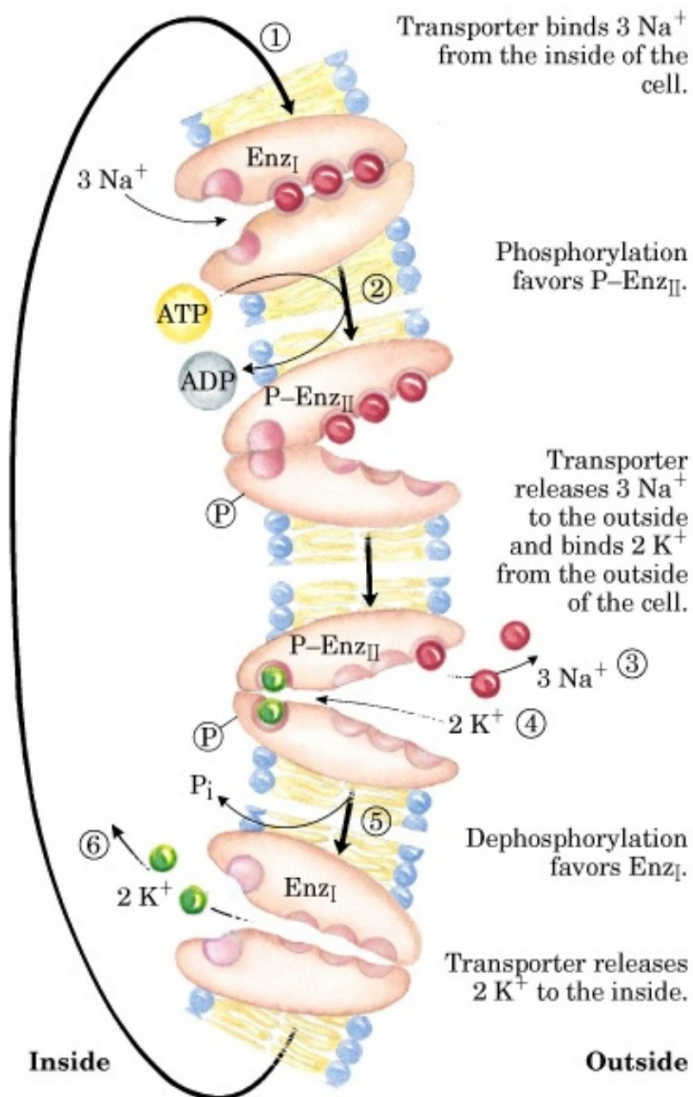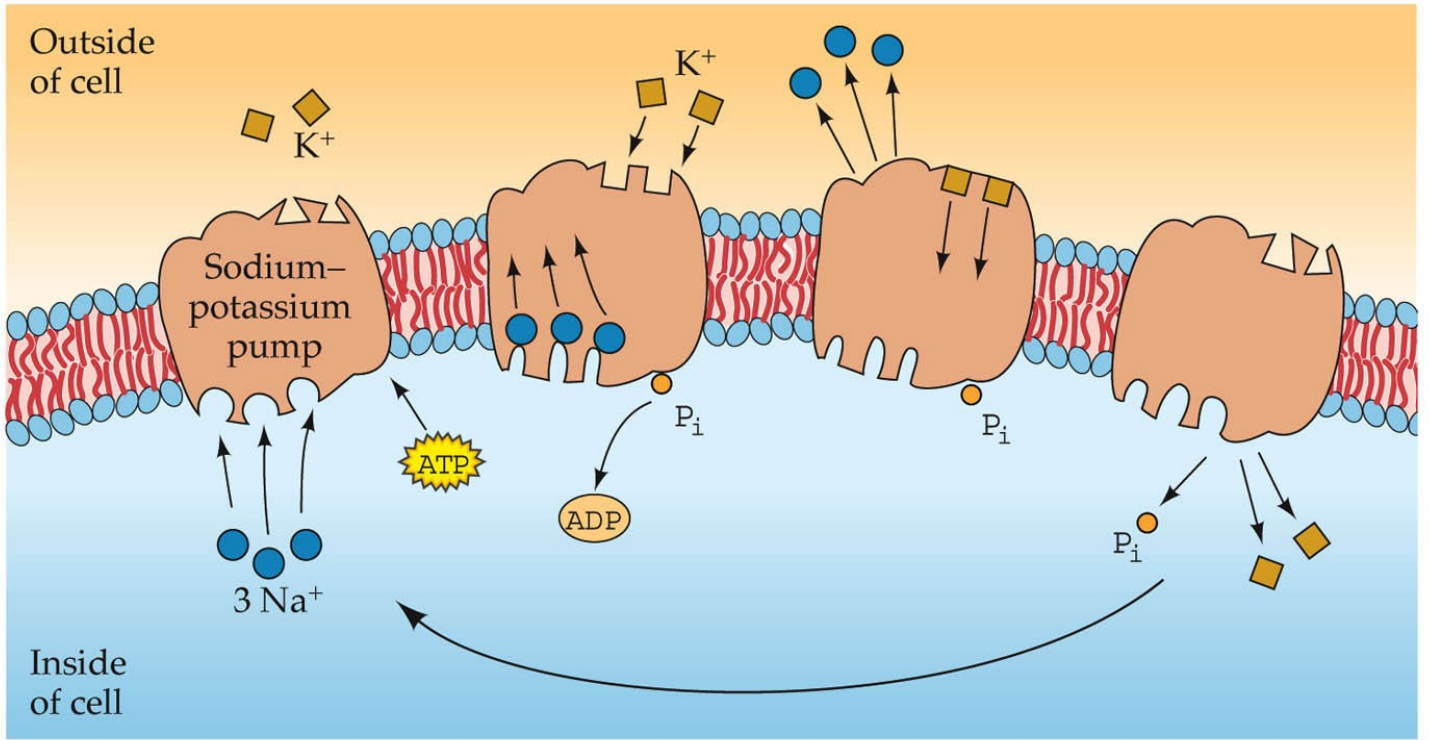# 29. Regulace metabolismu a membránový transport

Významné transportní systémy

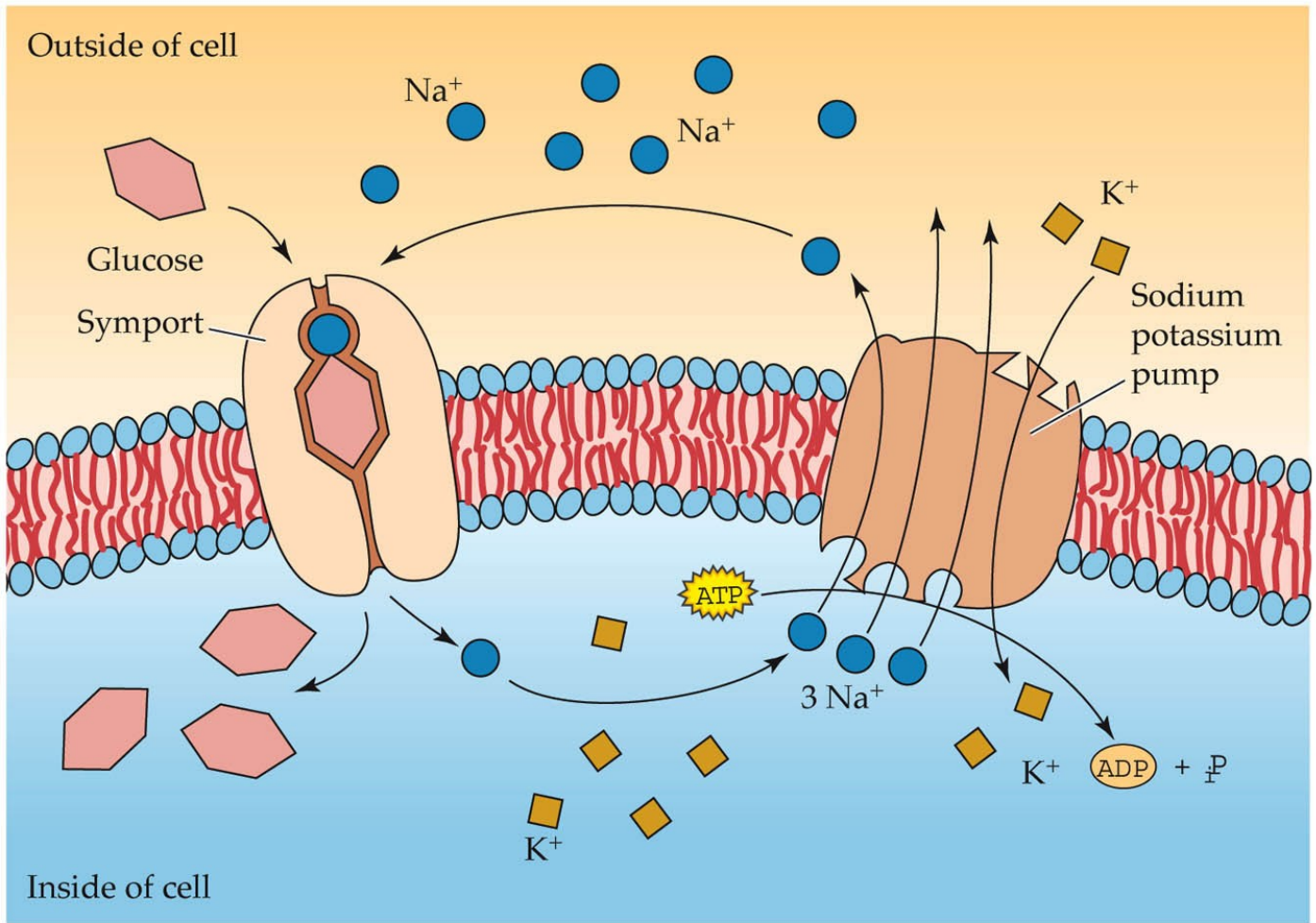**NaK - ATPasa**

Mechanism of the Na-K transporter

Outside of cell
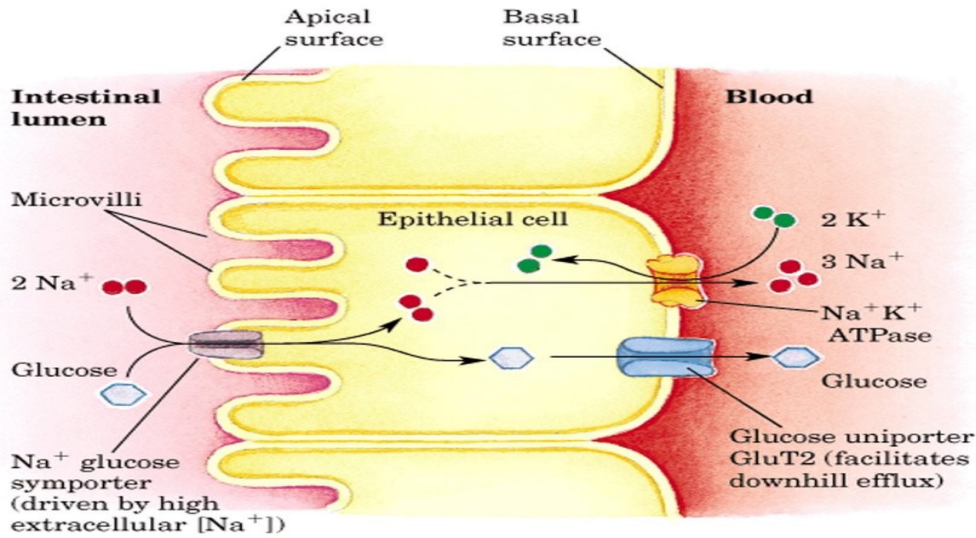
K⁺

Sodium–potassium pump

K⁺

Inside of cell

3 Na⁺

ATP

ADP

P$_i$

P$_i$

P$_i$

Outside of cell

Na⁺ Na⁺

K⁺

Glucose

Symport

Sodium potassium pump

ATP

3 Na⁺

K⁺

ADP + Pᵢ

K⁺

Inside of cell

Transport glukosy

Na+/glucose symporter

For charged ion transport: $\Delta G = RT\ln [Na^+]_{in}/[Na^+]_{out} + n\, F\Delta E$

$= 5.7\ KJ \log [Na^+]_{in}/[Na^+]_{out} + n \times 96.5\ \Delta E$

Moving a Na^+ ion into the cell releases $= 5.7 \log(12/145) + 1 \times 96.5 \times (-0.05)$
$= -6.2\ KJ/mol - 4.8\ KJ/mol = -11\ KJ/mol$

If two Na^+ ions move, energy available to pump glucose is -22 KJ/mol.

This energy could transport glucose against a concentration gradient; it's magnitude would be governed by the available energy:

$\Delta G = 22\ KJ/mol = 5.7\ kJ/mol \times \log[glucose]_{in}/[glucose]_{out}$

$3.86 = \log [glucose]_{in}/[glucose]_{out}$ therefore $[glucose]_{in}/[glucose]_{out} = 7000$.
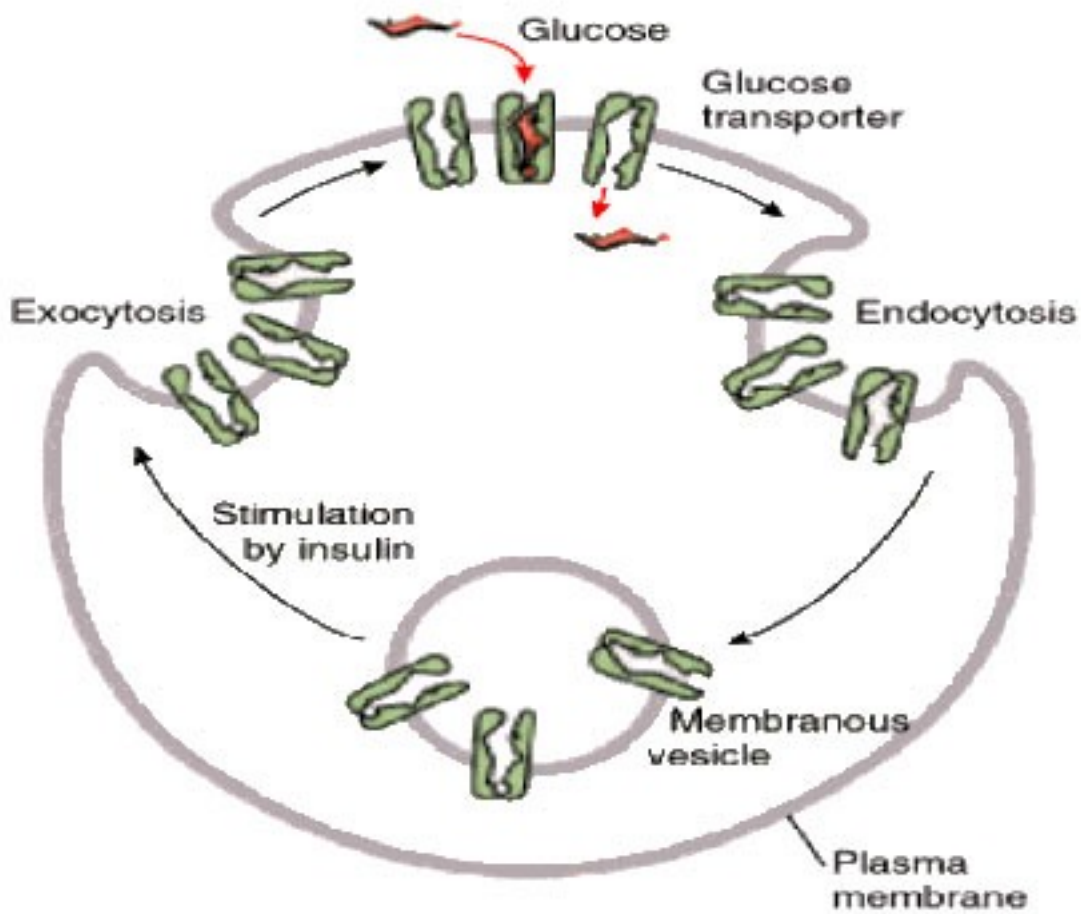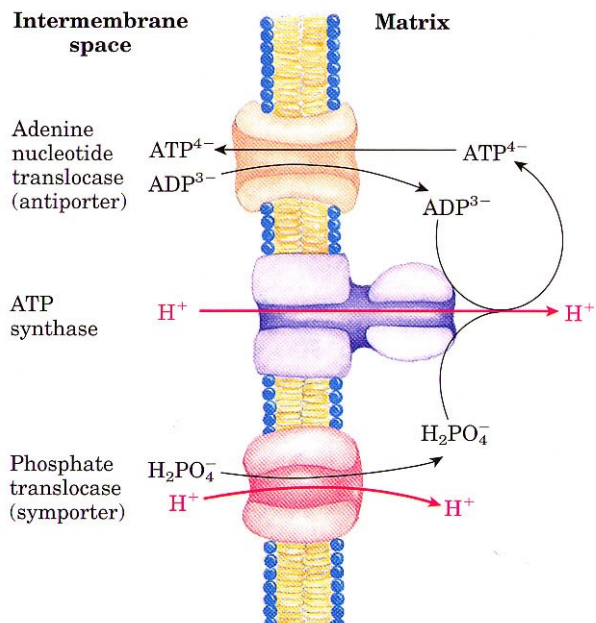
From D. Voet and J. G. Voet, *Biochemistry*, 2d ed., copyright © 1995, John Wiley & Sons, Inc. Reprinted by permission of John Wiley & Sons, Inc. Copyright 1999 John Wiley and Sons, Inc. All rights reserved.
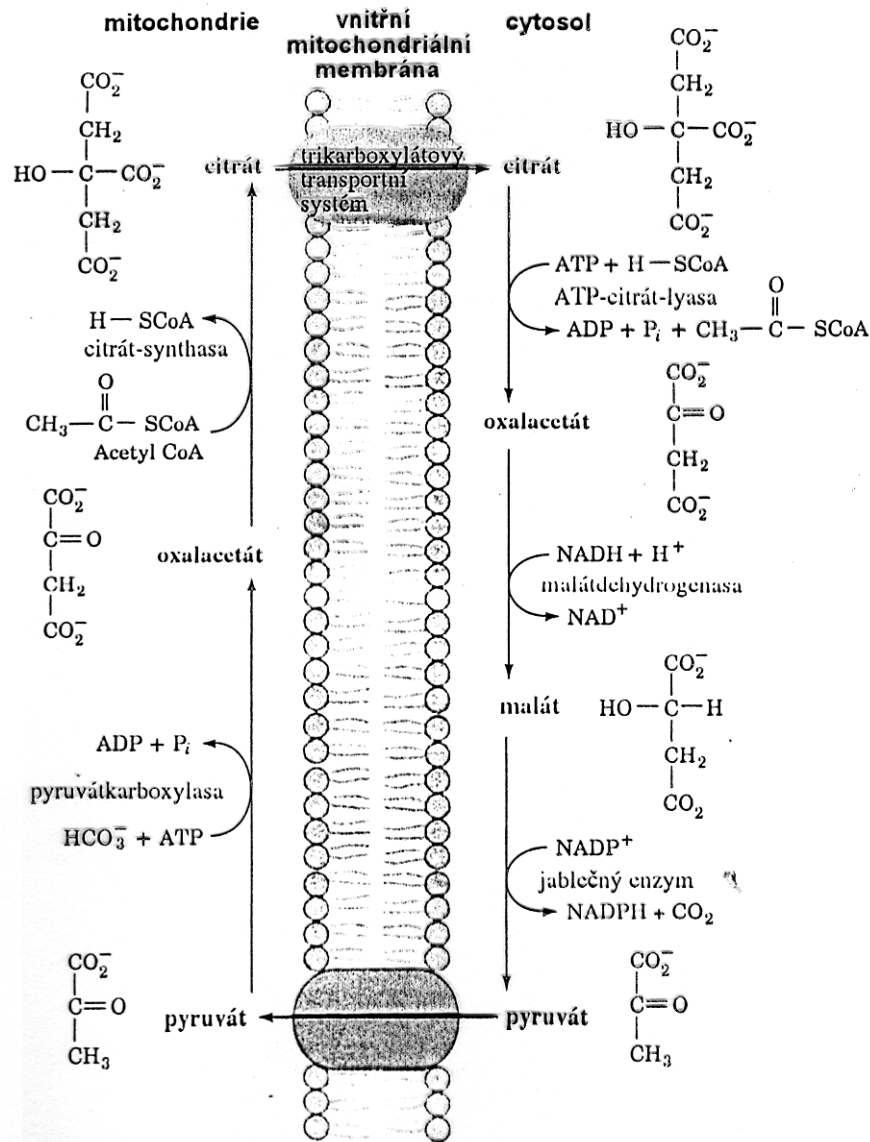
REGULACE příjmu glukosy insulinem

Transport HCl

Basolateral membrane — Apical membrane

Cl⁻ channel protein

Anion antiport protein

Cl^- → Cl^- → Cl^-

HCO_3^- ← HCO_3^-

H^+ → H^+

ATP
ADP + P_i
H^+/K^+ ATPase

H_2O

Carbonic anhydrase

K^+
K^+ → K^+

CO_2 → $CO_2 + {}^-OH$

K^+ channel protein

Tight junction

Stomach lumen
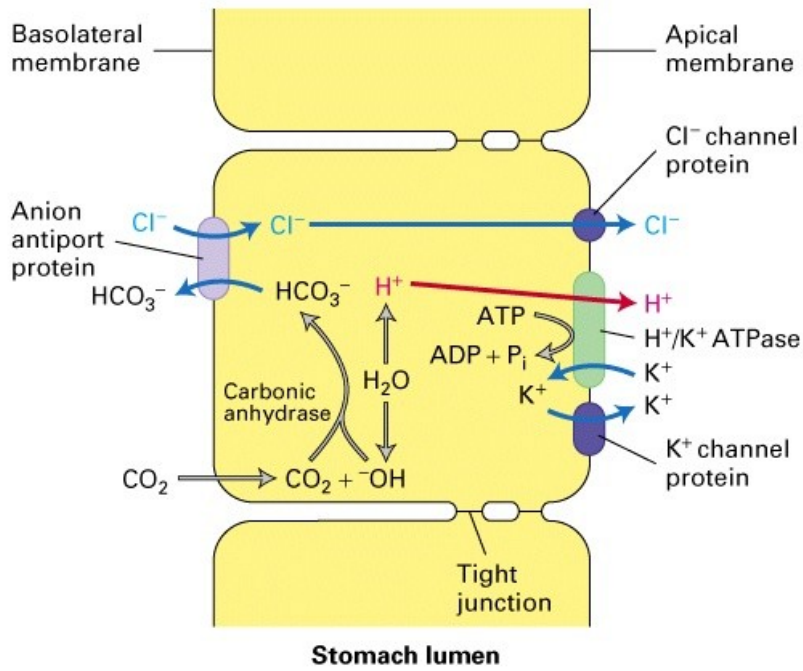
Mitochondriální transporty

Intermembrane space   **Matrix**

Adenine nucleotide translocase (antiporter)

ATP^{4-} ← ATP^{4-}
ADP^{3-} → ADP^{3-}

ATP synthase

H^+ → H^+

$H_2PO_4^-$

Phosphate translocase (symporter)
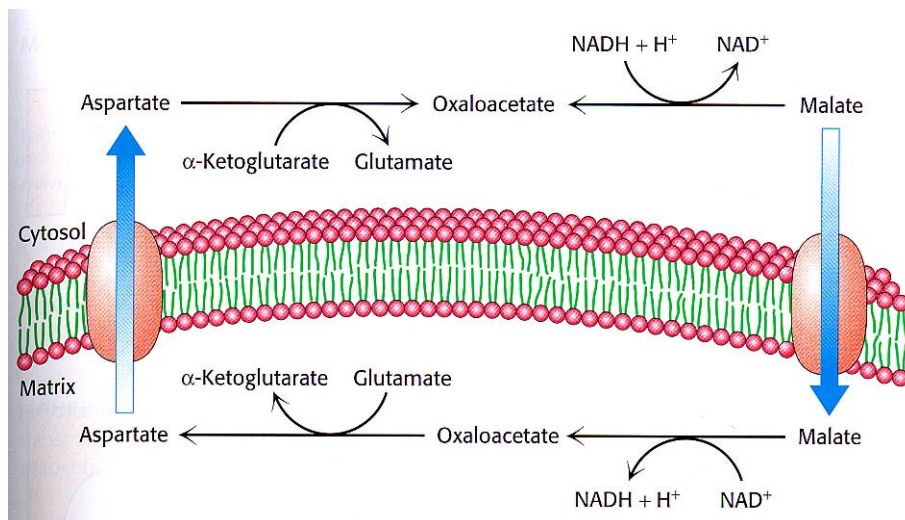
$H_2PO_4^-$
H^+ → H^+

Přenos AcetCoA vně mitochondrie

Oxidoredukční člunky – problém oxidace cytosolického NADH
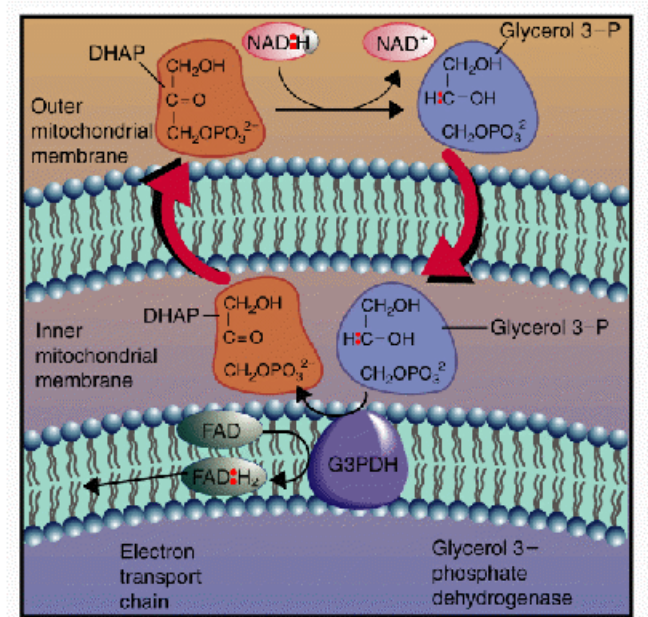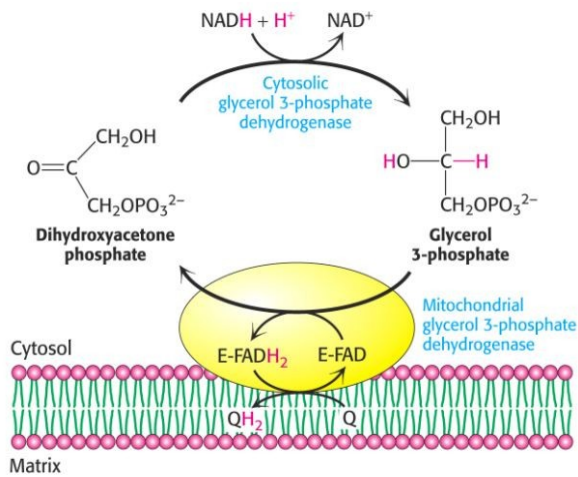
GLYCEROLFOSFÁTOVÝ člunek

Malate-aspartate shuttle