



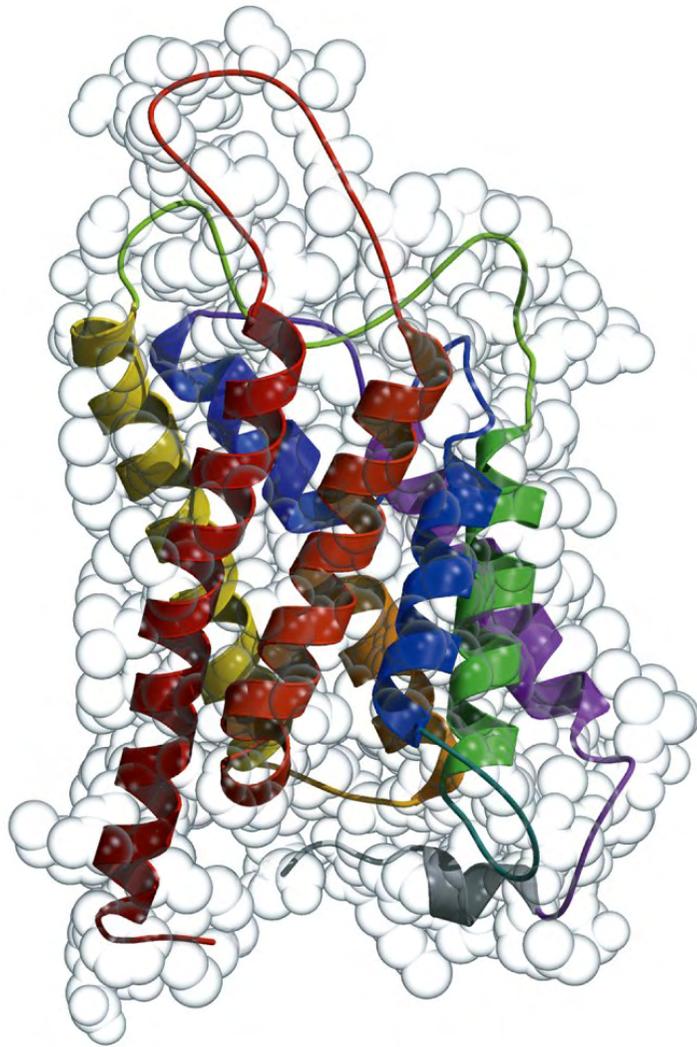
Peter Agre



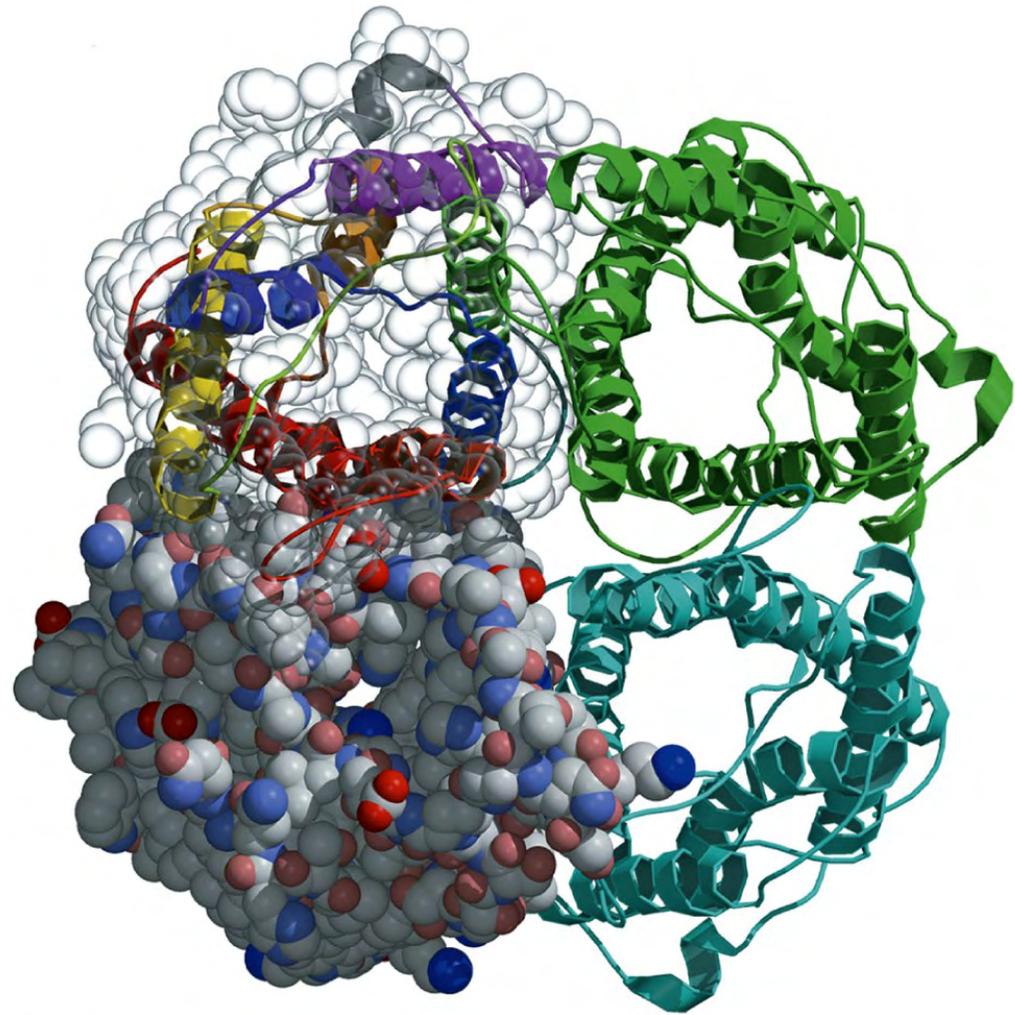
Roderick
MacKinnon

The Nobel Prize in Chemistry 2003 was awarded for "*for discoveries concerning channels in cell membranes*" jointly with one half to Peter Agre "*for the discovery of water channels*" and with one half to Roderick MacKinnon "*for structural and mechanistic studies of ion channels*".

ウシ赤血球アクアポリンAQP1のX線構造



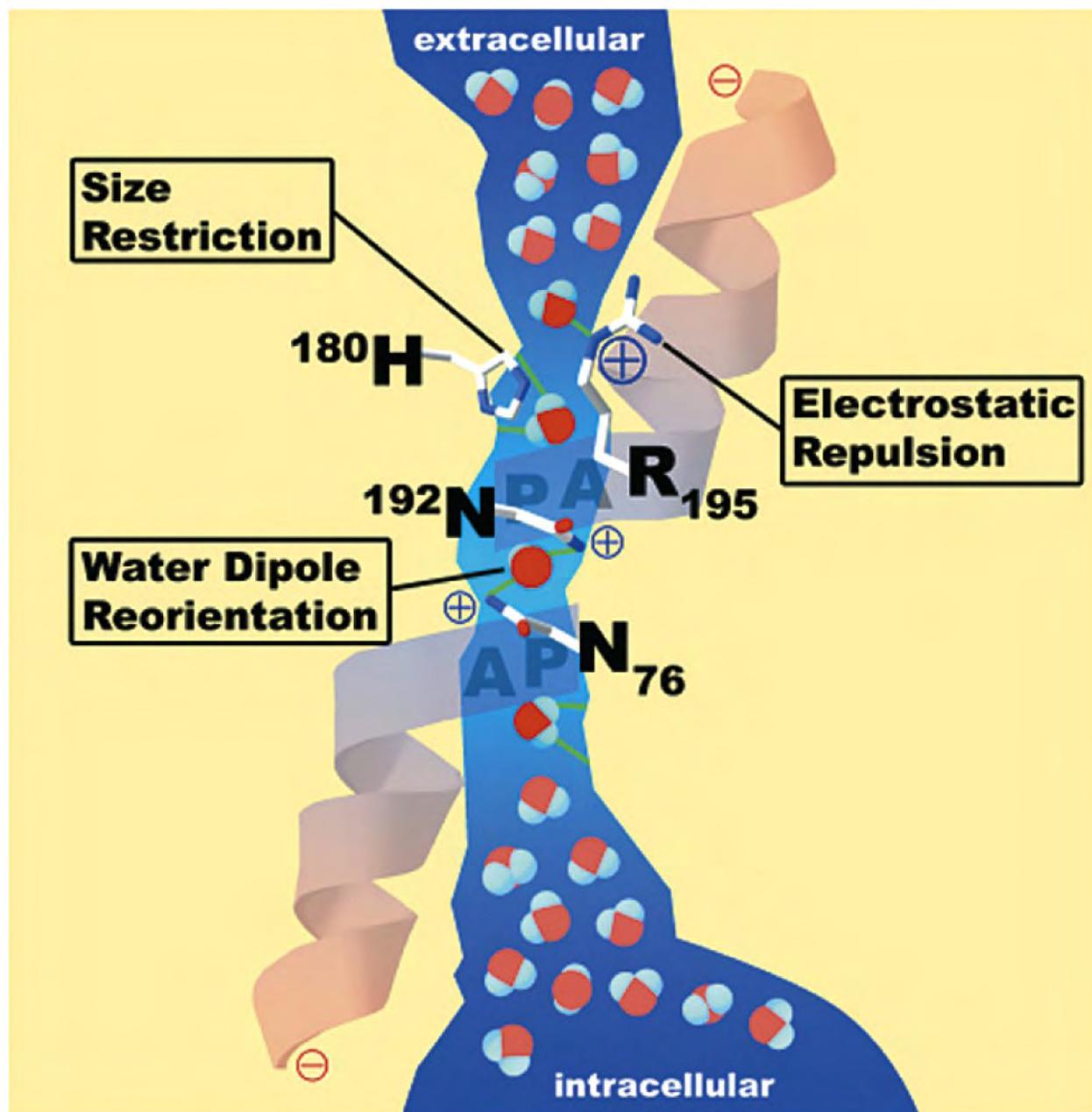
Courtesy of Bing Jap, University of California at Berkeley



Courtesy of Bing Jap, University of California at Berkeley

Figure 10-11a

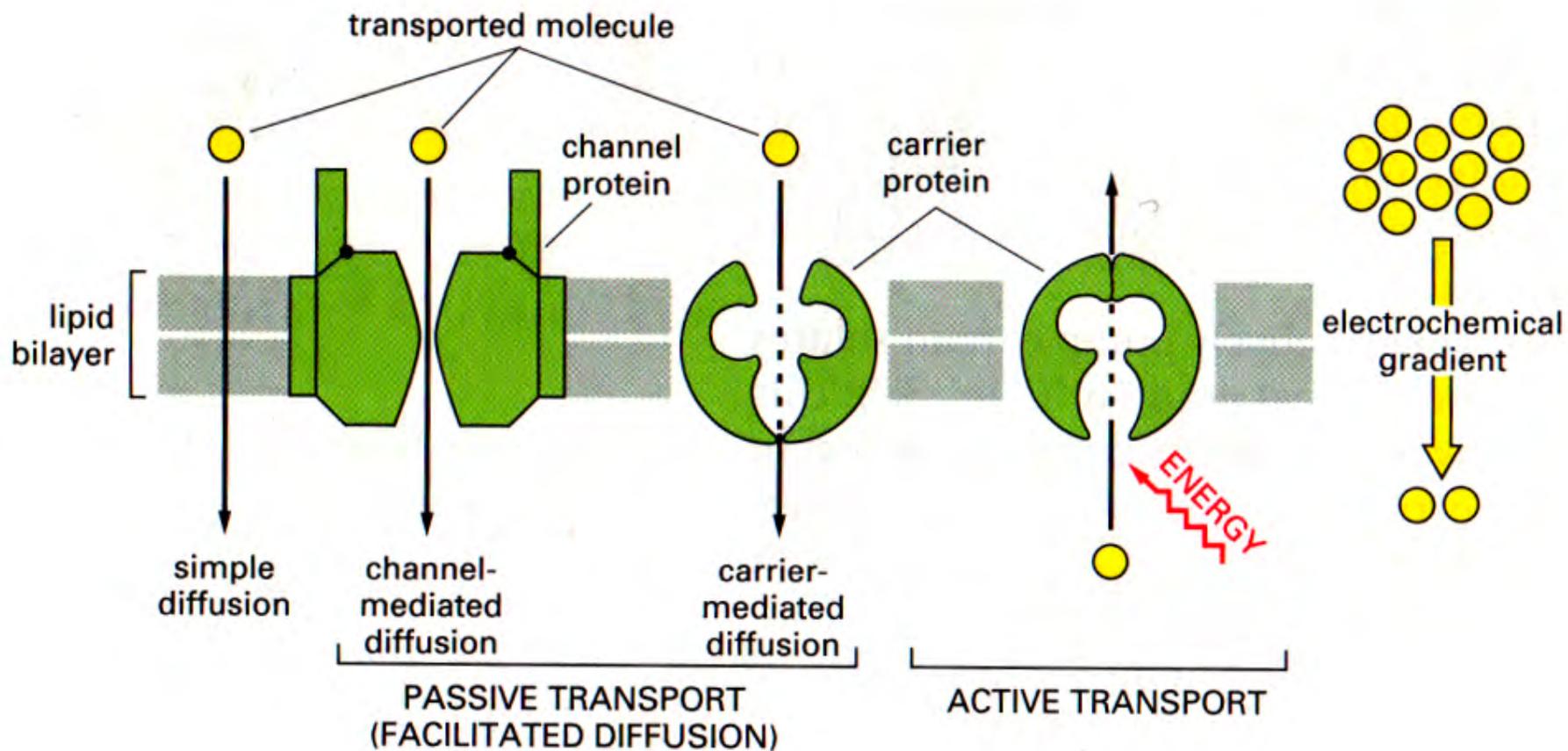
アクアポリンAQP1の水分子透過機構のモデル



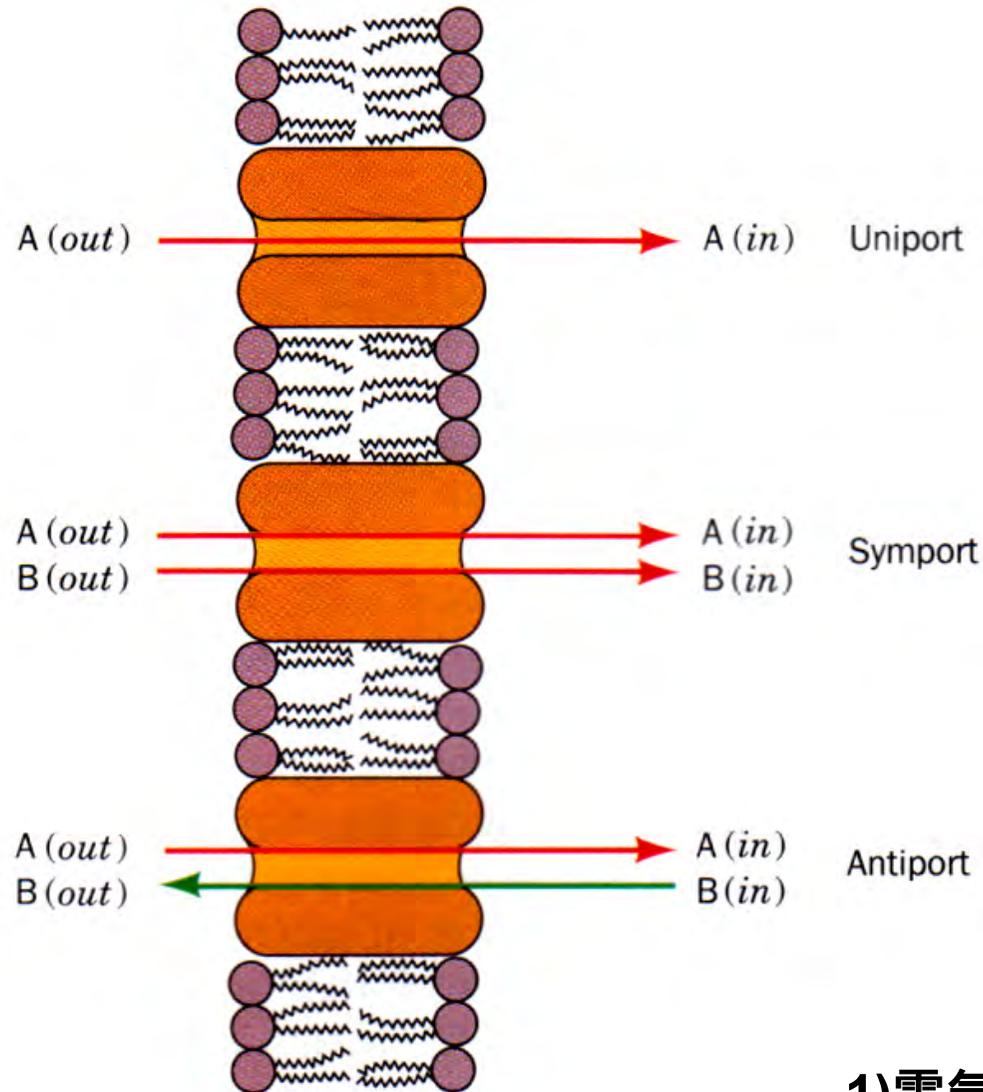
Courtesy of Peter Agre, The Johns Hopkins School of Medicine

Figure 10-12

膜蛋白質による輸送形態



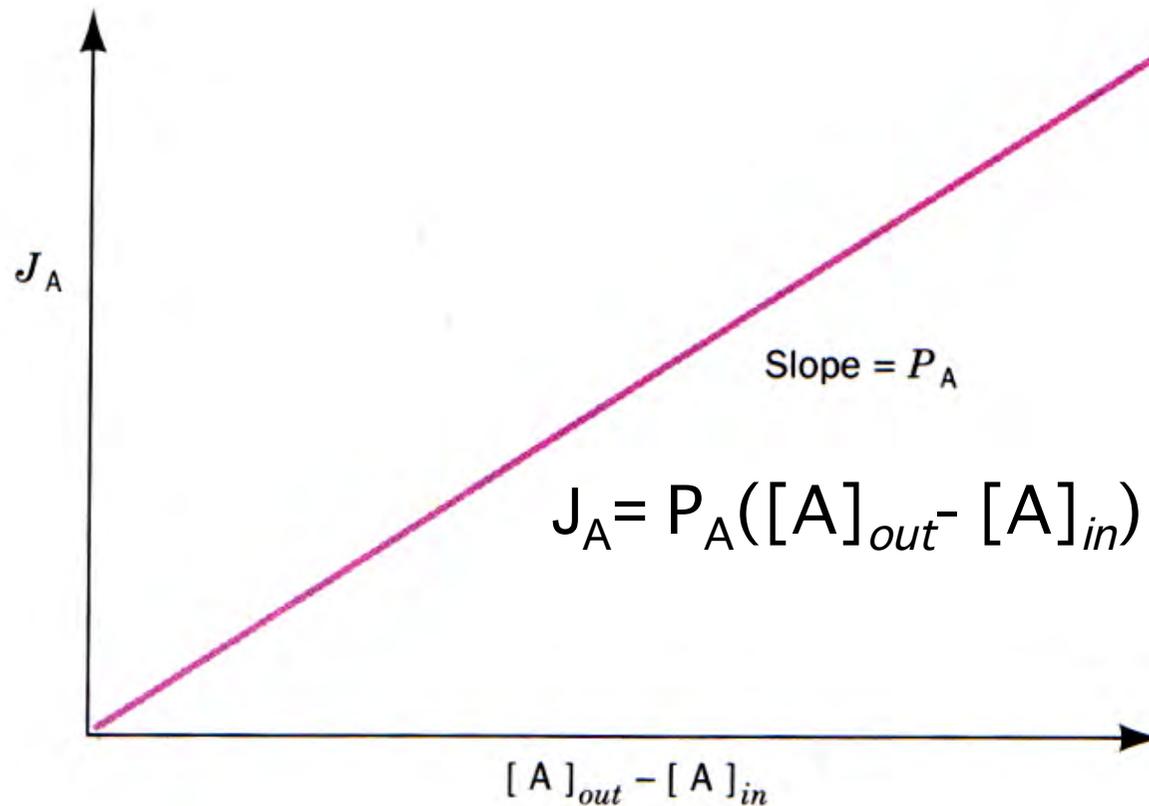
輸送形式の分類



- 1) ユニポート
- 2) シンポート
- 3) アンチポート

- 1) 電気的中性輸送 (electroneutral)
- 2) 起電的輸送 (electrogenic)

半透膜を横切る拡散速度と膜内外の基質濃度



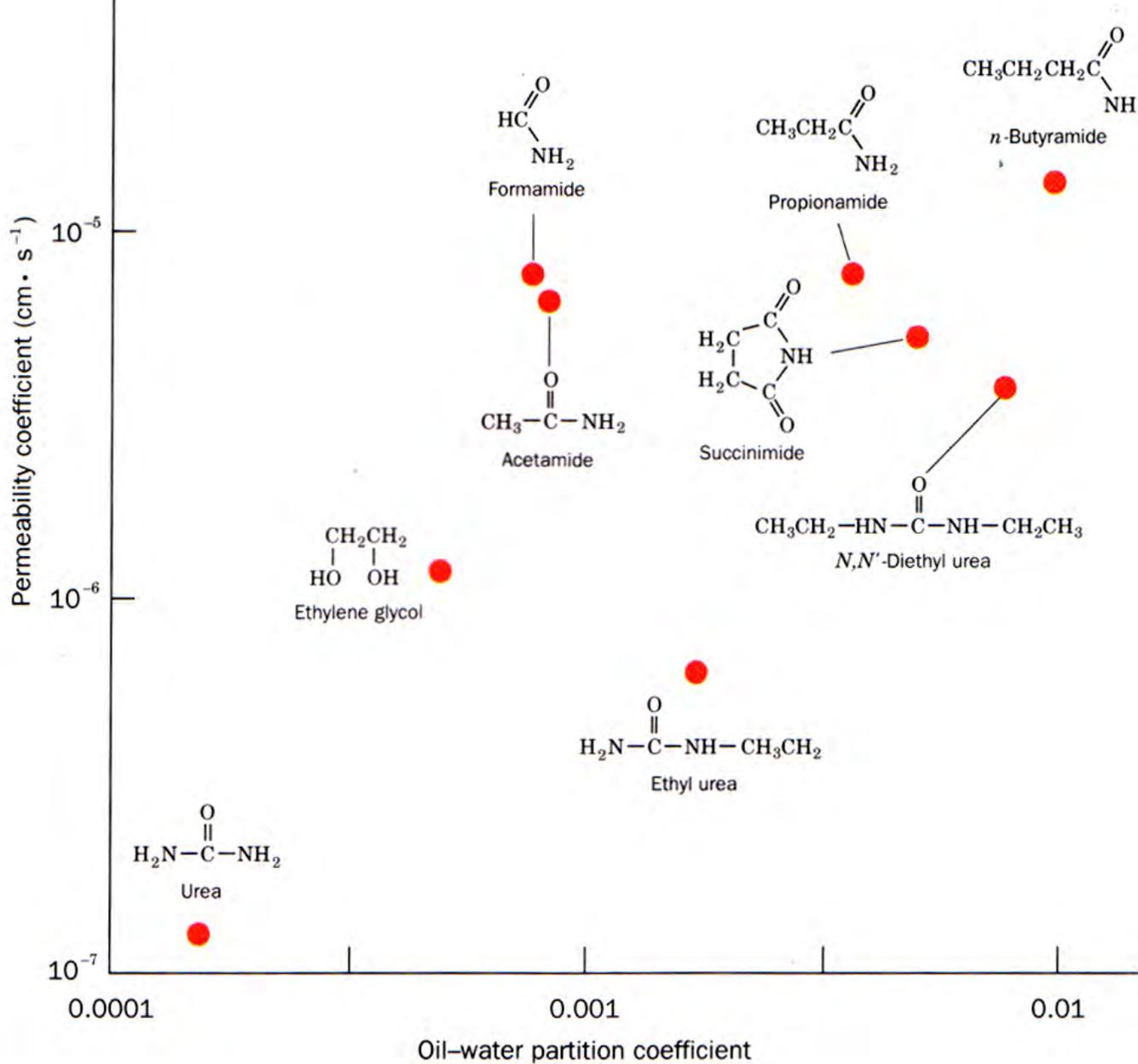
$$P_A = D/L$$

P_A : 透過係数 (permeability coefficient)

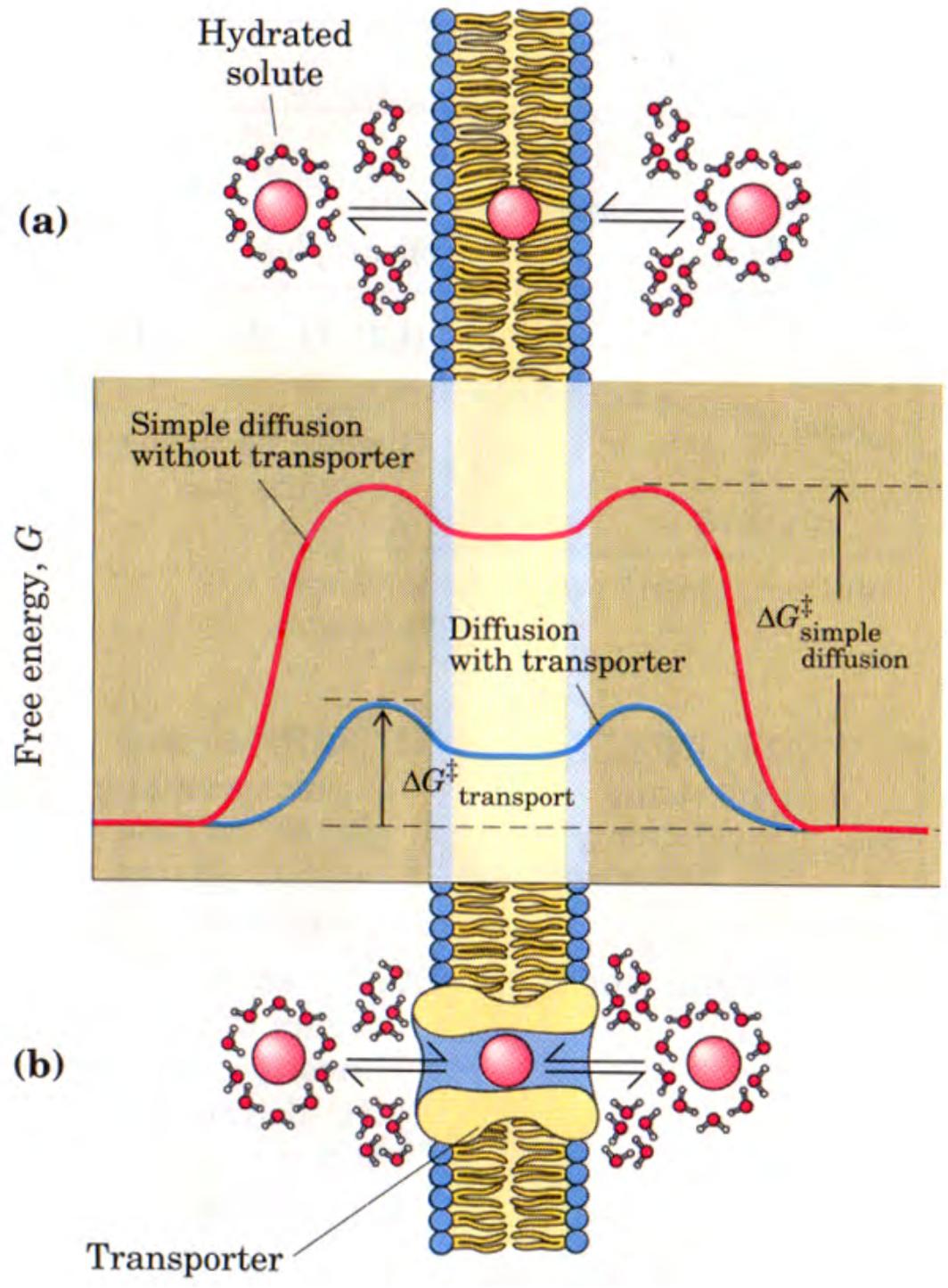
D : 拡散係数 (diffusion coefficient)

L : 膜厚

種々有機化合物の形質膜の透過係数と
オリーブ油・水の分配係数の関係



膜透過と自由エネルギー変化



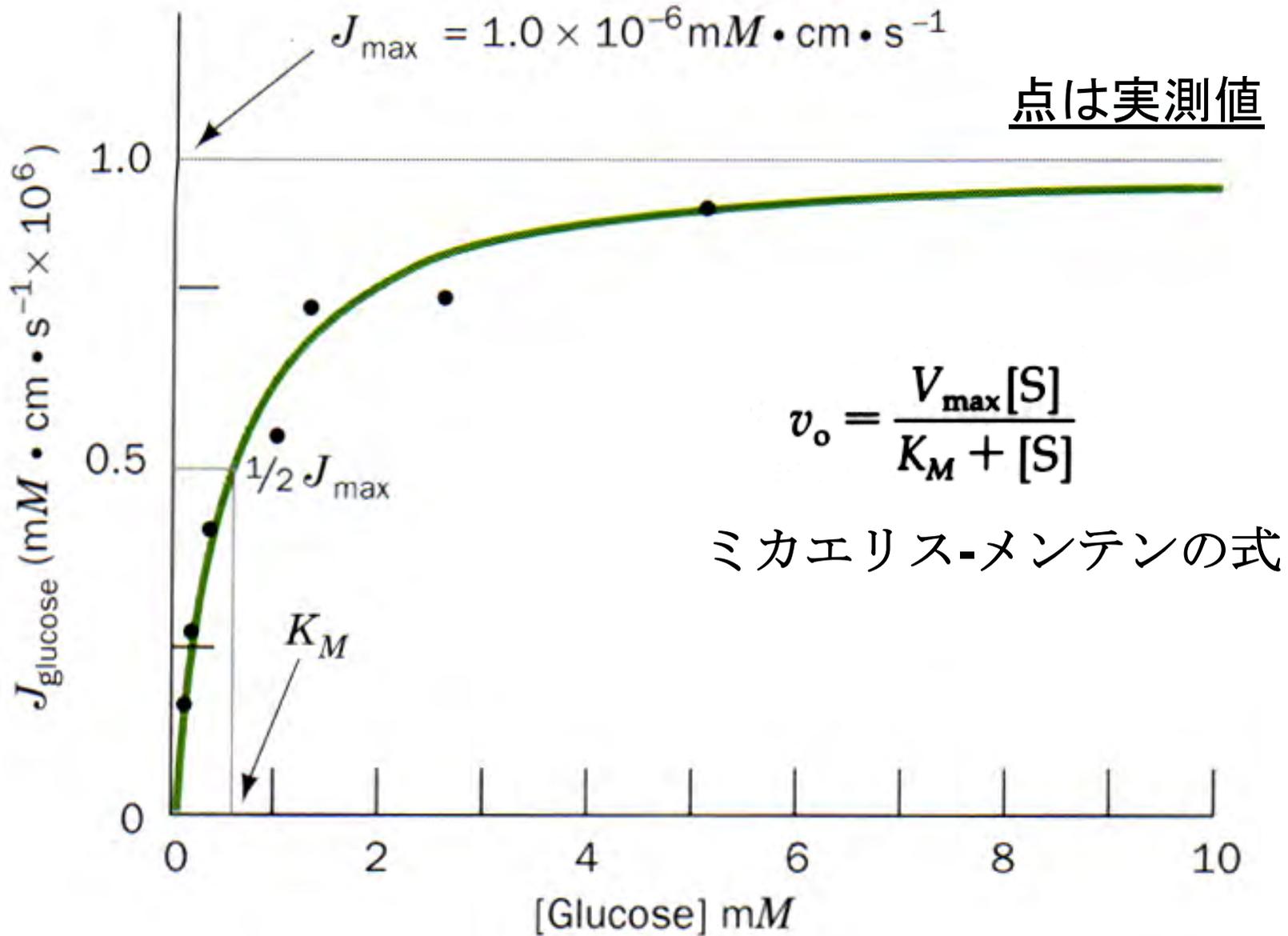
生体膜と合成膜での糖の透過係数

Permeability Coefficients of Natural and Synthetic Membranes to D-Glucose and D-Mannitol at 25° C

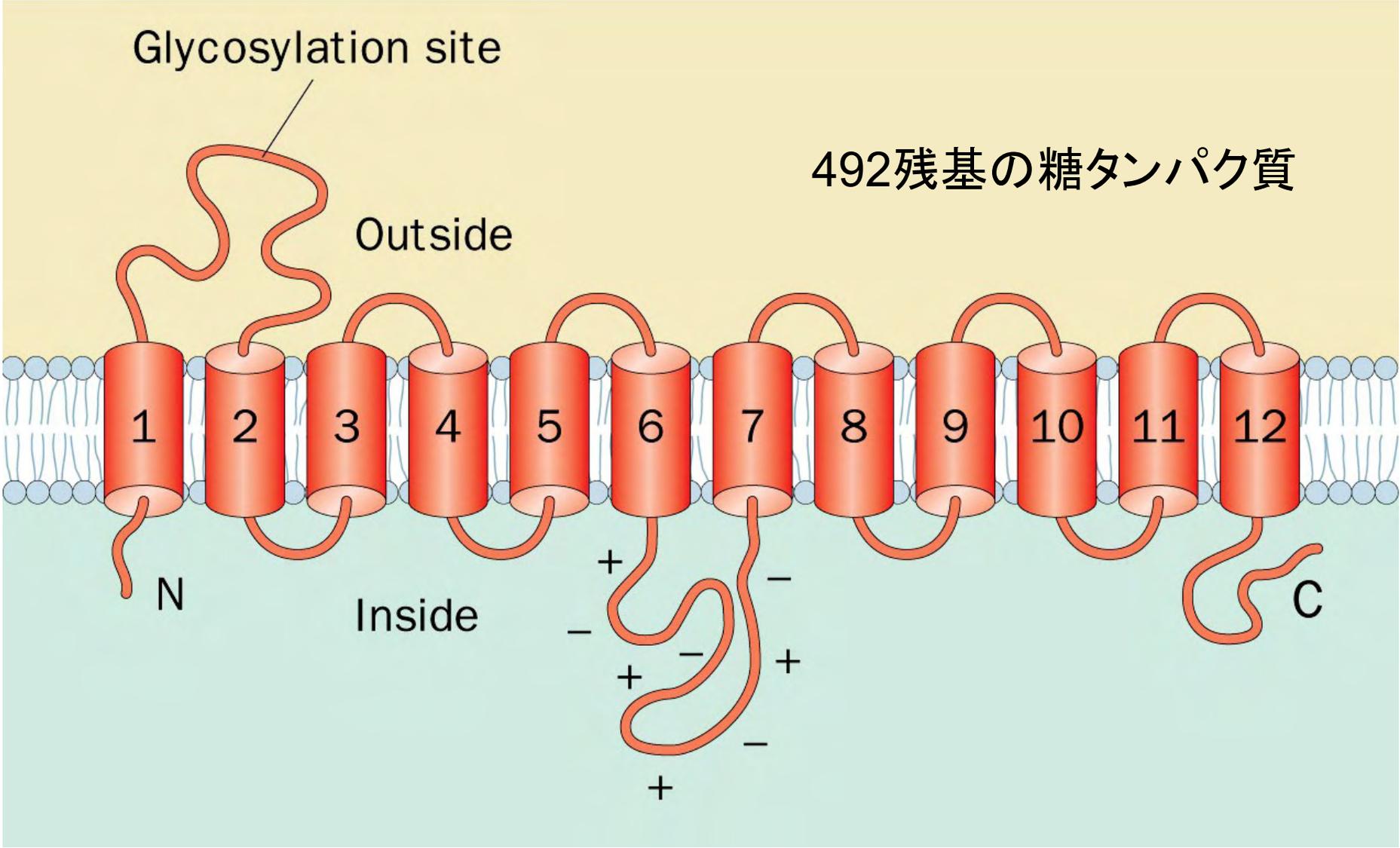
Membrane Preparation	Permeability Coefficients (cm · s ⁻¹)	
	D-Glucose	D-Mannitol
Synthetic lipid bilayer	2.4×10^{-10}	4.4×10^{-11}
Calculated nonmediated diffusion	4×10^{-9}	3×10^{-9}
Intact human erythrocyte	2.0×10^{-4}	5×10^{-9}

Source: Jung, C. Y., in Surgenor, D. (Ed.), *The Red Blood Cell*, Vol. 2, p. 709, Academic Press (1975).

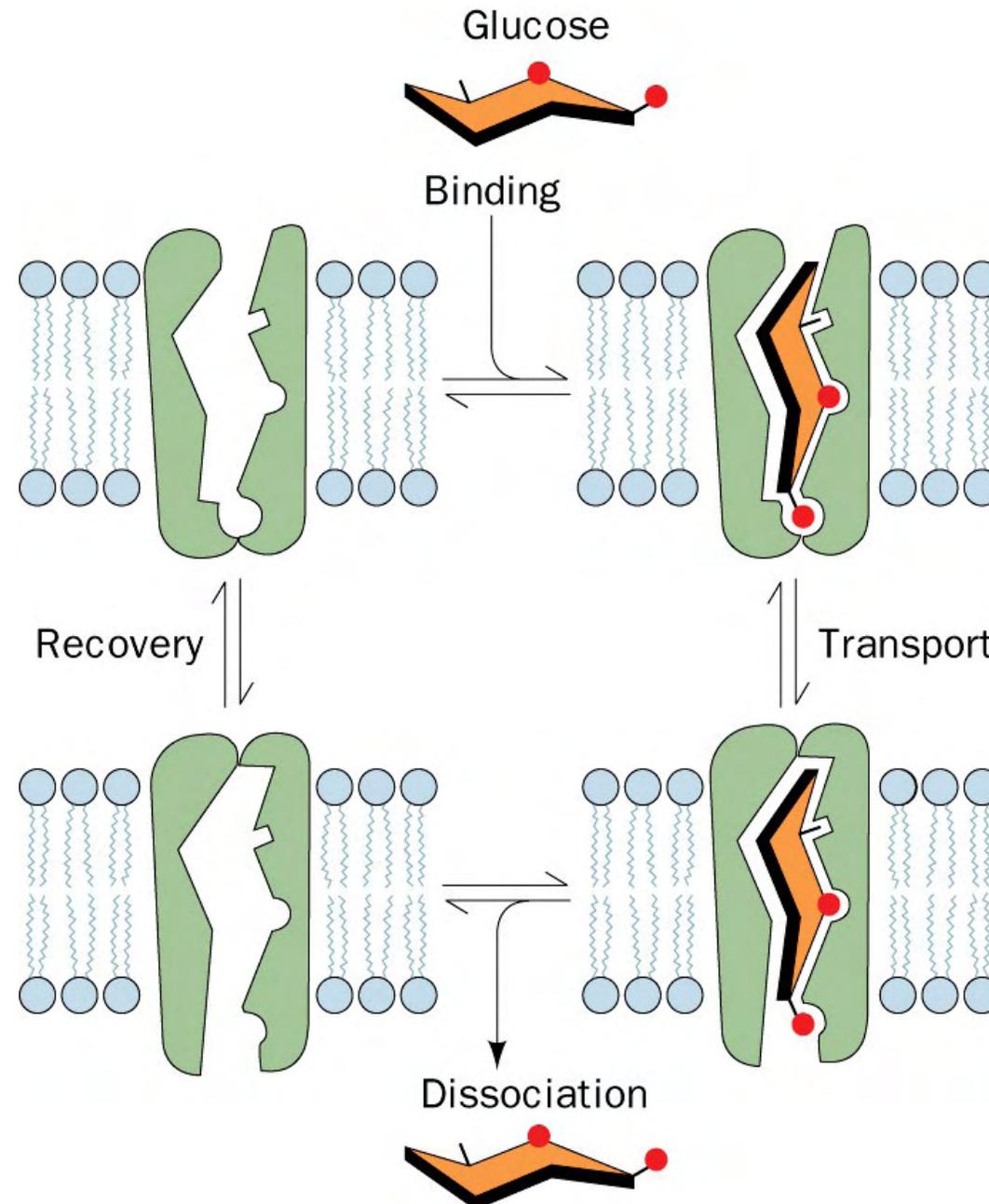
ヒト赤血球へのグルコース流入量と外部グルコース濃度の関係



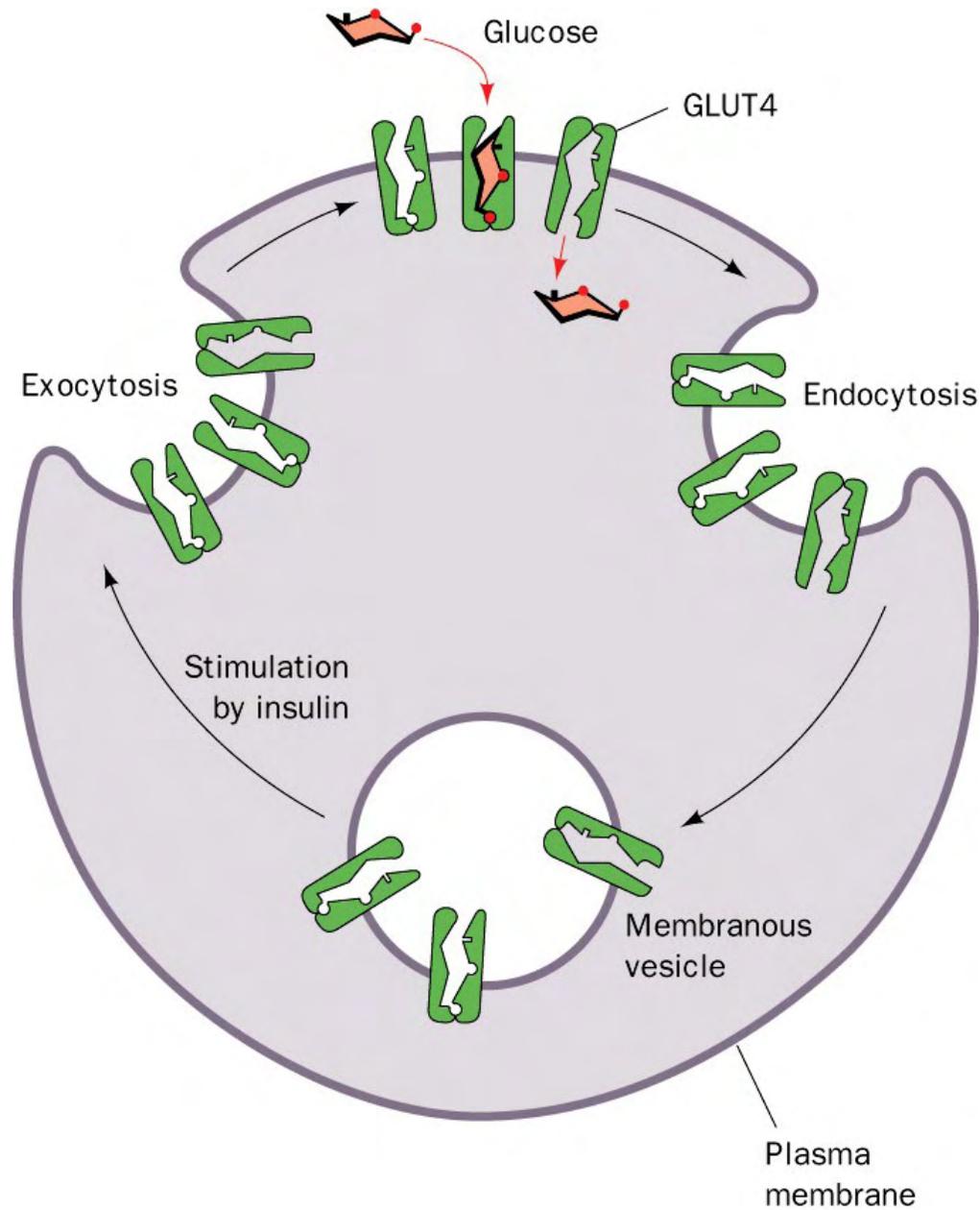
Predicted secondary structure and membrane orientation of the glucose transporter.



Alternating conformation model for glucose transport



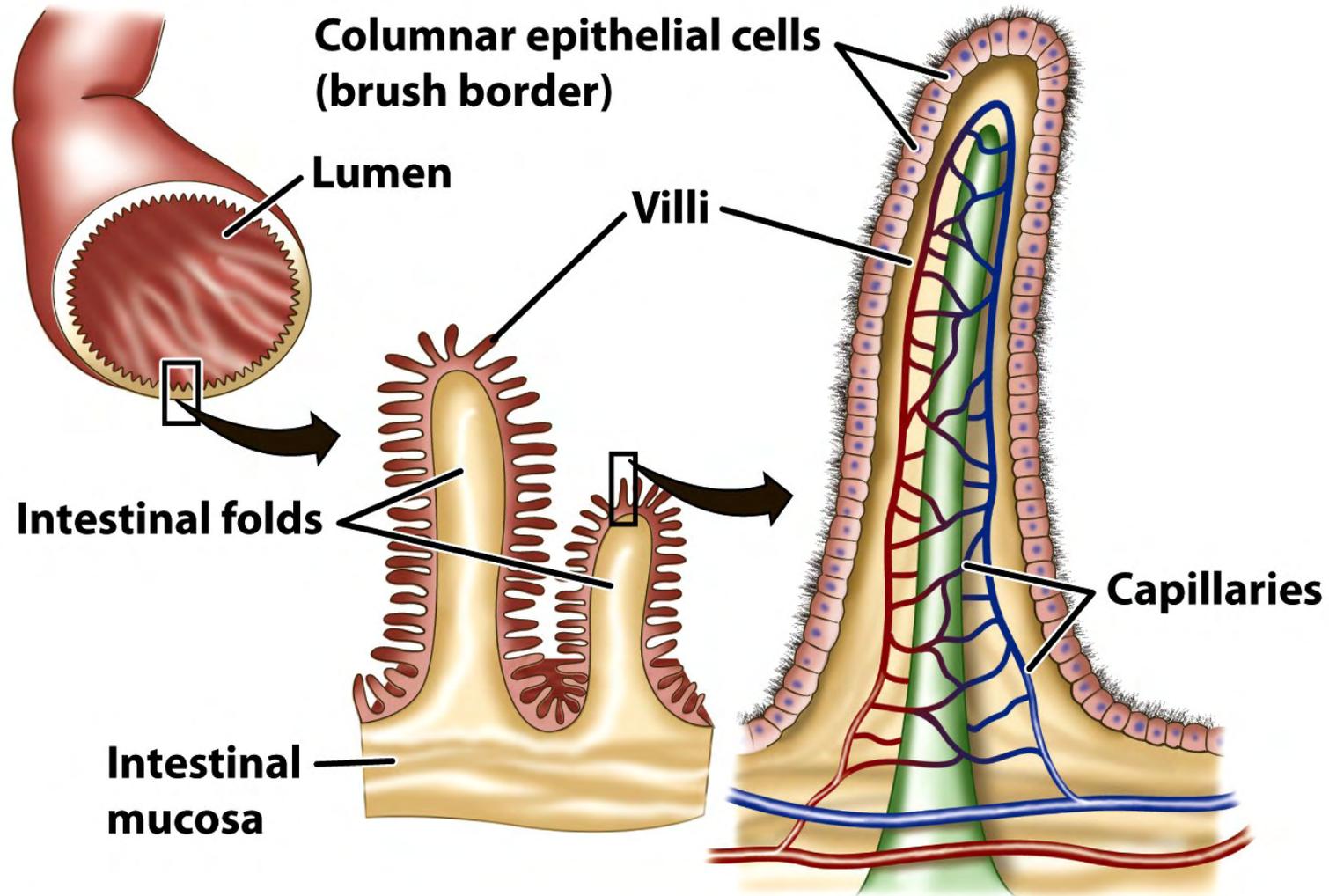
Regulation of glucose uptake in muscle and fat cells.



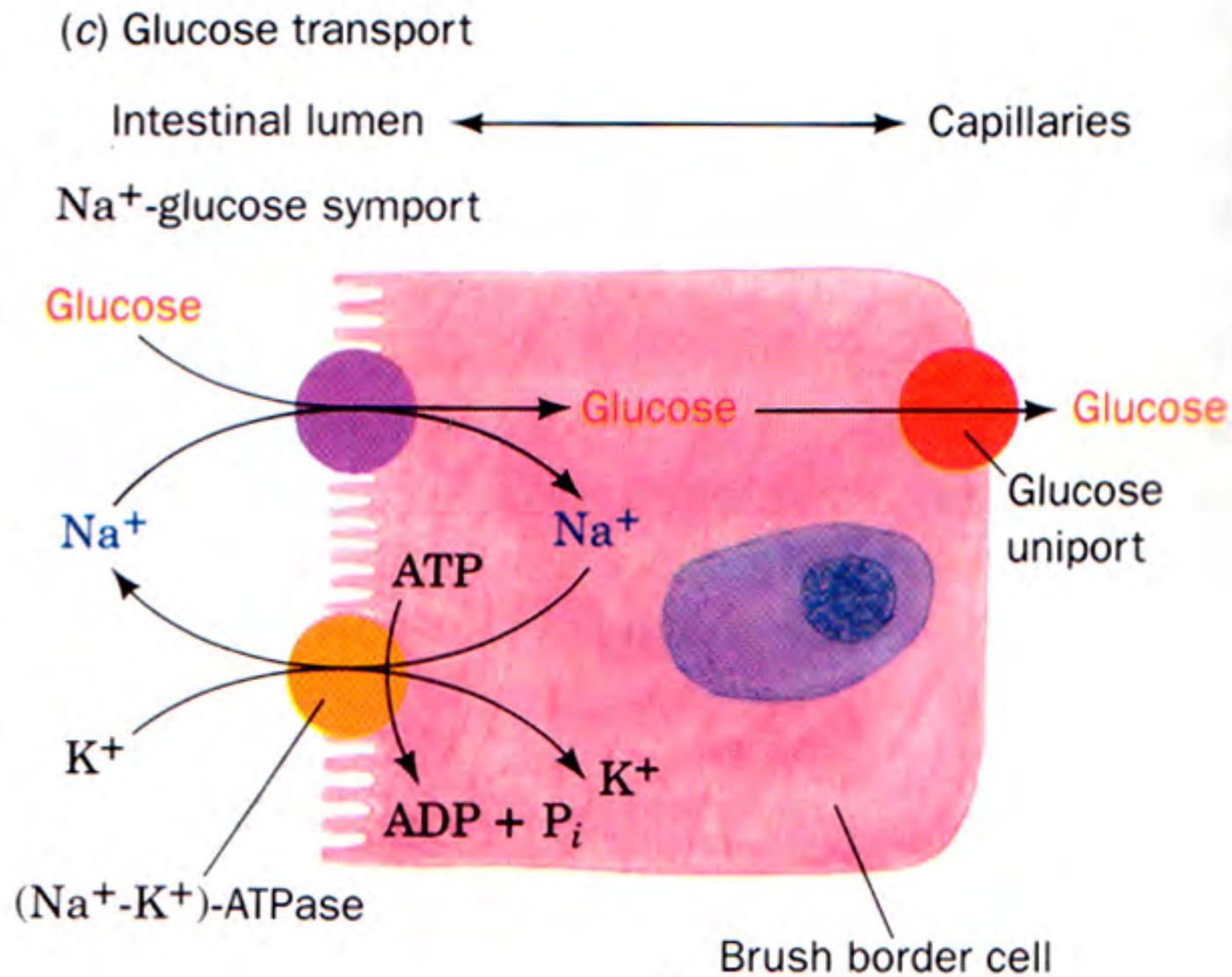
小腸上皮のグルコース輸送(1)

(a) Small intestine

(b) Villus

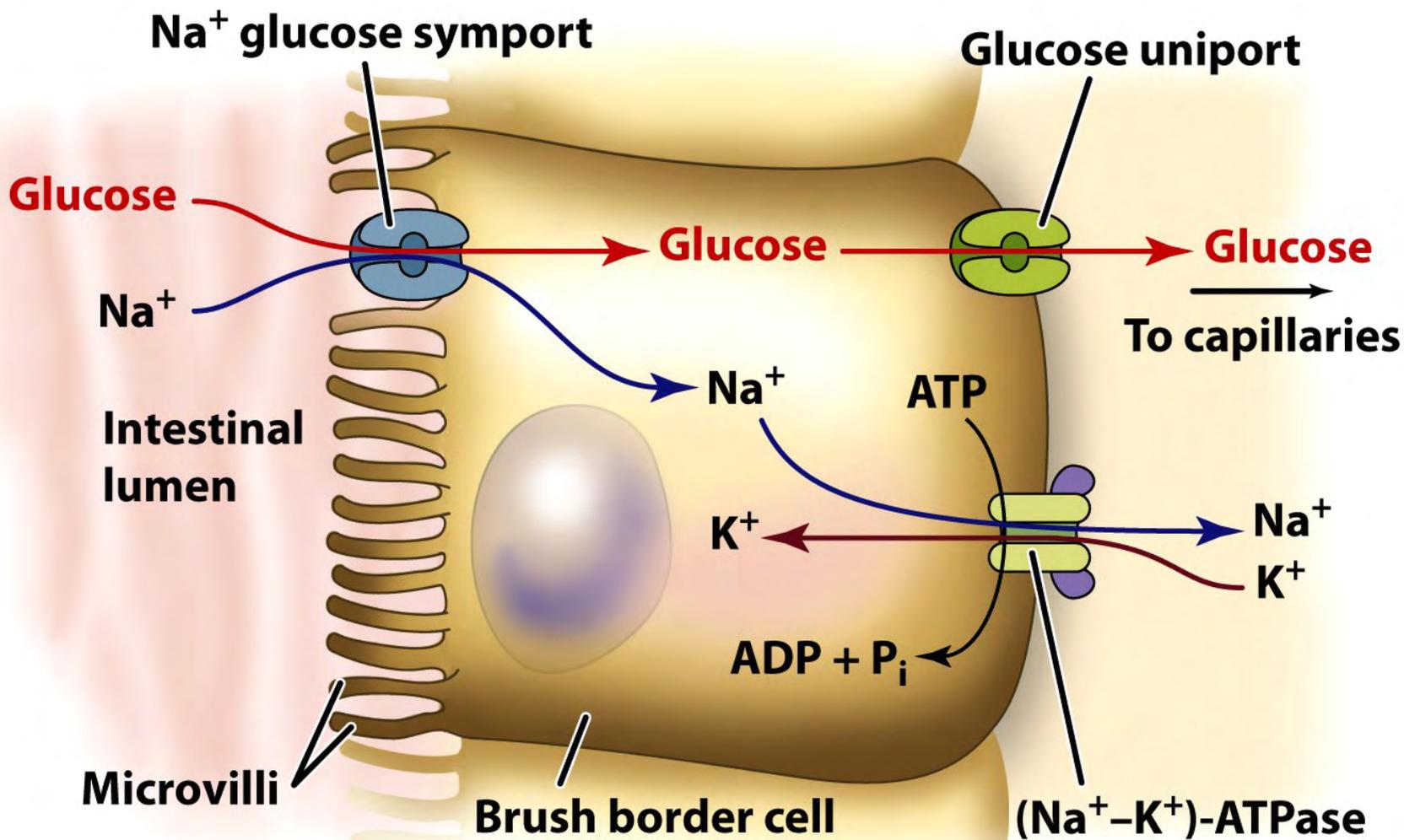


小腸上皮のグルコース輸送(2)



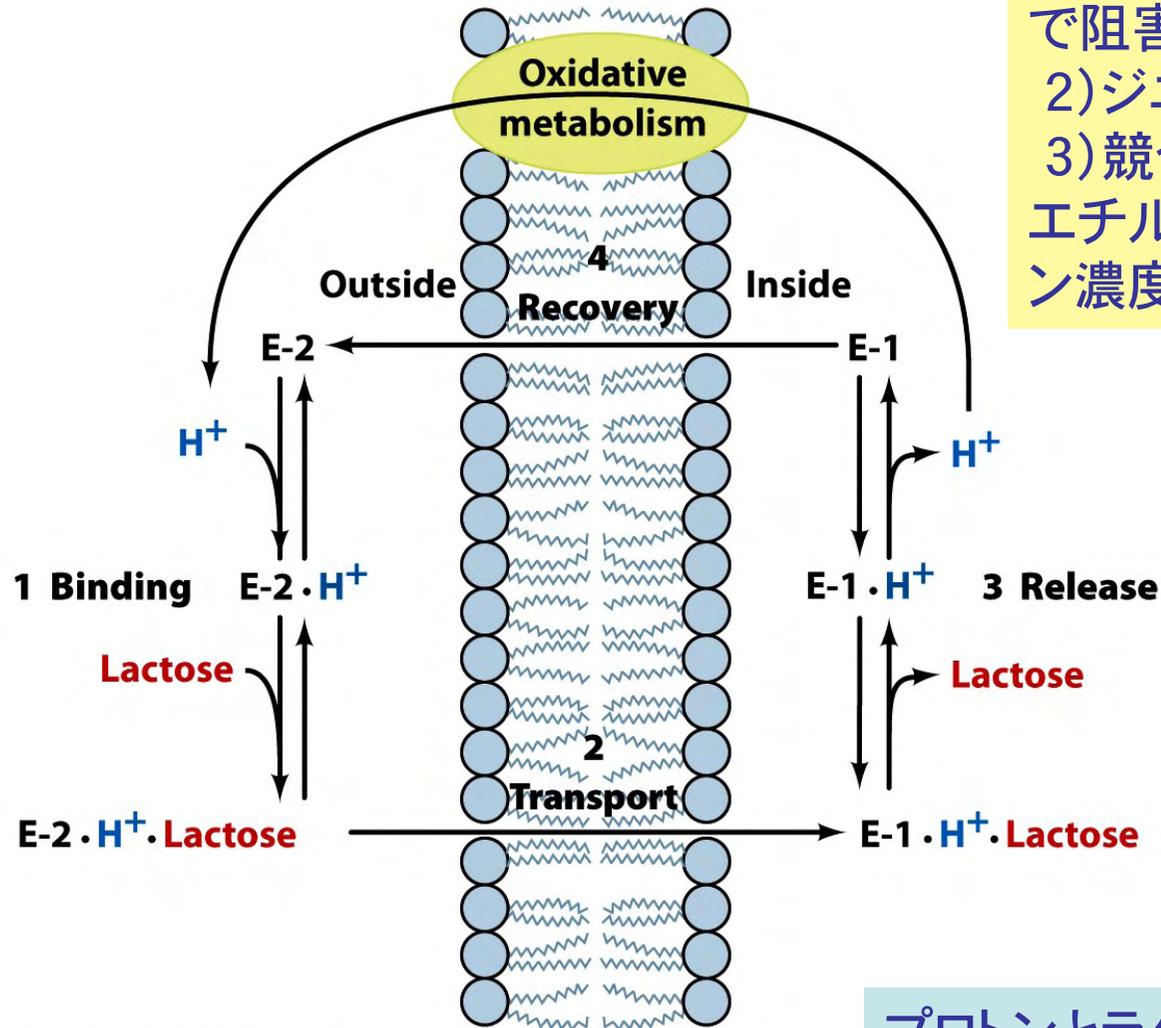
小腸上皮のグルコース輸送(2)

Glucose transport



ラクトースパミアーゼ

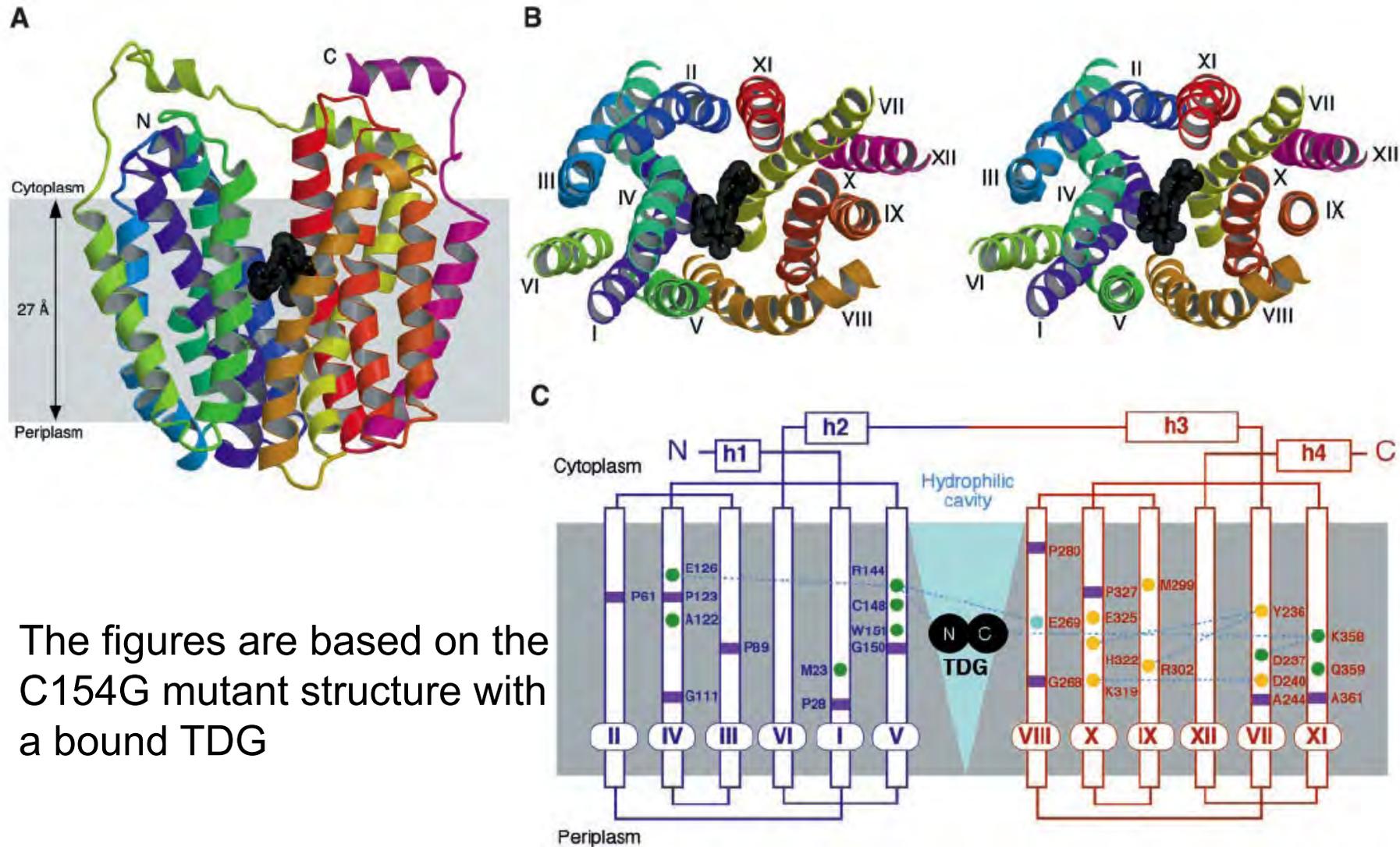
R. Kabackの観察



- 1) 乳酸添加で輸送上昇・シアンで阻害
- 2) ジニトロフェノールで輸送阻害
- 3) 競合阻害剤のダンシルアミノエチル β -チオガラクトシドのプロトン濃度勾配依存的な結合

プロトンとラクトースを共輸送する

ラクトース輸送体LacYの構造



The figures are based on the C154G mutant structure with a bound TDG

Science (2003) vol. 301, p. 610-

ラクトース輸送の仮想スキーム

