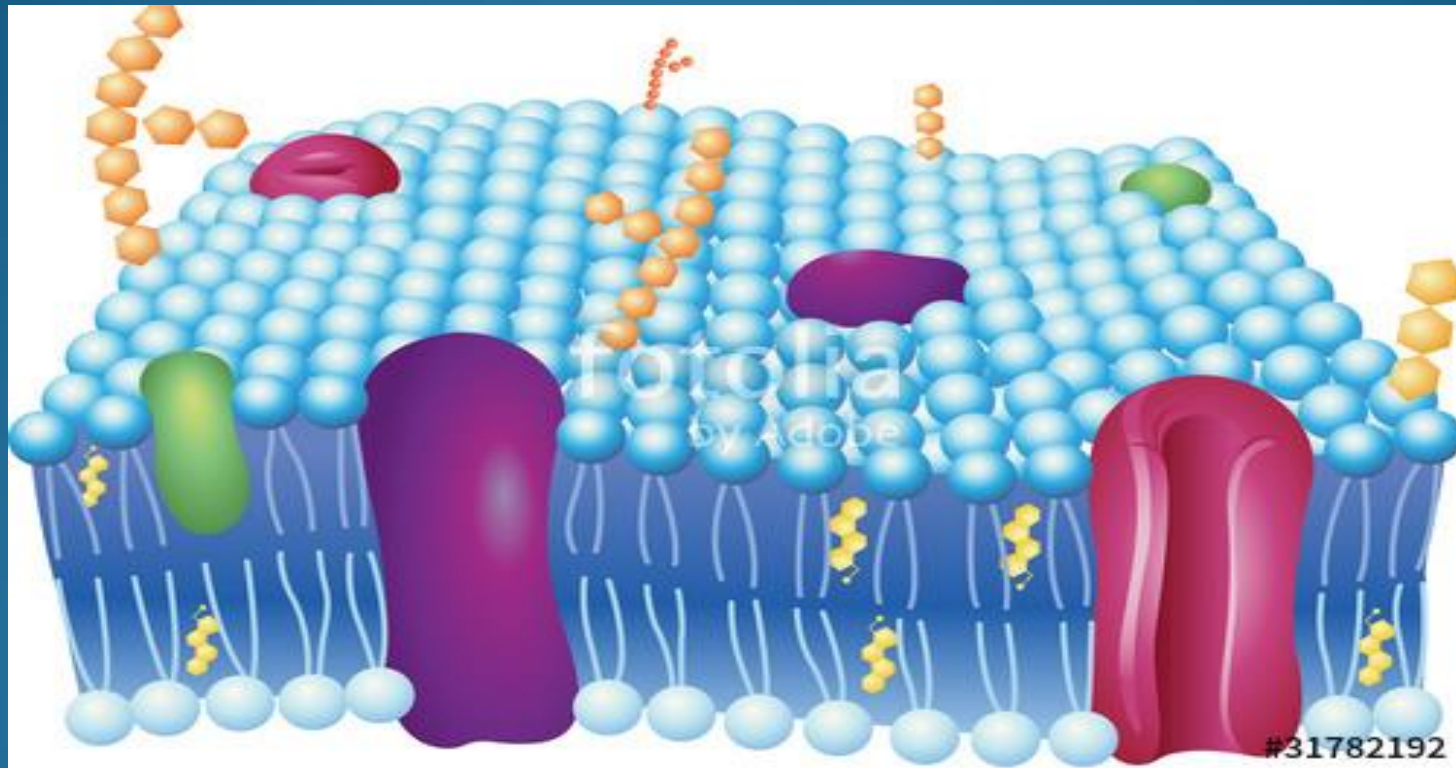


MEMBRANA CELULARA



Bordas Dorin
Chiricioaei Cristina

CUPRINS

I. Organizarea morfo-functionala a membranei celulare

- I.1 Lipide
- I.2 Proteine
- I.3 Glucide
- I.4 Structuri specializate

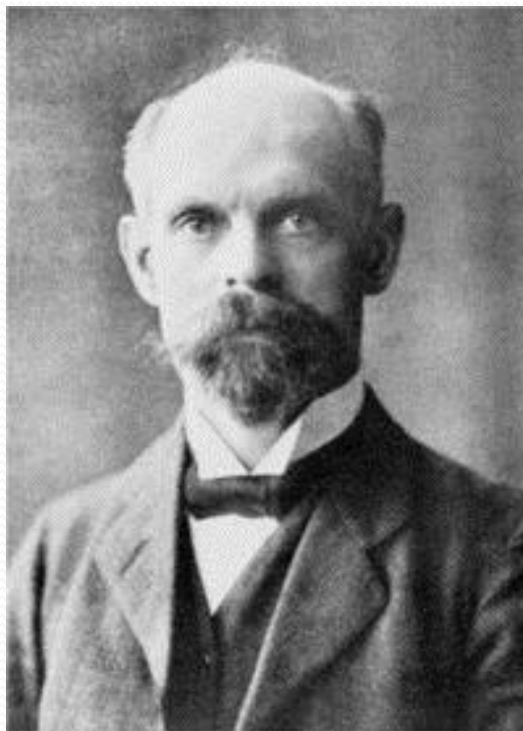
II. Functia de transport a membranei celulare

- II.1 Transport prin membrana
 - II.1.1 Transport pasiv
 - II.1.2 Transport activ
- II.2 Transport cu membrana
 - II.2.1 Endocitoza
 - II.2.2 Exocitoza
 - II.2.3 Transcitoza

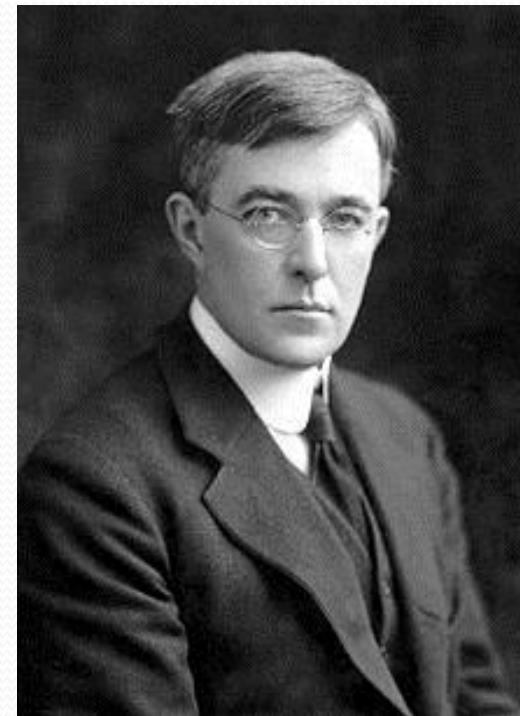
ISTORIC



Wilhelm B. Hofmeister
1824-1877



Charles Ernest Overton
1865-1933



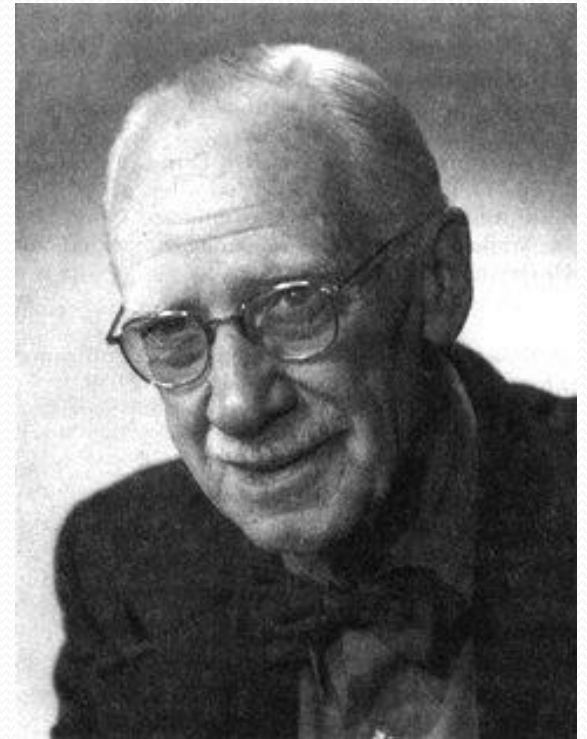
Irving Langmuir
1887-1957



Gorter Evert
1881-1954



James Frederic Danielli
1911-1984



Hugh Davson
1909-1996

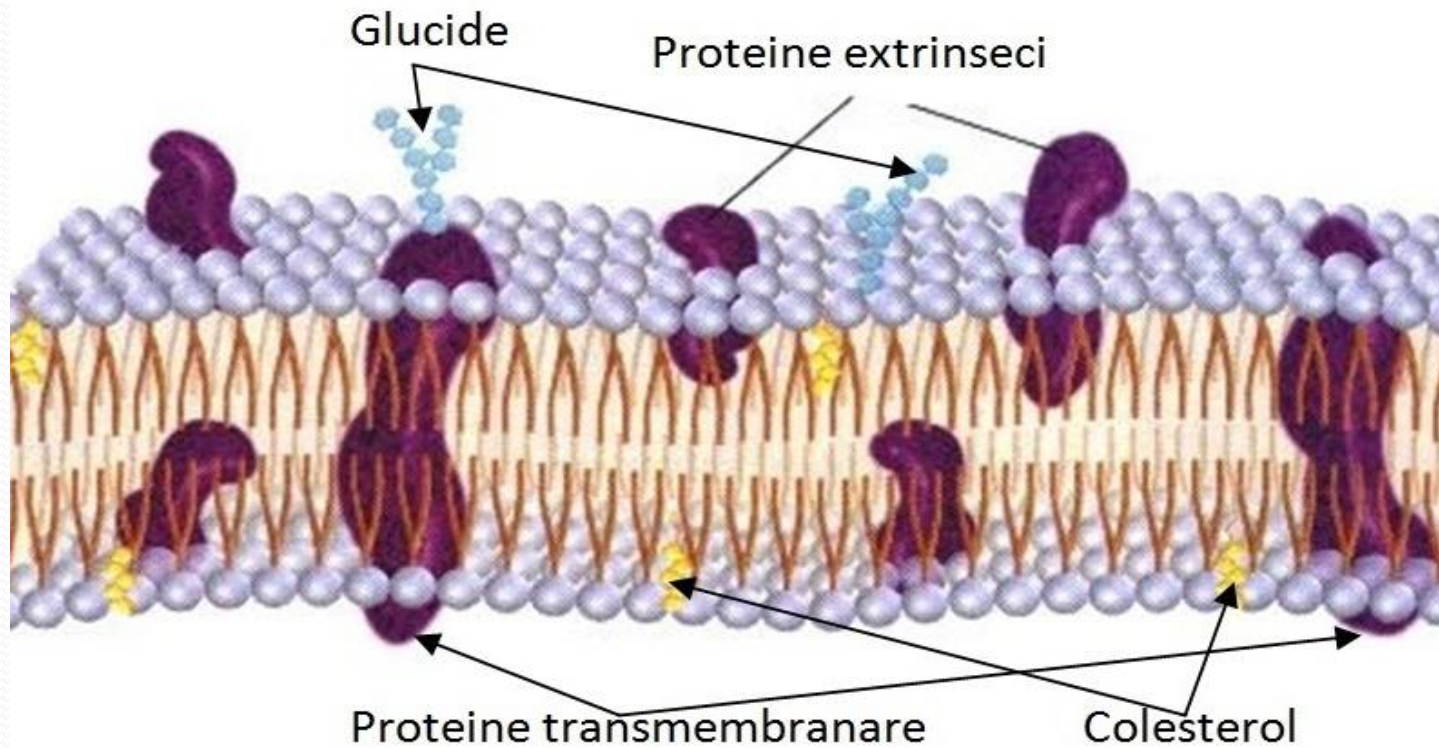


Nicolson

Modelul mozaicului fluid



Singer
1924-2017



I. Organizare morfologica

➤ Apa 20-30%

➤ Reziduu uscat 70-80% :

-substante minerale 1%

-substante organice 99% {
lipide 40-50%
proteine 50-60%
glucide 1-10%

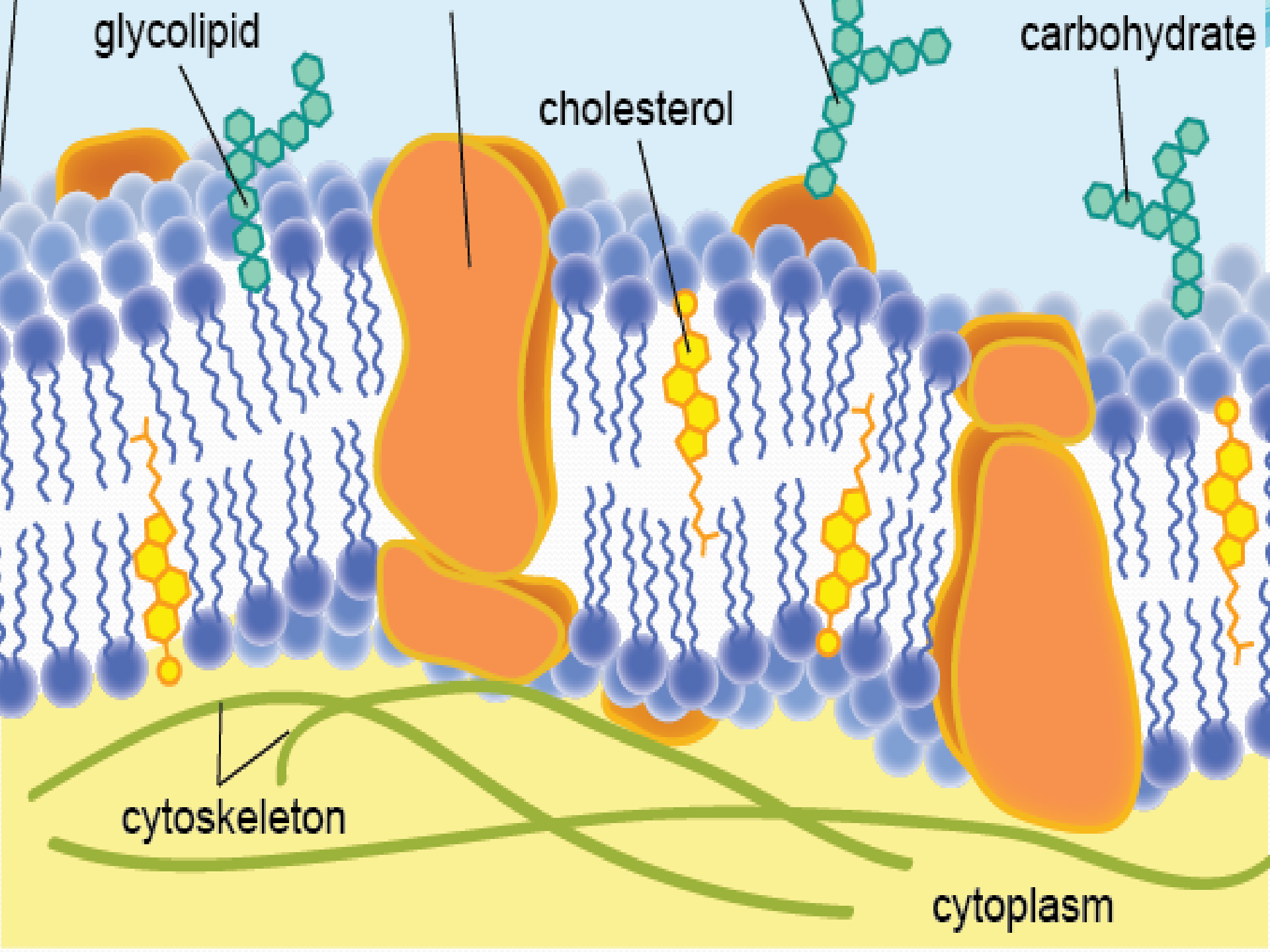
I.1 Lipidele membranare

- Fosfolipide 70-75%
- Colesterol 20-25%
- Glicolipide 1-10%

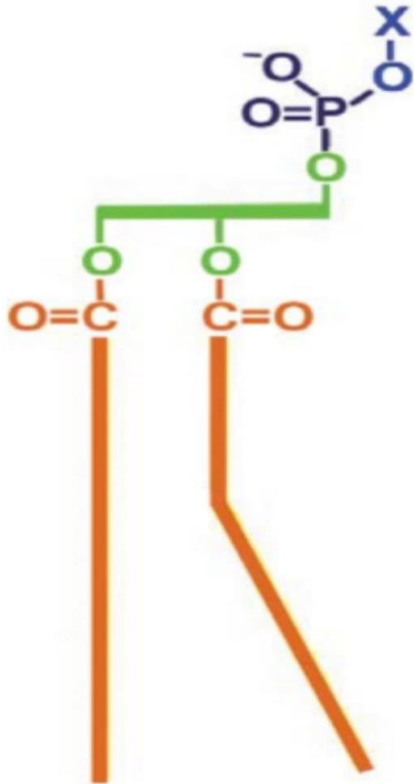
-molecule ideale pentru structurarea membranei, relativ insolubile in apa

-caracter amfifil: bariera prin partea hidrofoba, intermediar prin partea hidrofila

-molecule mici cu mobilitate mare



- Bistratul lipidic confera eterogenitate si asimetrie membranei
- Fosfolipidele sunt dispuse diferit intre cele doua foite, externa/interna si au o multitudine de subtipuri, dintre care :



- * fosfogliceride
- * fosfatidilcolina
- * fosfosfingozide
- * fosfatidilserina
- * fosfatidiletanolamina
- * fosfatidilinozitol

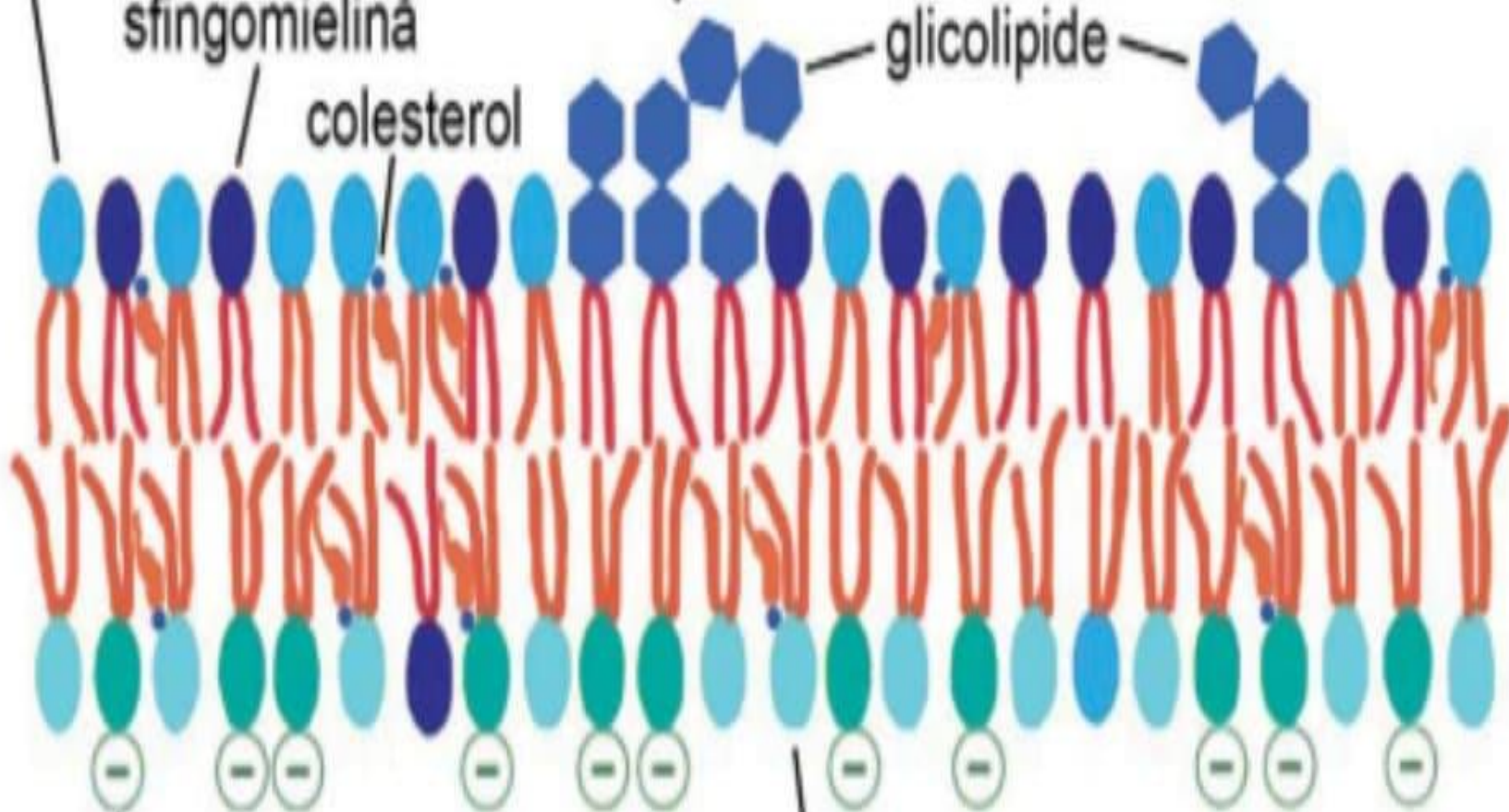
SPATIUL EXTRACELULAR

fosfatidilcolină

sfingomielină

colesterol

glicolipide

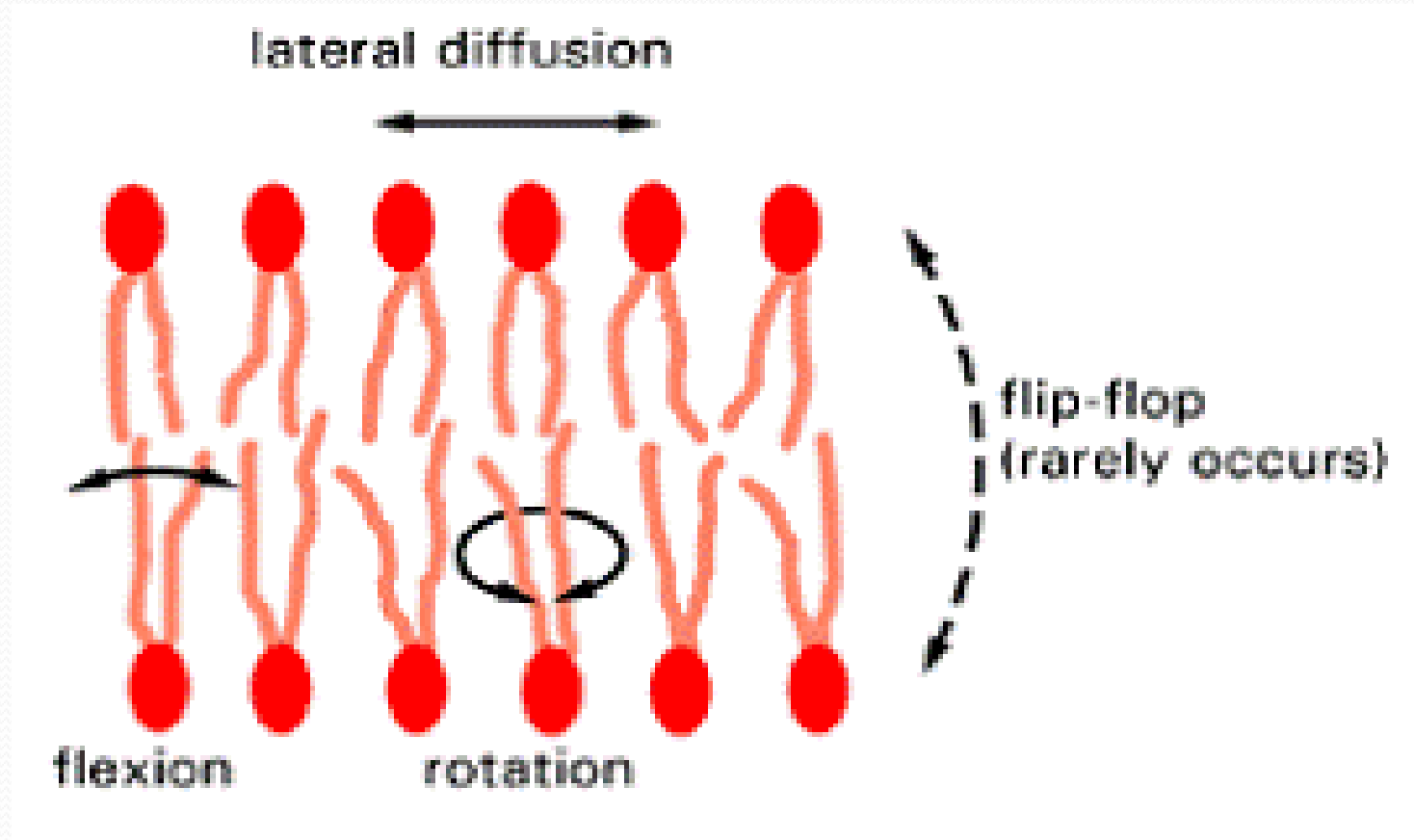


fosfatidilserină

fosfatidiletanolamină

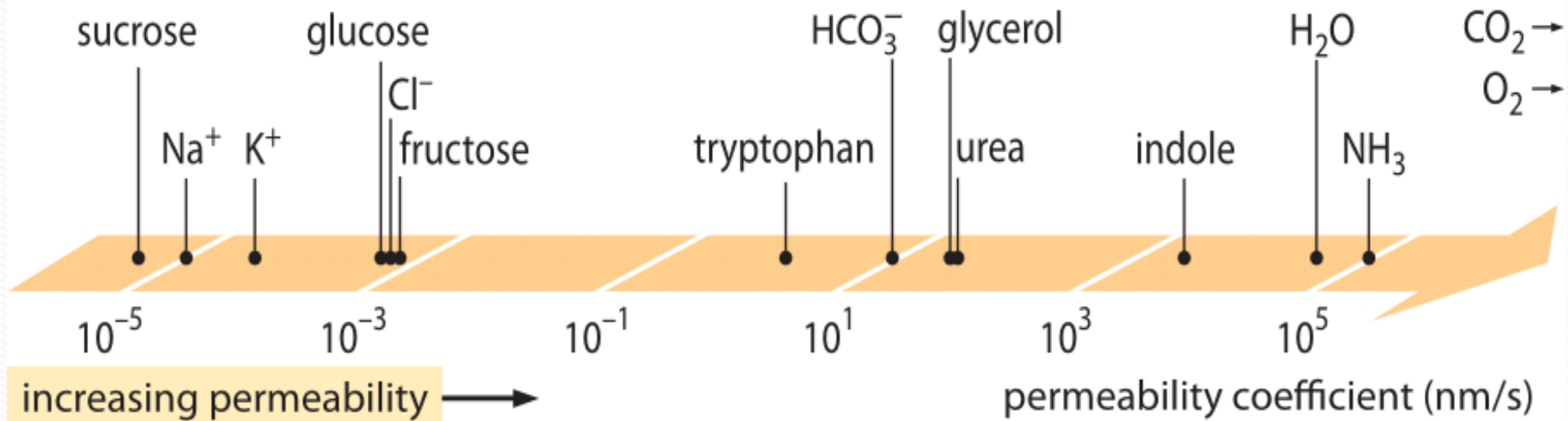
CITOSOL

- Lipidele se afla in continua dinamica, putand realiza miscari de rotatie, flexie, translatie, flip-flop- rezulta fluiditatea bistratului

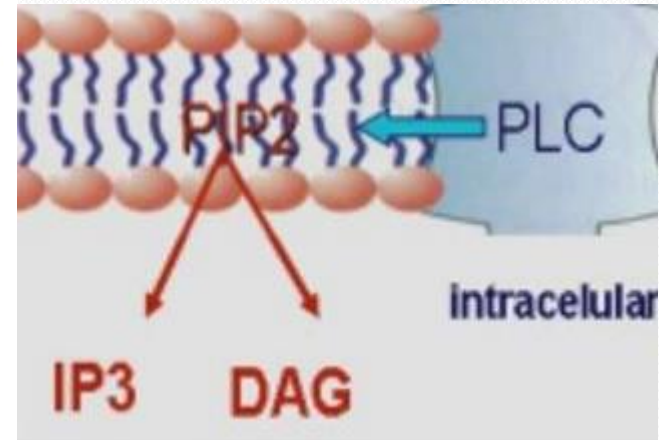
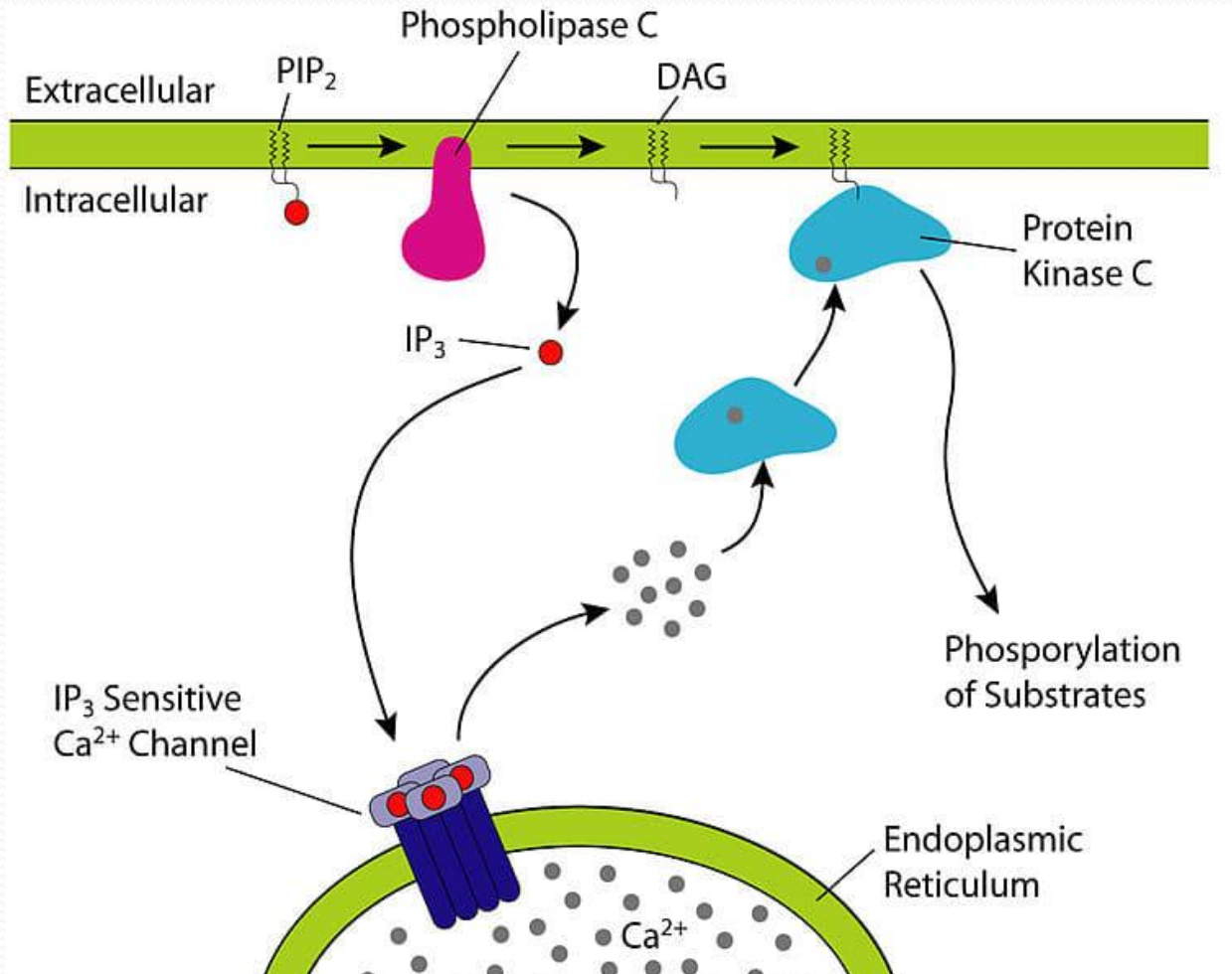


Funcțiile matricei lipidice

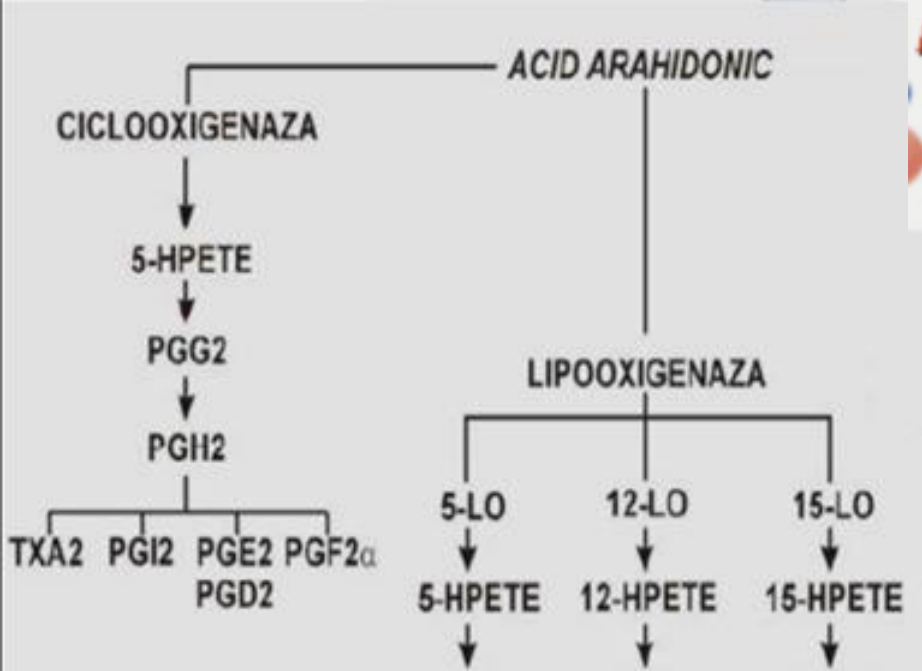
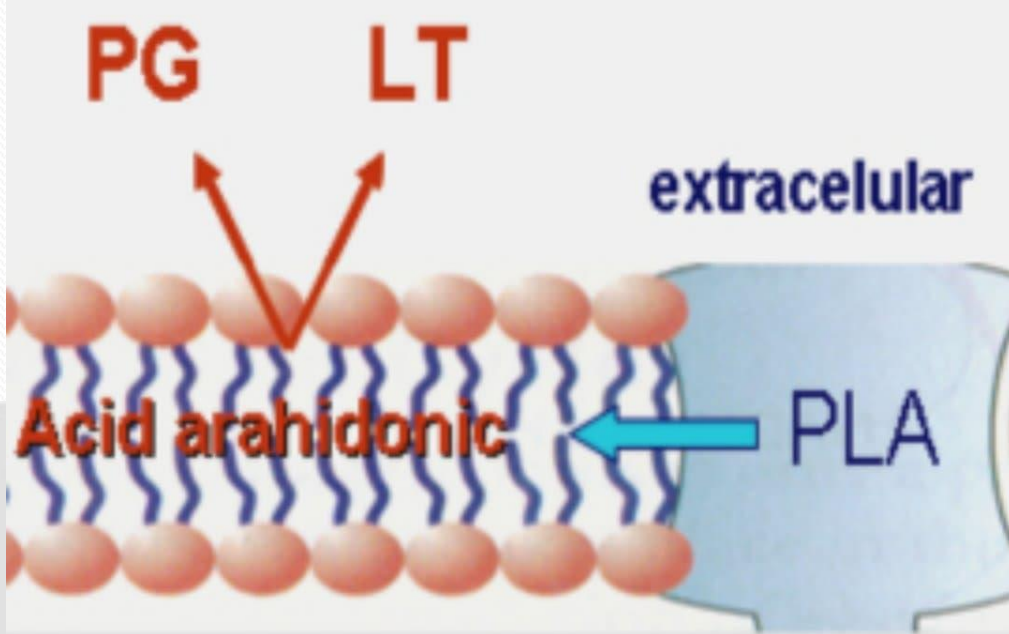
- *Asigura permeabilitatea selectivă a membranei*



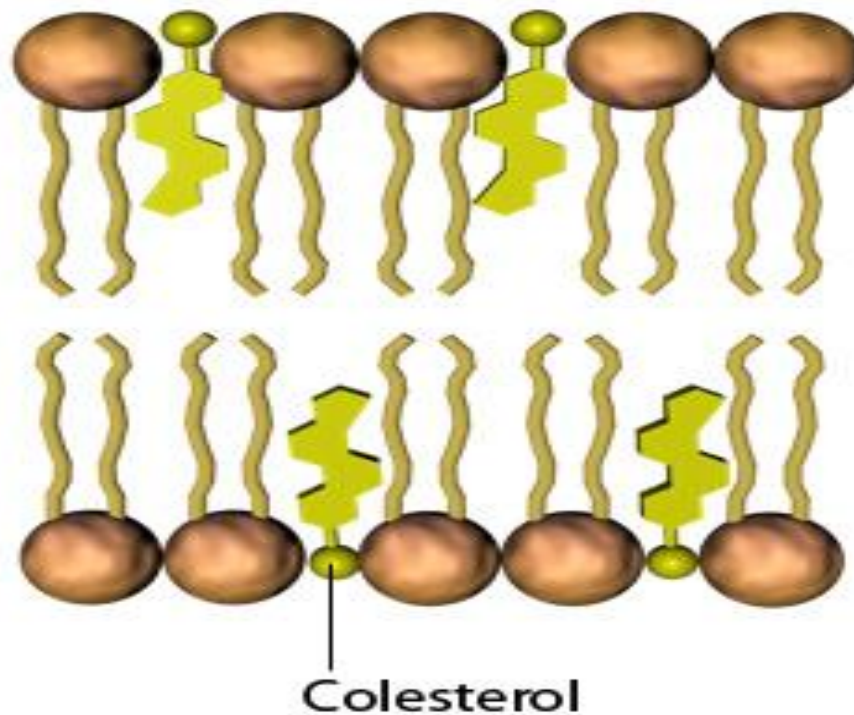
- *Fosfolipidele: Sursa de mesageri intracelulari*



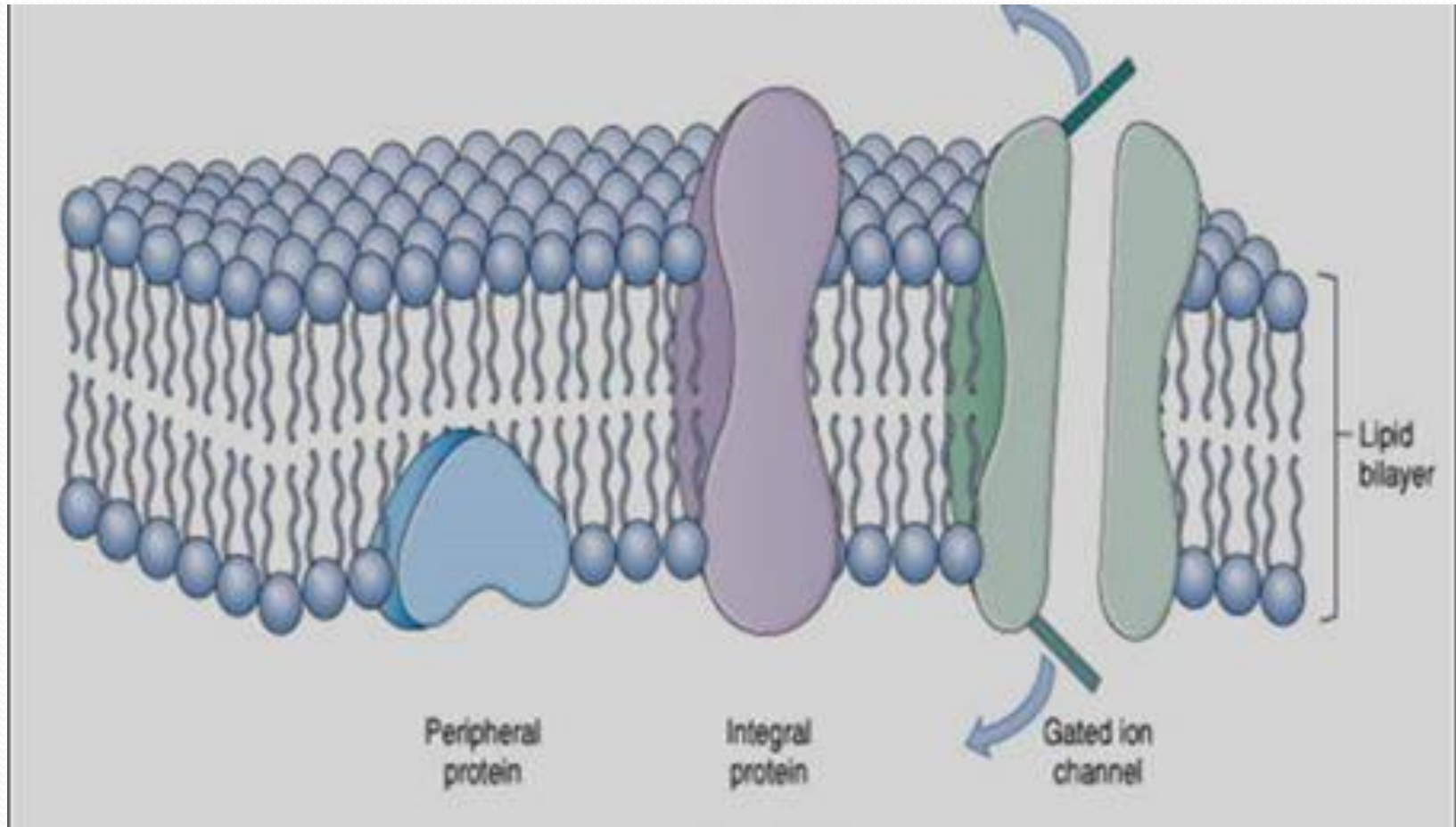
- Fosfolipidele: Sursa de mesageri extracelulari*



- *Glicolipidele : recunoastere si semnalizare intercelulara*
- *Colesterolul: rigidizarea membranei*



1.2 Proteine



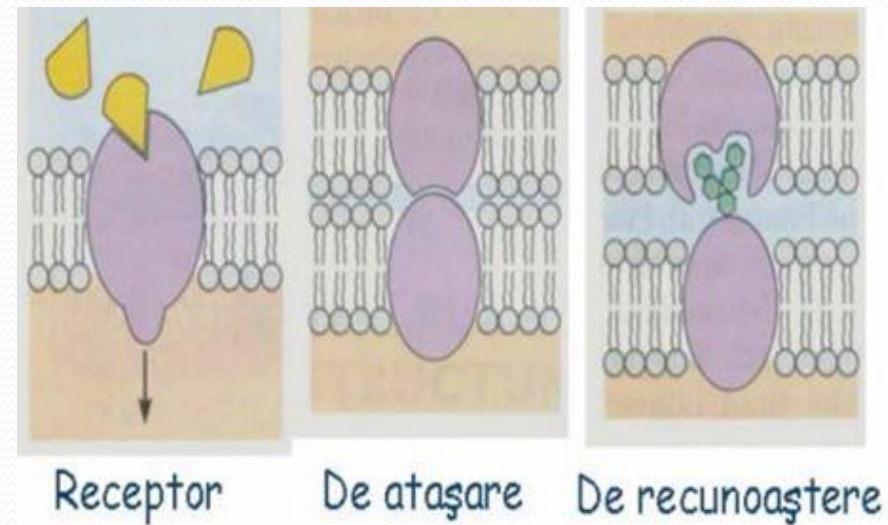
Funcțiile proteinelor membranare

Proteinele periferice:

- ❖ Rol enzimatic;
- ❖ Contact cu citoscheletul celular;
- ❖ Fixarea celulei pe matricea extracelulara.

Proteinele integrale

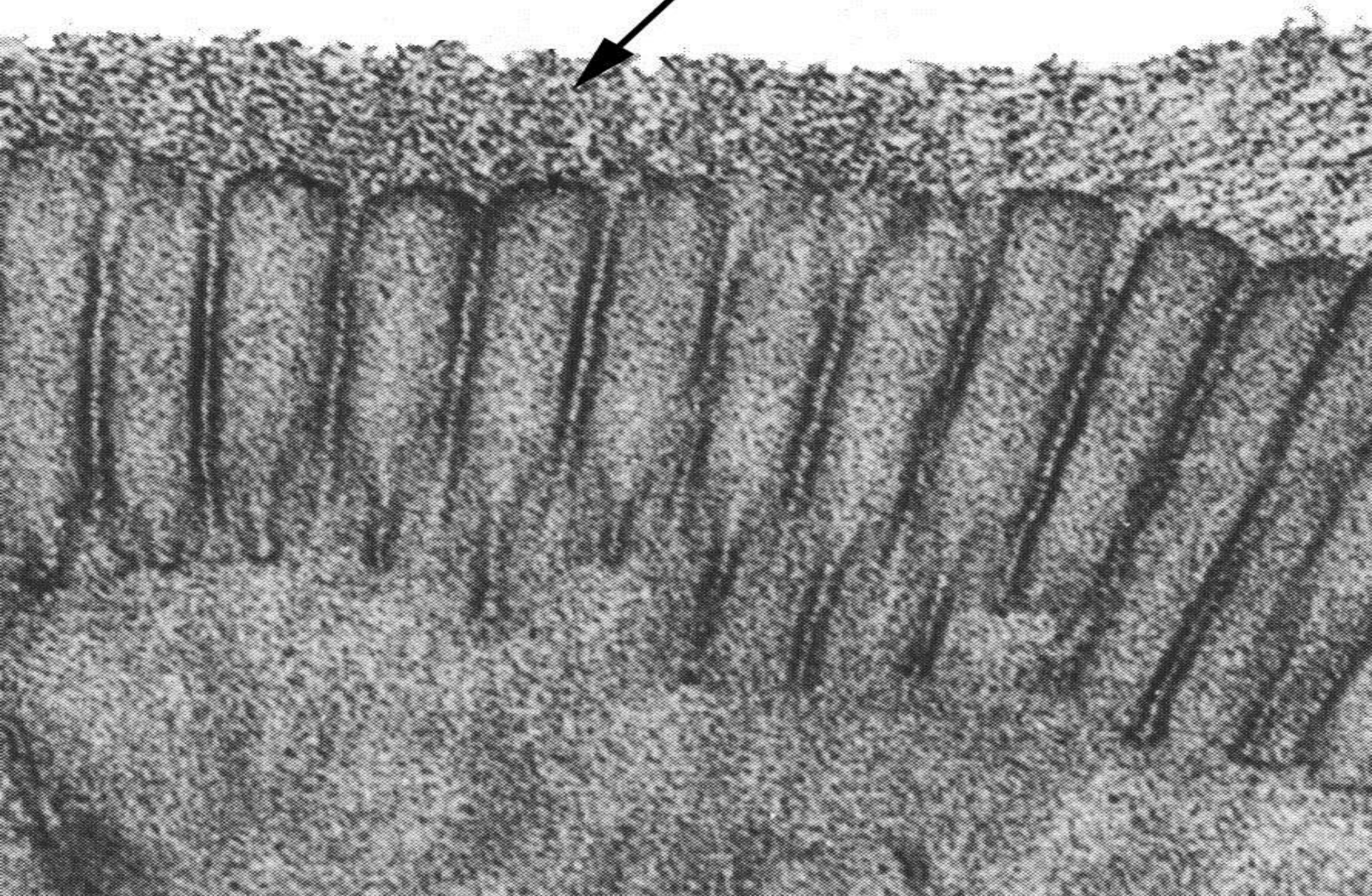
- ❖ Canale;
- ❖ Transportori;
- ❖ Receptori membranari;
- ❖ Atasare intercelulara;
- ❖ Recunoastere intercelulara.



1.2 Glucide

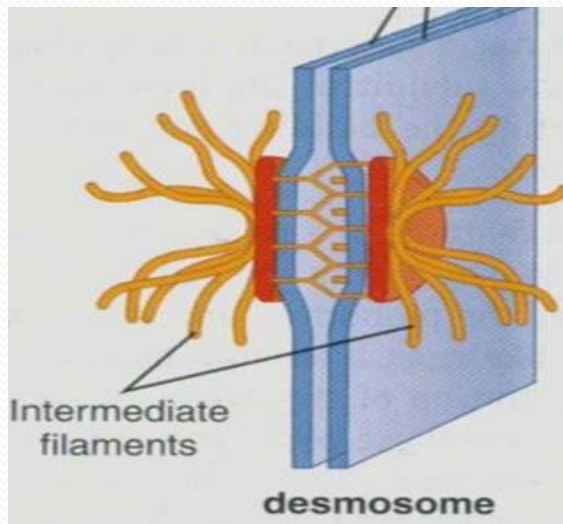
- Dispuse exclusiv pe fata externa
- Formeaza glicocalixul: glicolipide, glicoproteine, proteoglicani
- Confera sarcina negativa membranei prin componentele acide (acizi sialici, uronici)
- Protejeaza membrana de agresiuni fizico-biochimice
- Implicate In fenomene de recunoastere celulara
- Rol in alcatuirea receptorilor celulari (glicoproteici)

Glycocalyx

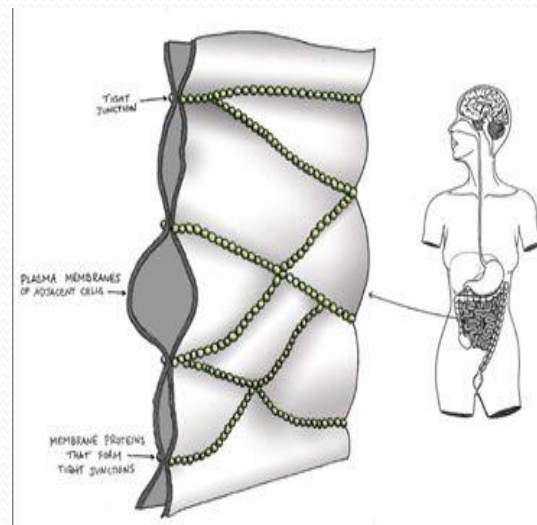


1.4 Structuri specializate

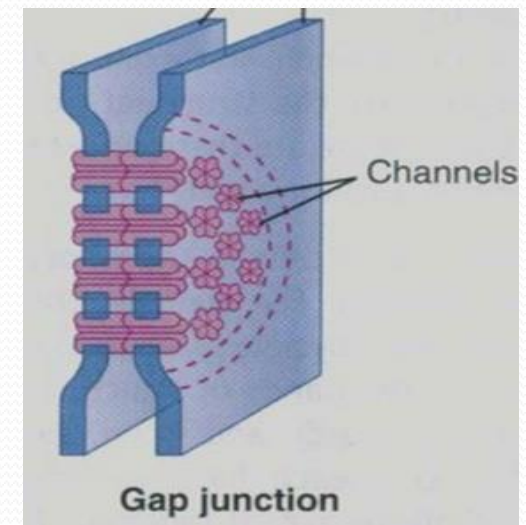
- Microvili
- Jonctiuni intercelulare:
 1. Desmozomi
 2. Stranse (tight)
 3. GAP (conexoni)



1



2



3

II.1 Transport prin membrana

□ Transport pasiv

-uniport/co-transport; simport/antiport

* Difuziunea simpla

* Difuziunea facilitata (transportori, canale)

* Osmoza

	Compuși transportați	Mecanisme	Exemple
1). Difuzia simplă	- substanțe ce sunt solubile parțial sau total în partea hidrofobă a membranei celulare	- se realizează prin simpla dizolvare a compușilor în membrana celulară	Transportul O ₂ în celulă
2). Difuzia facilitată	- ioni metalici	- prin intermediul unor canale ionice cu specificitatea foarte mare (canale specifice pentru Na, Cl, K)	Ioni de Na ⁺ sau K ⁺
	- substanțe de dimensiuni mici, încărcate electric	- prin intermediul unor proteine de transport (carrier) ce leagă compusul de transporta pe o parte a membranei și îl eliberează de cealaltă parte	Transportul glucozei în celule
3). Osmoza	H ₂ O	- prin intermediul unor proteine specifice de transport - aquaporine - apa se mișcă de la soluțiile diluate (hipoosmotice) spre cele concentrate (hiperosmotice). Concentrația osmotică se definește ca fiind concentrația tuturor soluțiilor dintr-o soluție	Mentținerea turgescenței celulare

1

molecule nepolare
(gaze - O_2 , CO_2 , NO ,
eter etilic, benzen)

molecule polare mici
(apă, etanol, uree,
glicerină)

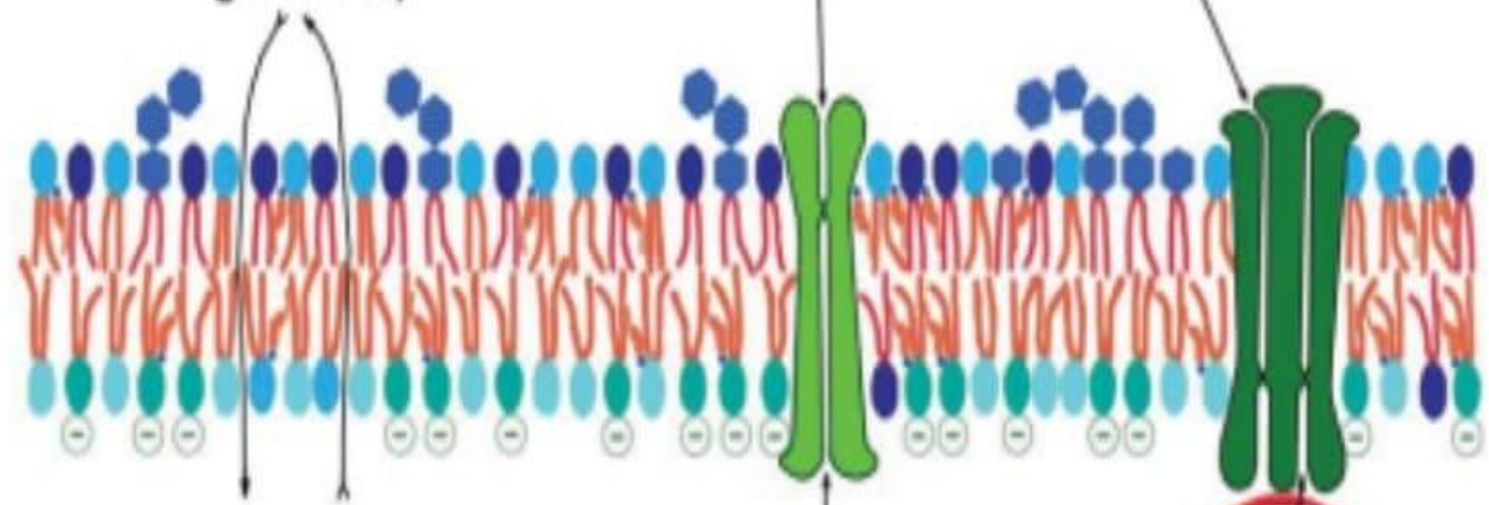
2

molecule polare mari
(glucoză, zaharoză,
aminoacizi), apă

ioni (Na^+ , Ca^{2+} , Cl^-)

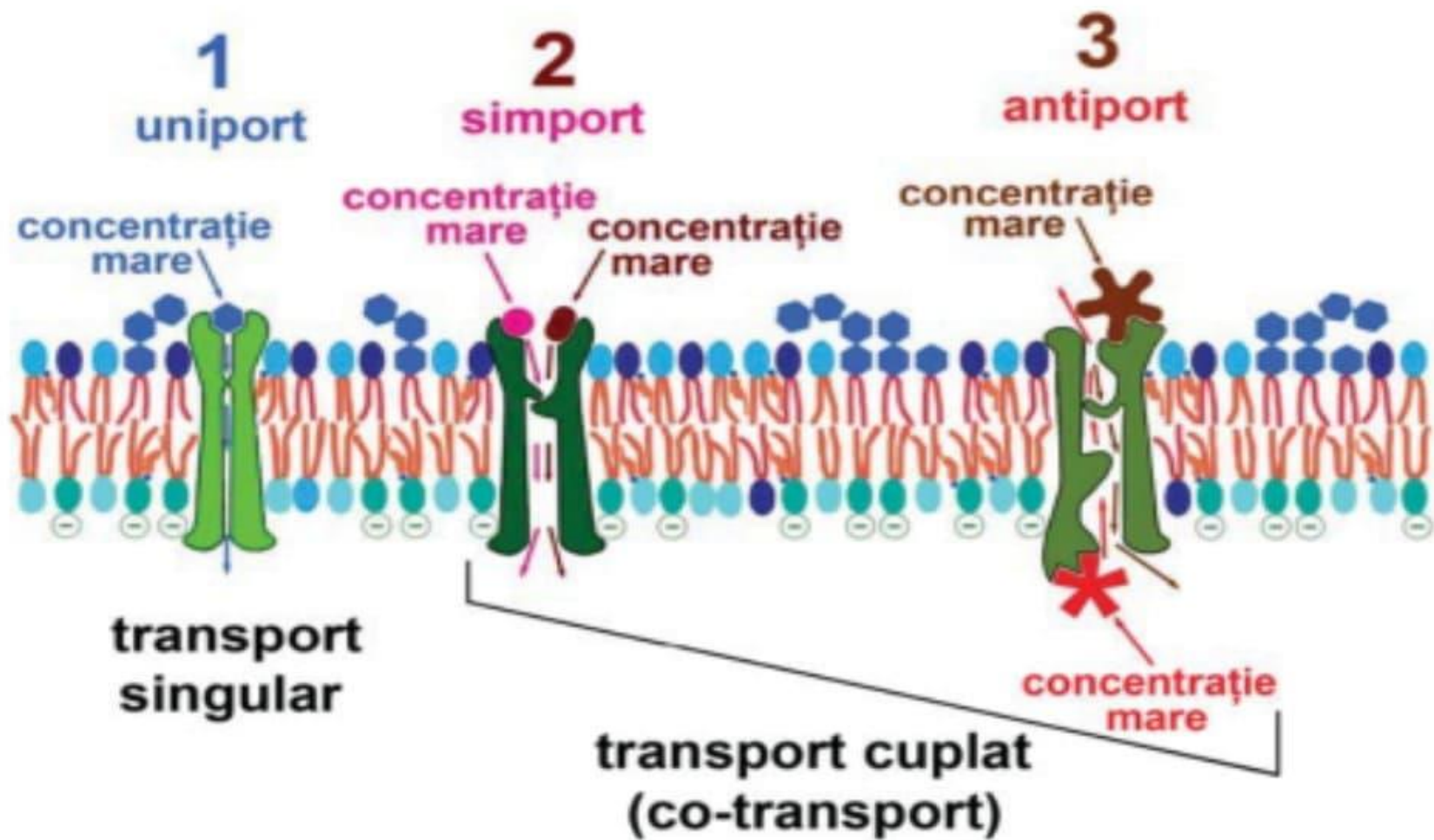
3

ioni (K^+)



ioni (K^+ , HCO_3^-)
apă

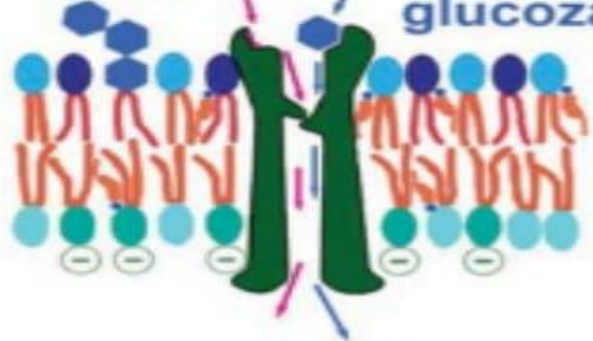
ATP
ADP
ioni (Na^+ , Ca^{2+})



lumen intestinal

concentrație
mare de
 Na^+

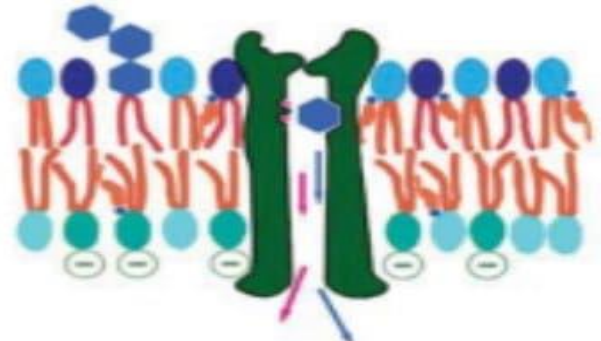
concentrație
mică de
glucoză



**citosol
enterocit**

1

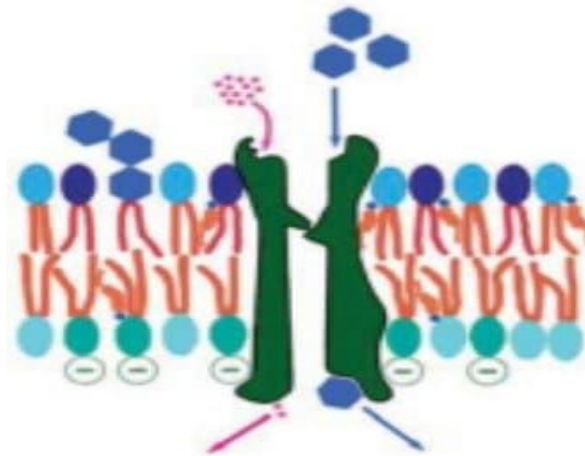
lumen intestinal



**citosol
enterocit**

2

lumen intestinal

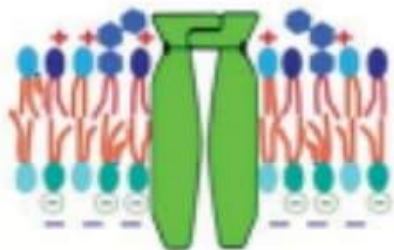
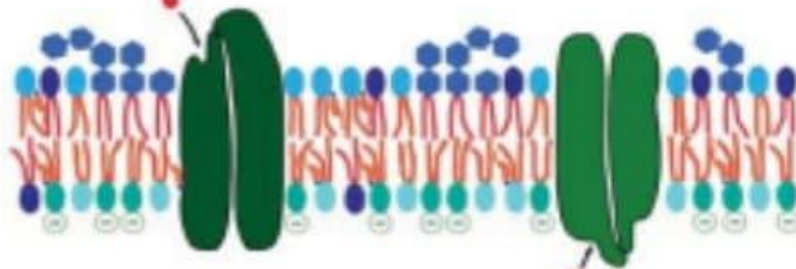
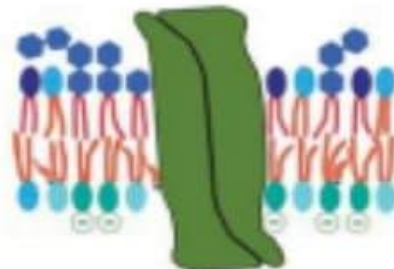
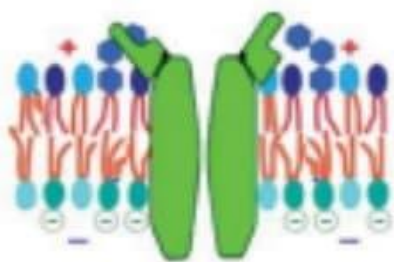
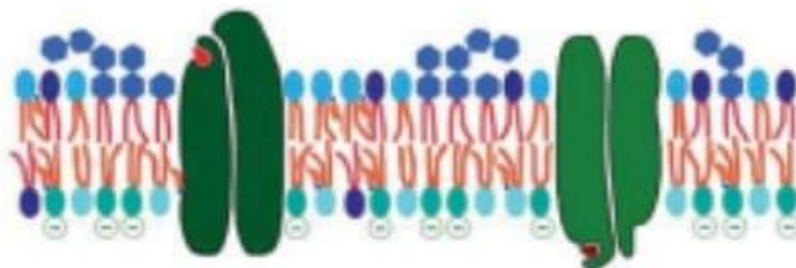
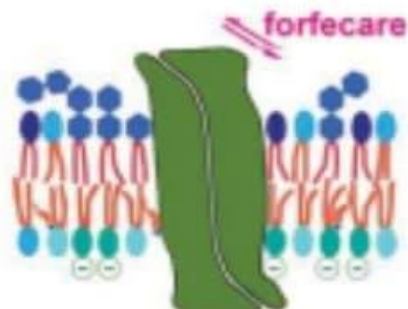
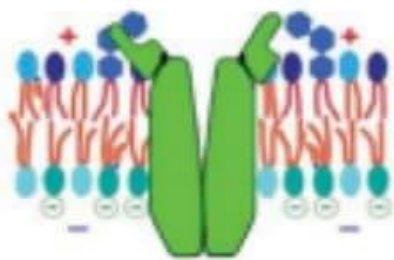
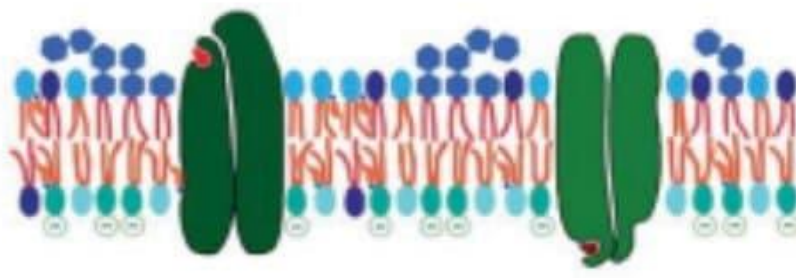
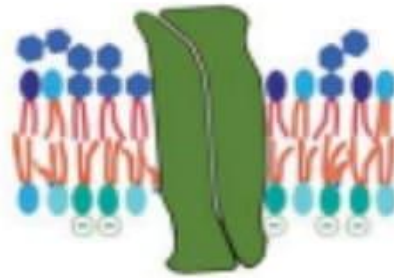


**citosol
enterocit**

3

Canalele ionice pot fi controlate :

- electric (prin voltaj) : prin modificarea potentialului membranelor de repaus
- chimic : prin legarea unui ligand
- mecanic : prin exercitarea unei tensiuni asupra membranei

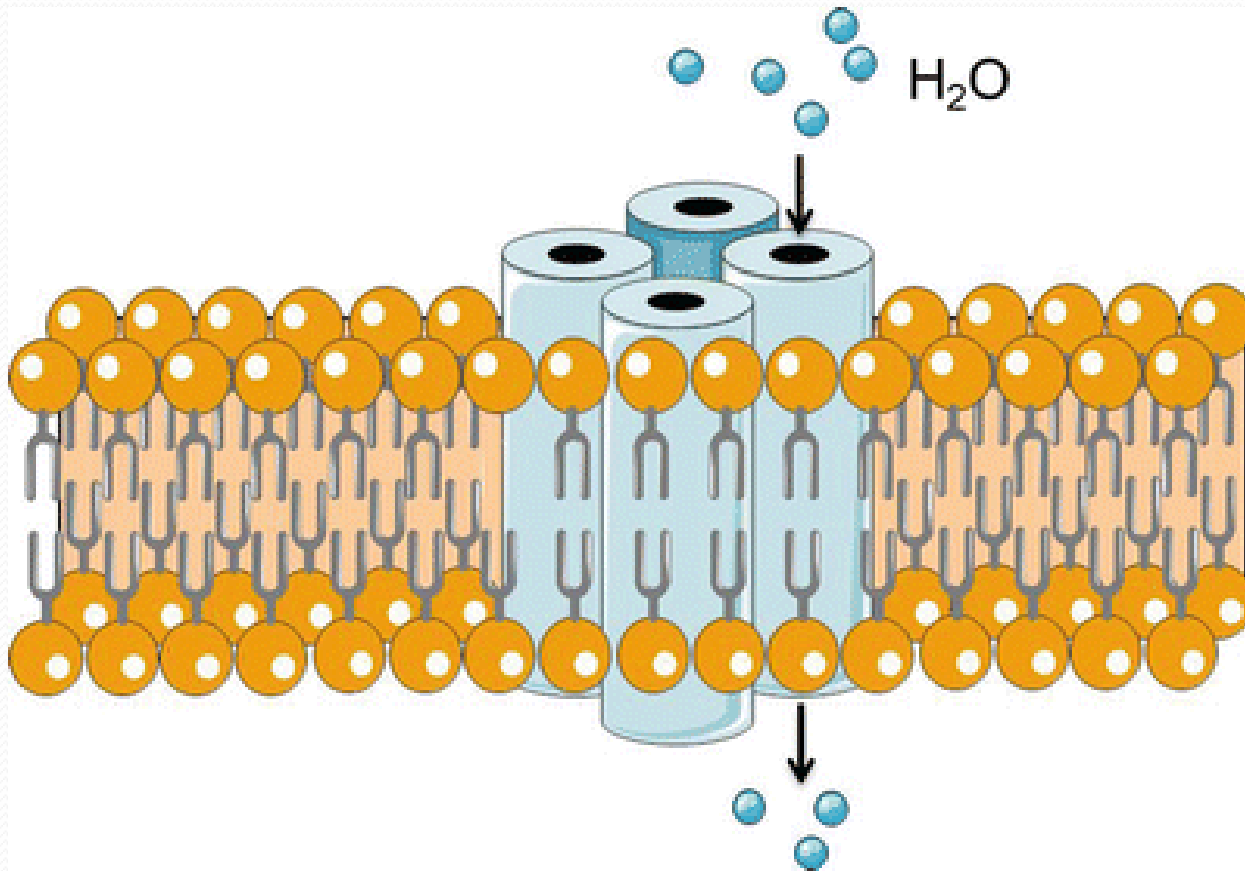
1**(a)**ligand
extracellular**2****(a)****3****(a)****(b)****(b)****(b)****(c)****(c)****(c)**

Osmoza

Trecerea apei prin membrana poate fi realizata atat prin difuziune simpla, cat si facilitata de proteine specializate= **AQUAPORINE** -exprimarea adecvata contribuind la:

- absorbtia adecvata la nivelul cailor urinare pentru formarea urinei
- semnalizarea neuronală prin modularea transportului prin canale ionice
- motilitatea celulara
- hidratarea pielii
- proliferarea celulara
- metabolismul lipidic

Deficiente in exprimarea aquaporinelor pot induce sau insoti: cataracta, diabet insipid, edem cerebral, obezitate



II.1 Transport prin membrana

□ Transport activ

-impotriva gradientilor de concentratie, cu consum de energie (ATP)

-realizat cu ajutorul unor pompe (proteine transmembranare)

-Pompa Na/K are capacitatea de a-si schimba conformatia, realizand **6 etape** diferite prin care o molecula de ATP este hidrozilata pentru a expulza 3 atomi de Na si a importa 2 atomi de K

1. Pompa este deschisa spre interior- Na intracelular se poate lega

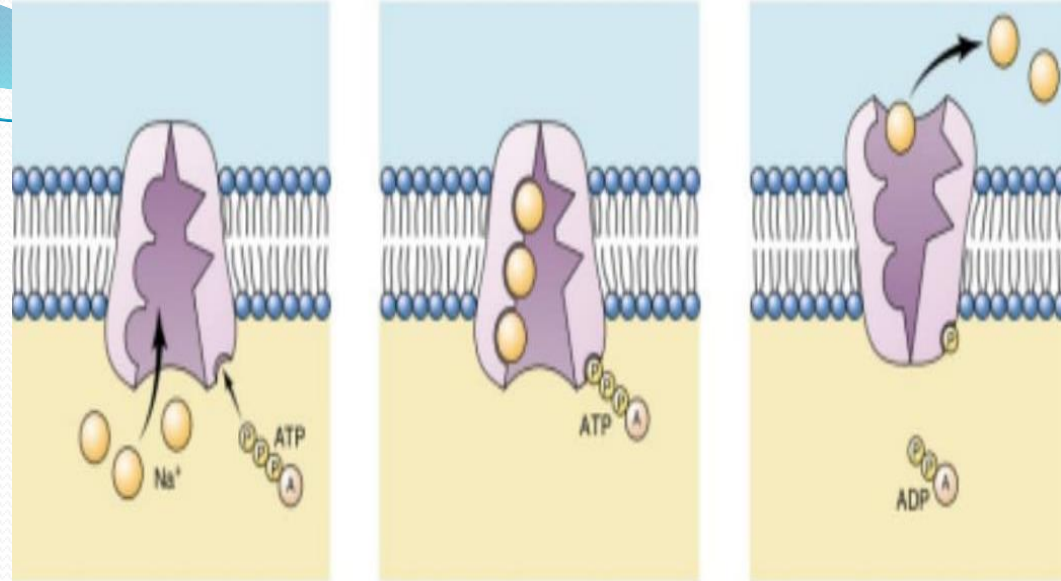
2. Legarea ATP-ului si hidroliza sa duce la fosforilarea pompei

3. Fosforilarea modifica conformatia pompei, care se deschide spre exterior eliberand Na

4. Pompa deschisa spre exterior leaga acum K extracelular

5. Legarea K duce la defosforilarea pompei

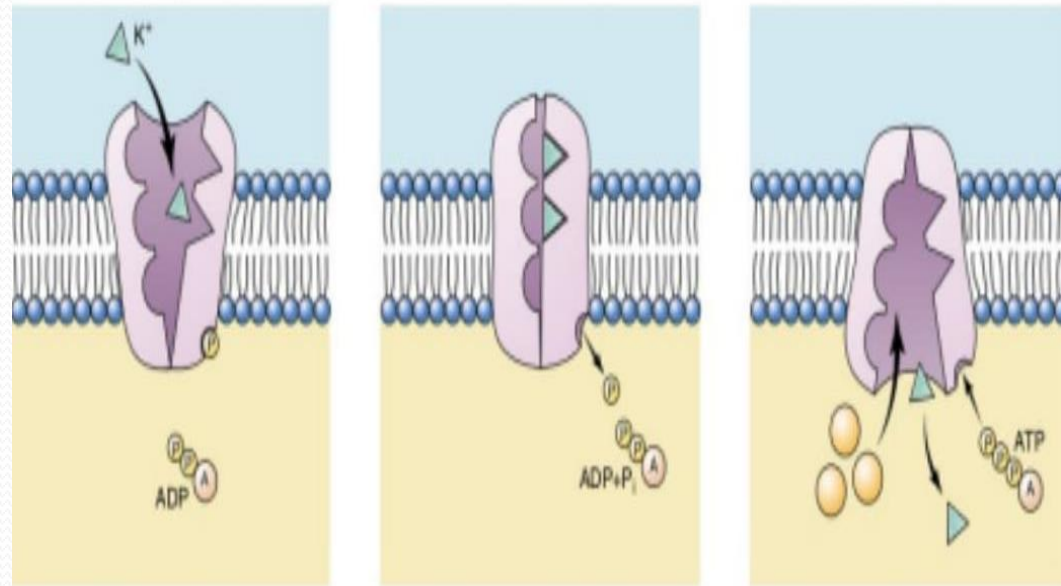
6. Defosforilarea duce la deschiderea pompei spre interior, unde elibereaza atomii de K



1

2

3



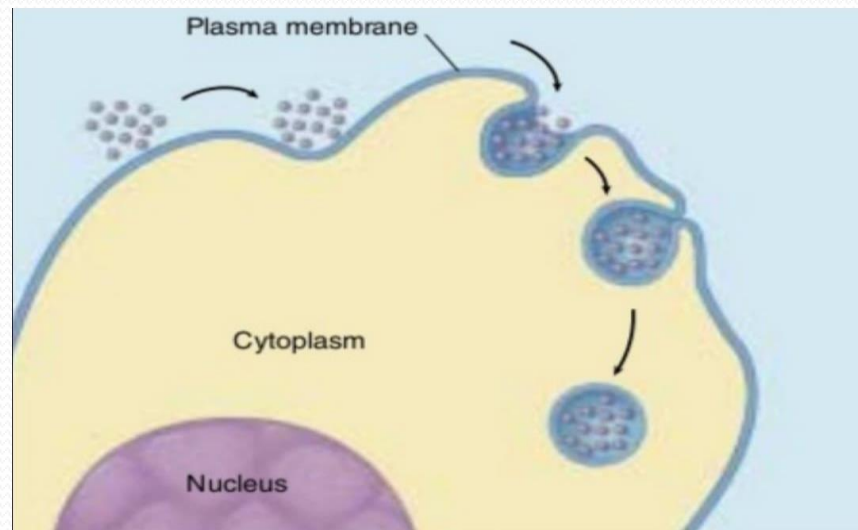
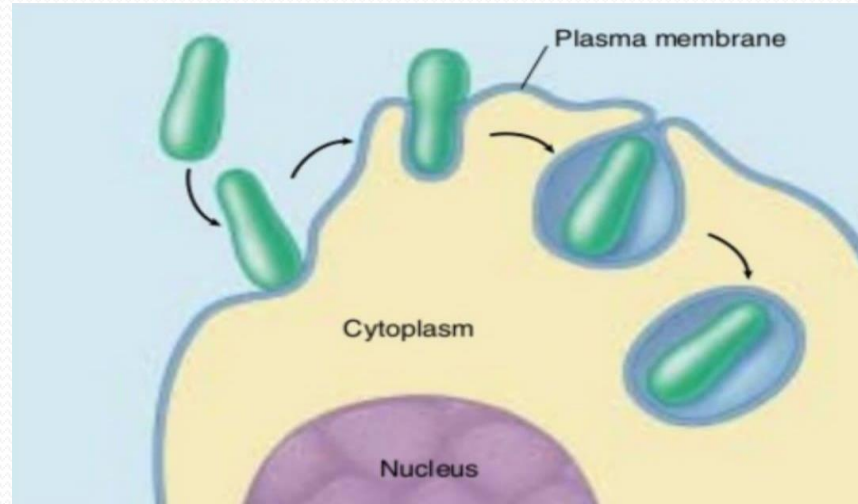
4

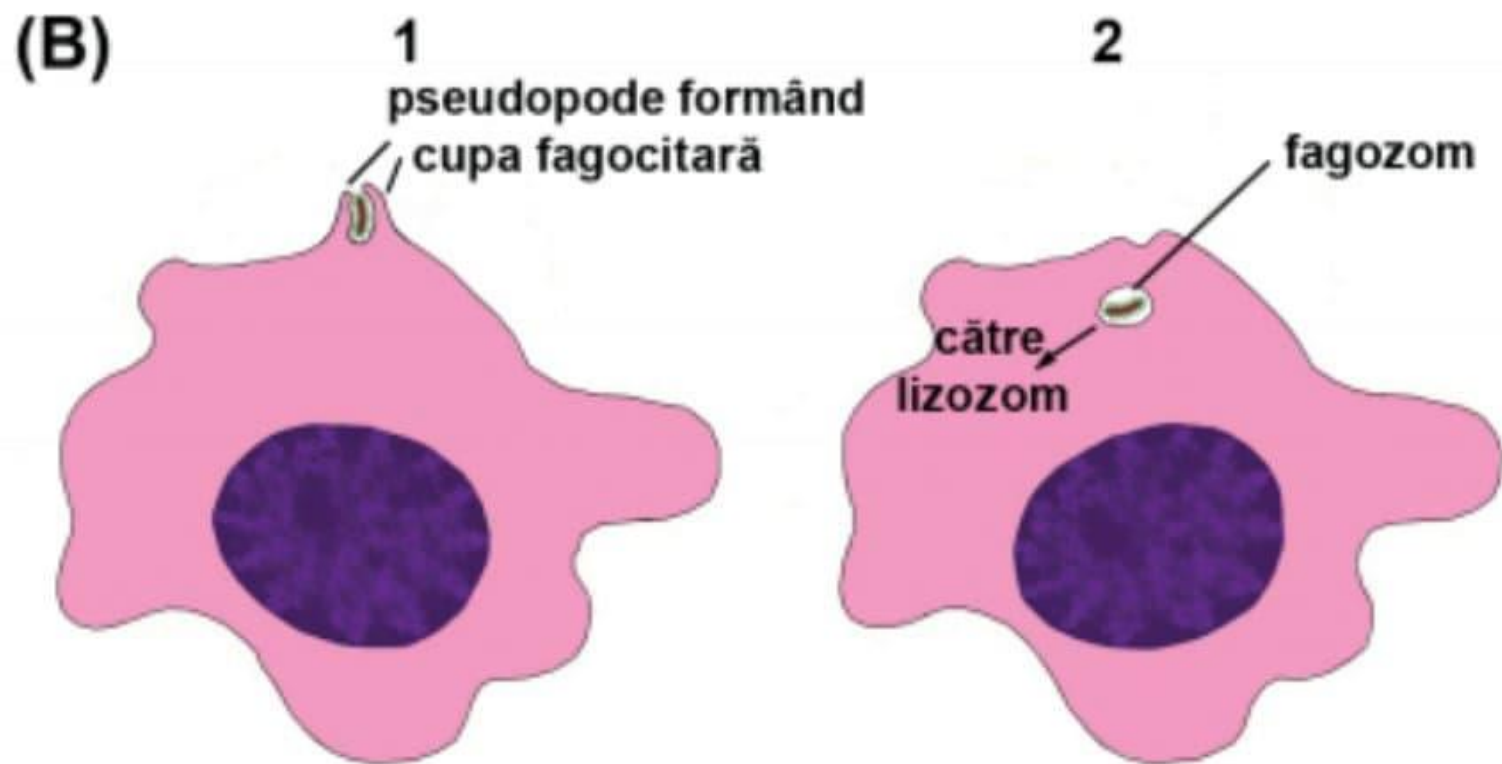
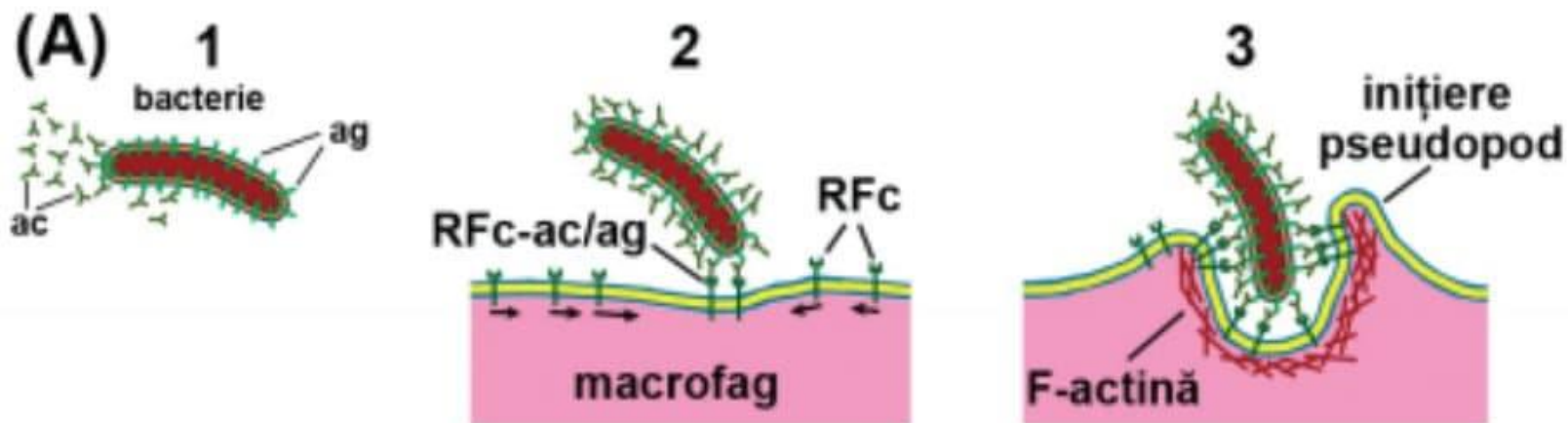
5

6

II.2 Transport cu membrana

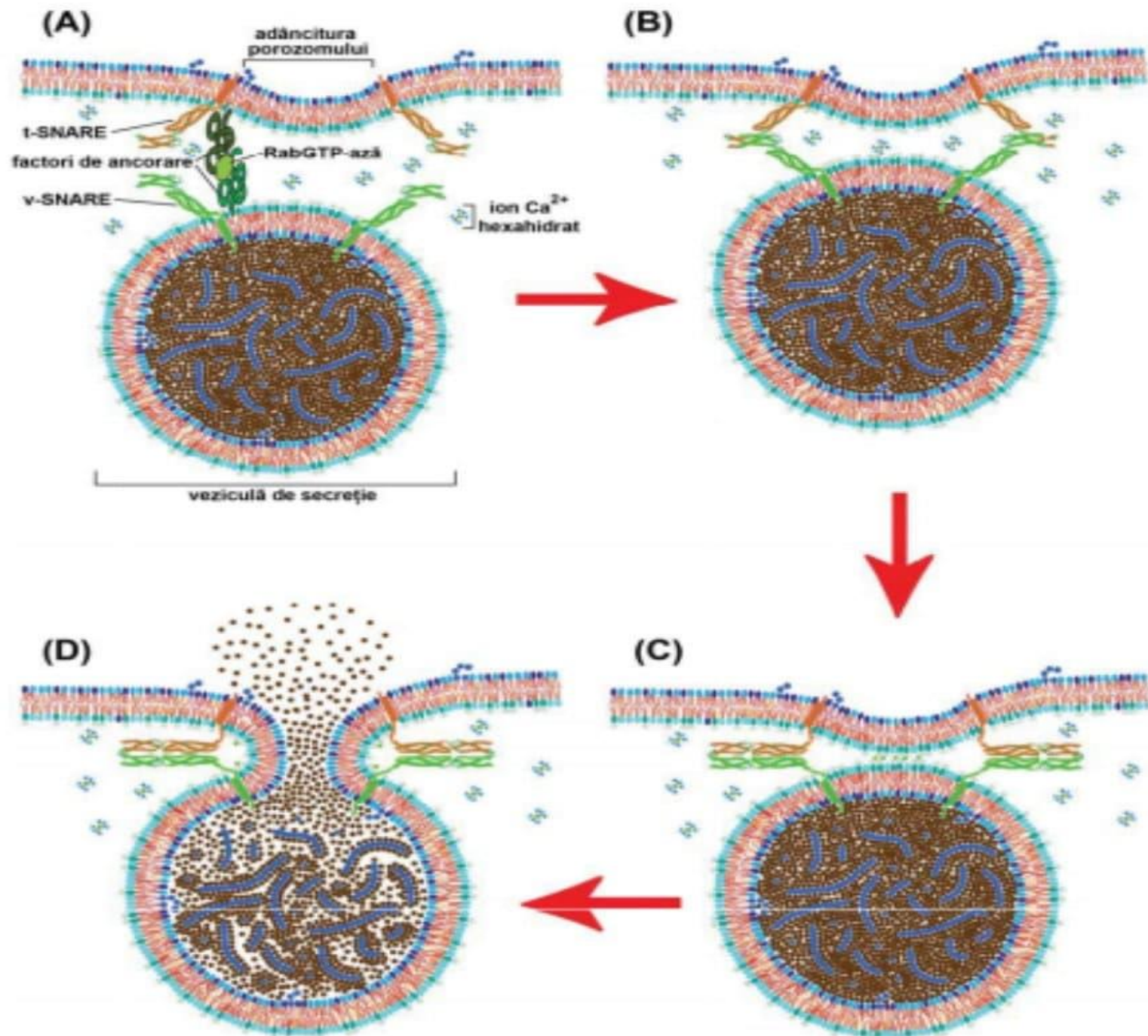
- **Endocitoza:**
 - fagocitoza
 - pinocitoza



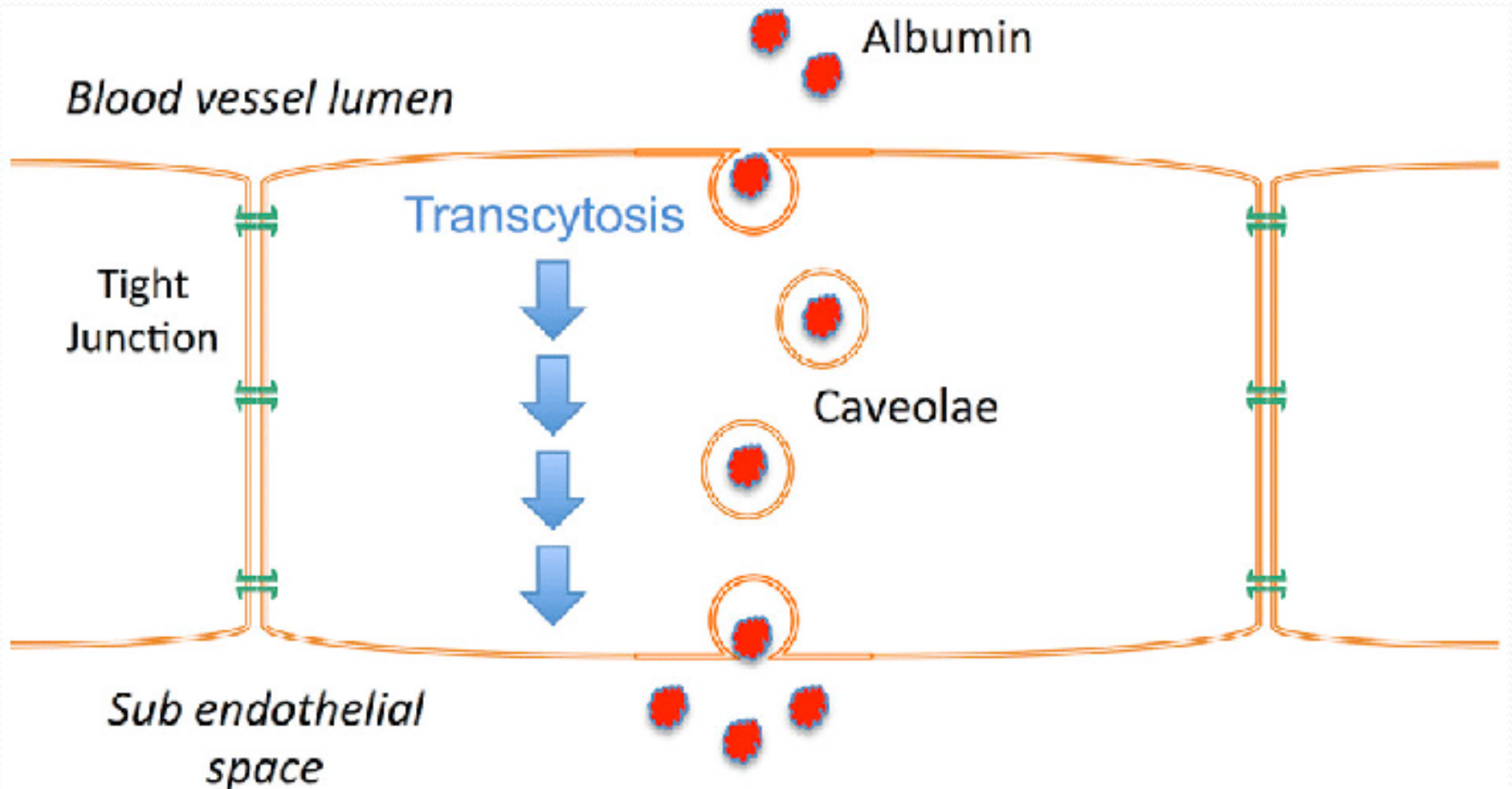


❑ **Exocitoza : eliminarea substantelor acumulate in vezicule de secretie; constitutiva/ semnalizata**

1. Transportul veziculelor
2. Ancorarea acestora
3. Acostarea
4. Capacitarea
5. Fuzionarea: la nivelul unor structuri preformate=porozomi



❑ Transcytosis



VA MULTUMIM
PENTRU ATENTIE !