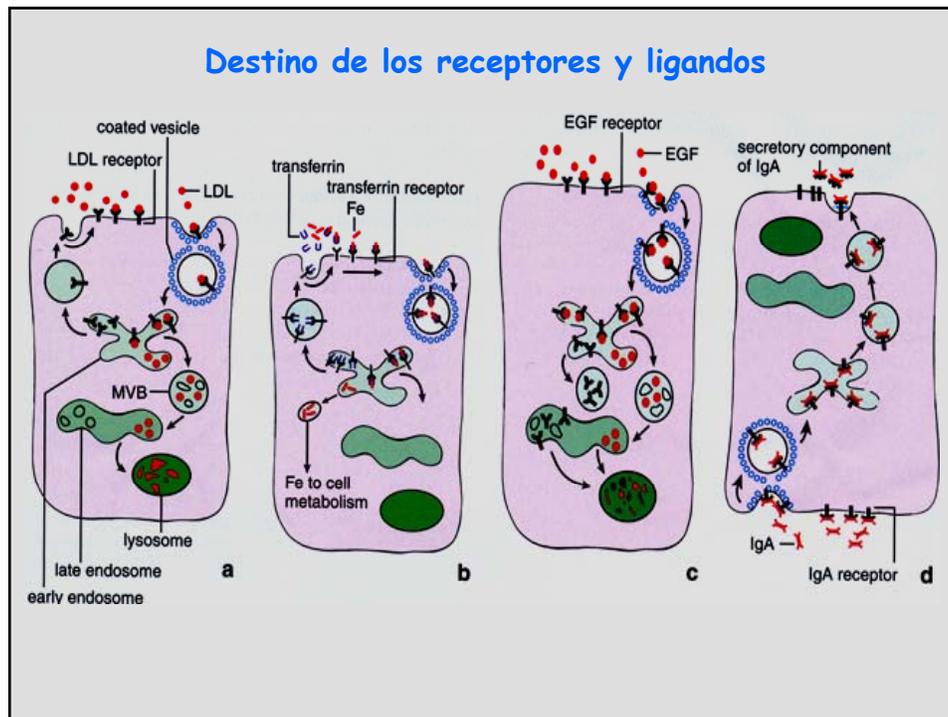
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## Endocitosis mediada por receptores

- Partículas de LDL (colesterol)
- Hormonas (insulina)
- Transferrina (hierro)
- Factores de crecimiento
- virus

## Endocitosis de factores de crecimiento (EGF)





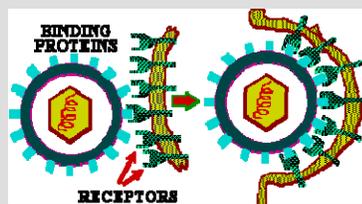
### Destino de los receptores y ligandos

- Receptores se separan de sus ligandos y los receptores reciclan solos. **Receptor a LDL**
- Receptor y ligando reciclan juntos. **Receptor a transferrina** (sólo se separa el hierro).
- Receptor y ligando son llevados a los lisosomas donde se degradan. **Receptor a EGF**

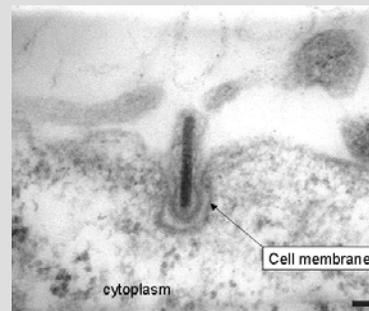
## Endocitosis mediada por receptores

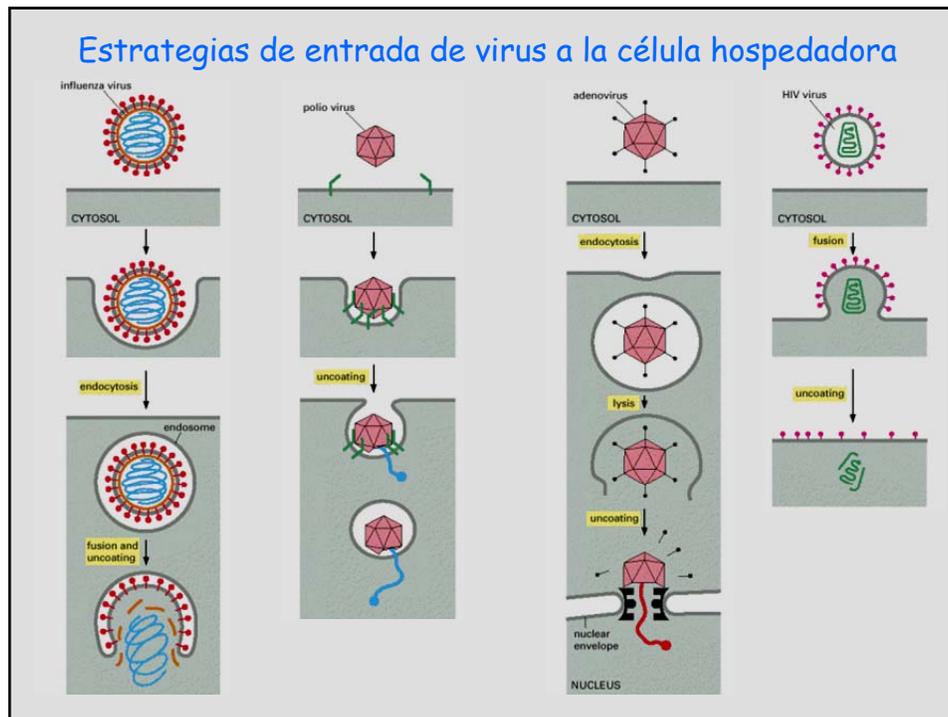
- Partículas de LDL (colesterol)
- Hormonas (insulina)
- Transferrina (hierro)
- Factores de crecimiento
- **virus**

## Endocitosis de virus



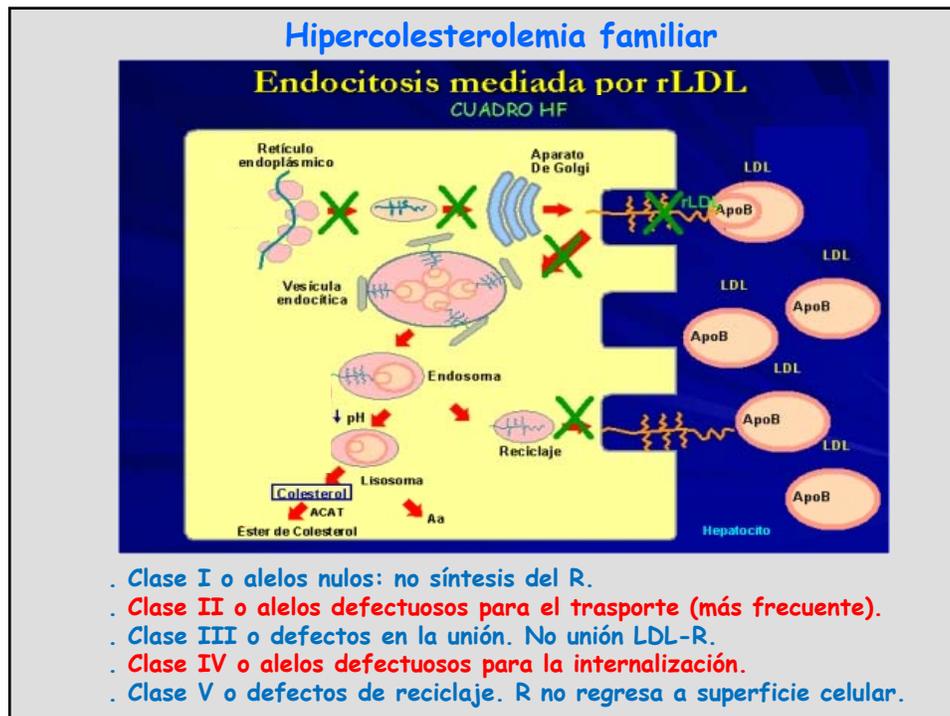
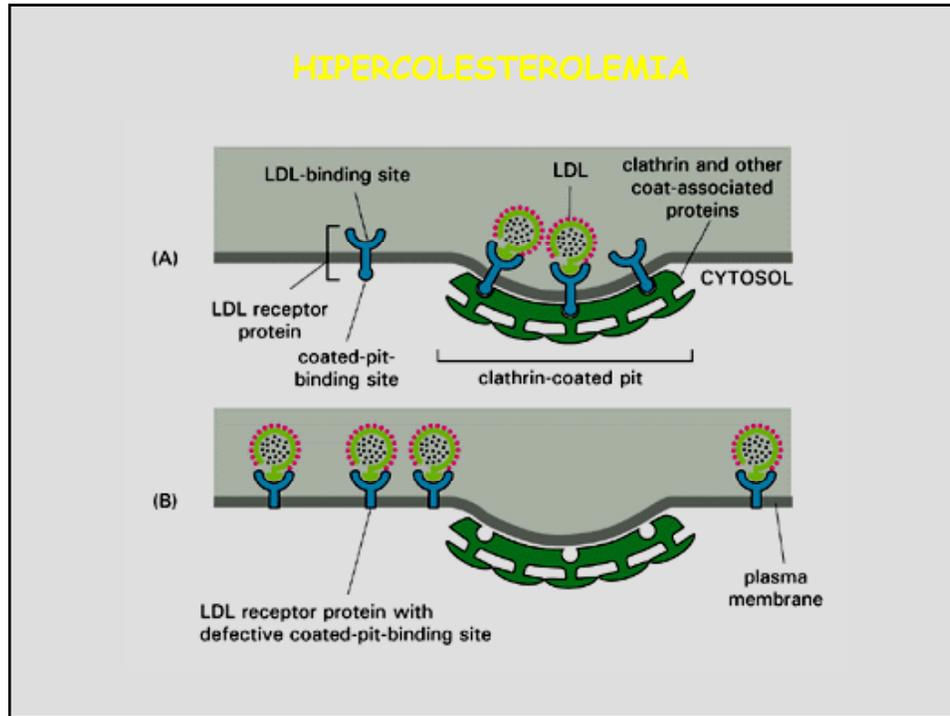
## Baculovirus





## PATOLOGÍAS RELACIONADAS CON ALTERACIONES EN LA VÍA ENDOCÍTICA

- **Hipercolesterolemia familiar**
- **Enfermedades de almacenamiento lisosomal**



## PATOLOGÍAS RELACIONADAS CON ALTERACIONES EN LA VÍA ENDOCÍTICA

- Hipercolesterolemia familiar
- Enfermedades de almacenamiento lisosomal

Table 1. Disorders associated with defects of lysosomal enzyme proteins

GlycoWord

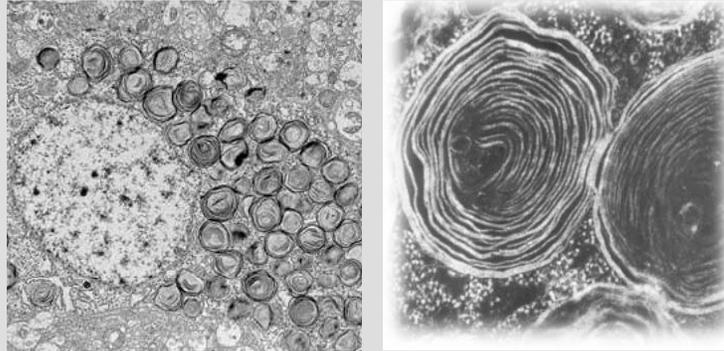
Disease	Defective enzyme	Accumulated substrates
<b>I) Sphingolipidoses</b>		
GM1 gangliosidosis	$\beta$ -galactosidase	GM1 ganglioside, oligosaccharides and glycoproteins containing a terminal $\beta$ -galactosidic linkage
GM2 gangliosidosis B variant (Tay-Sachs disease) O variant (Sandhoff disease)	$\beta$ -hexosaminidase A $\beta$ -hexosaminidases A and B	GM2 ganglioside GM2 ganglioside, GA2 ganglioside, oligosaccharides and glycoproteins containing a terminal $\beta$ -N-acetylglucosamine linkage
Fabry disease Metachromatic leukodystrophy	$\alpha$ -galactosidase arylsulfatase A	globotriaosylceramide sulfatide
Krabbe disease (Globoid-cell leukodystrophy)	galactosylceramidase	galactocerebroside, psychosine
Gaucher disease	glucosylceramidase	glucocerebroside
Niemann-Pick disease types A and B	sphingomyelinase	sphingomyelin
Farber disease	ceramidase	ceramide

Table 2. Disorders of lysosomal enzyme phosphorylation and transport

GlycoWord

Disease	Defective enzyme
I-cell disease (Mucopolipidosis II) and Pseudo-Hurler polydystrophy (Mucopolipidosis III)	UDP-N-acetylglucosamine: lysosomal enzyme N-acetylglucosamine-1-phosphotransferase

### Enfermedad de Tay-Sachs: acumulación de gangliósidos en los lisosomas de neuronas



### Enfermedad de Tay-Sachs



- Se transmite por gen autosómico recesivo.
- Carencia de la enzima lisosomal hexosaminidasa A
- Se acumula gangliósido GM2 en cerebro
- Ceguera, retraso en desarrollo mental y muerte a los 3-4 años de edad.