

بِسْمِ تَعَالَى



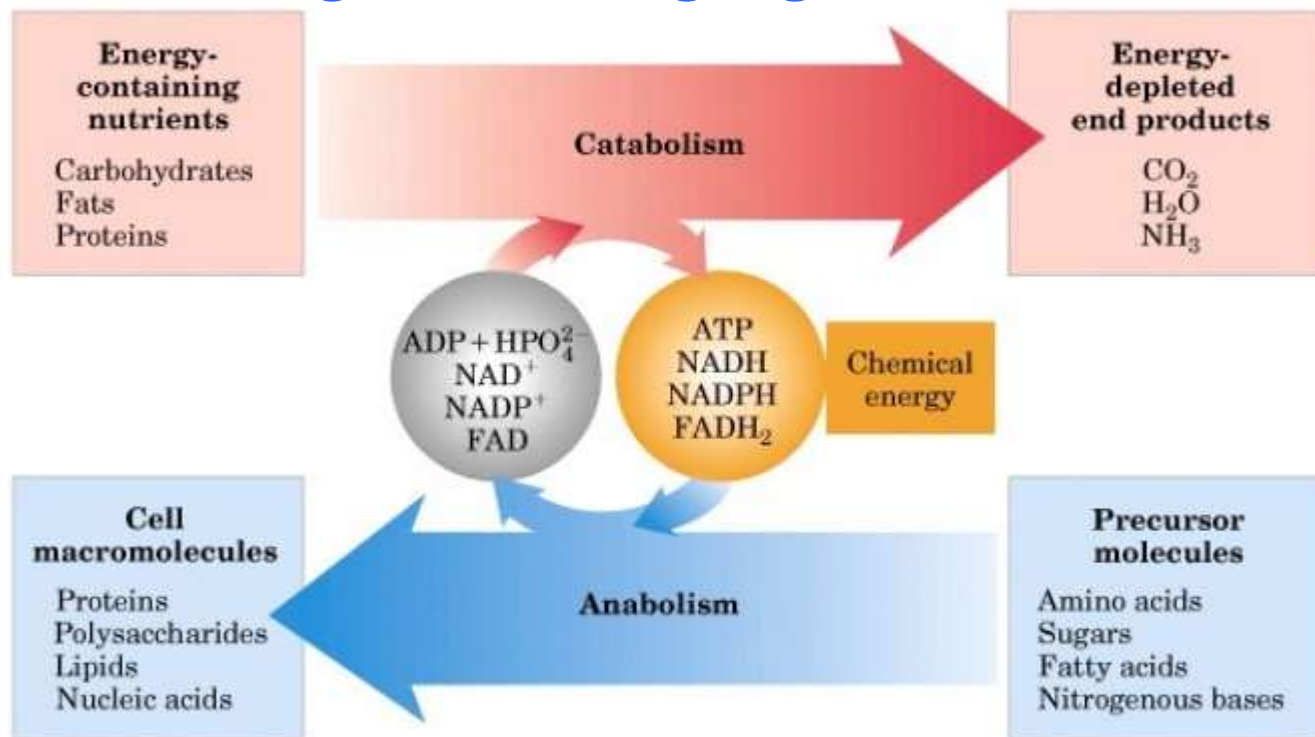
گروه علوم دامی
کارشناسی ارشد
بیوشیمی تکمیلی

متابولیسم و تولید ATP

ابراهیم قاسمی

متابوليسم

- A series of chemical processes that transform energy and molecules and go on in living organisms.



مصرف ATP

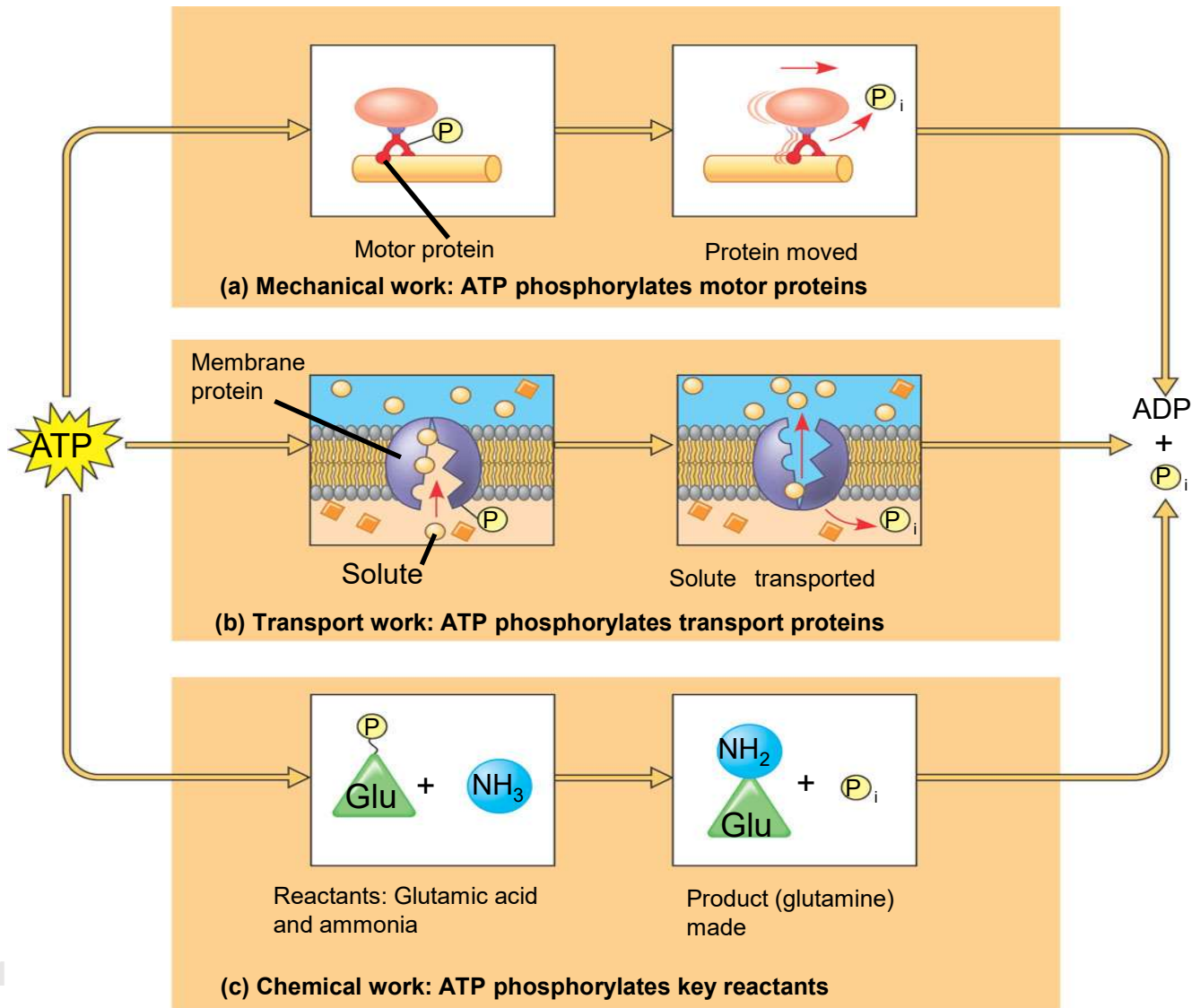
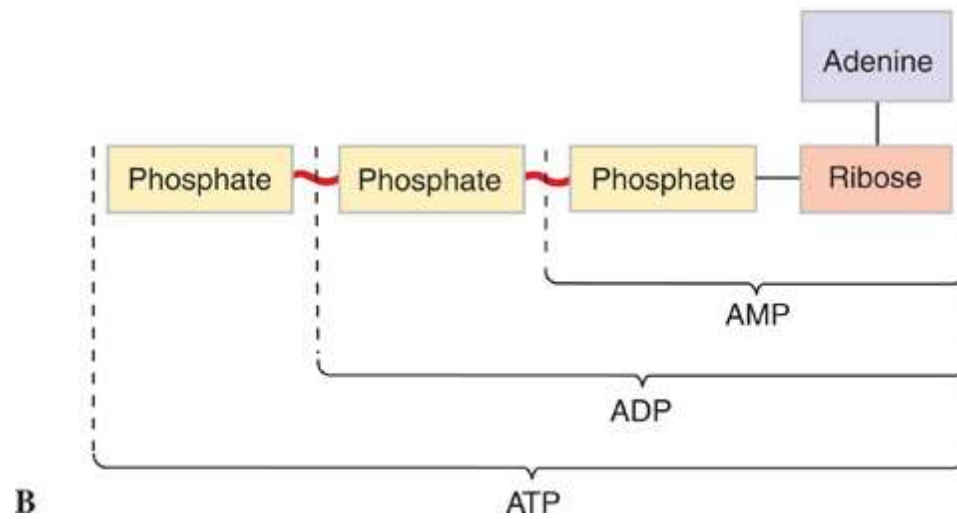
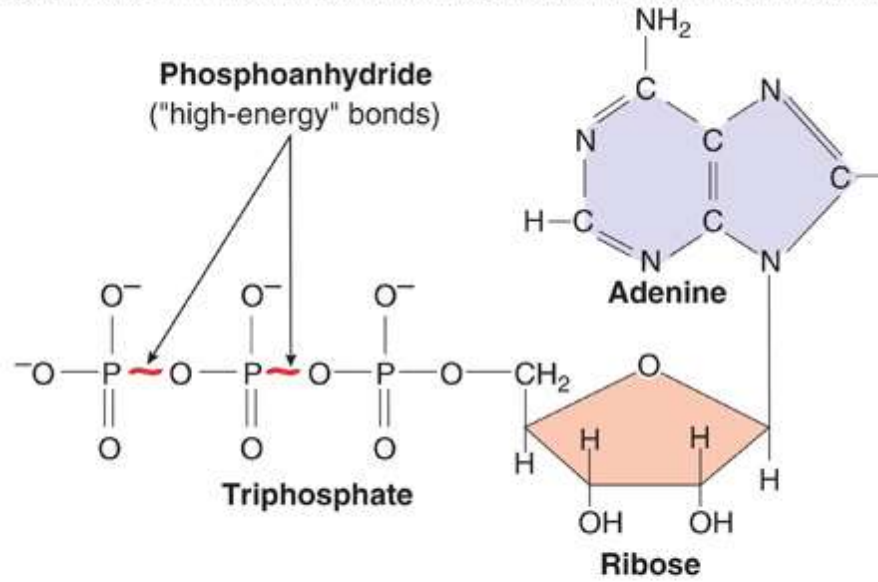


Figure 8.11

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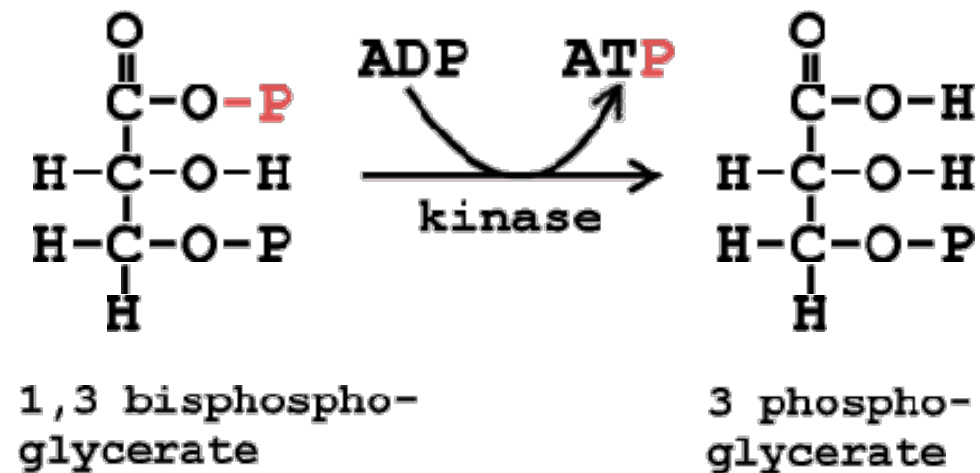
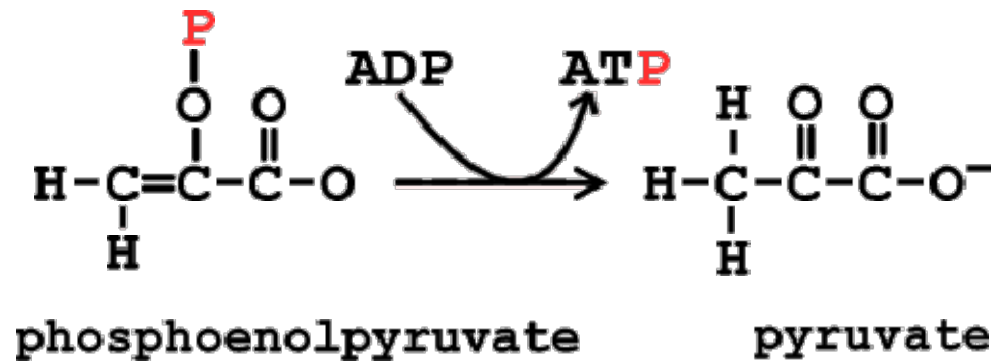
ATP



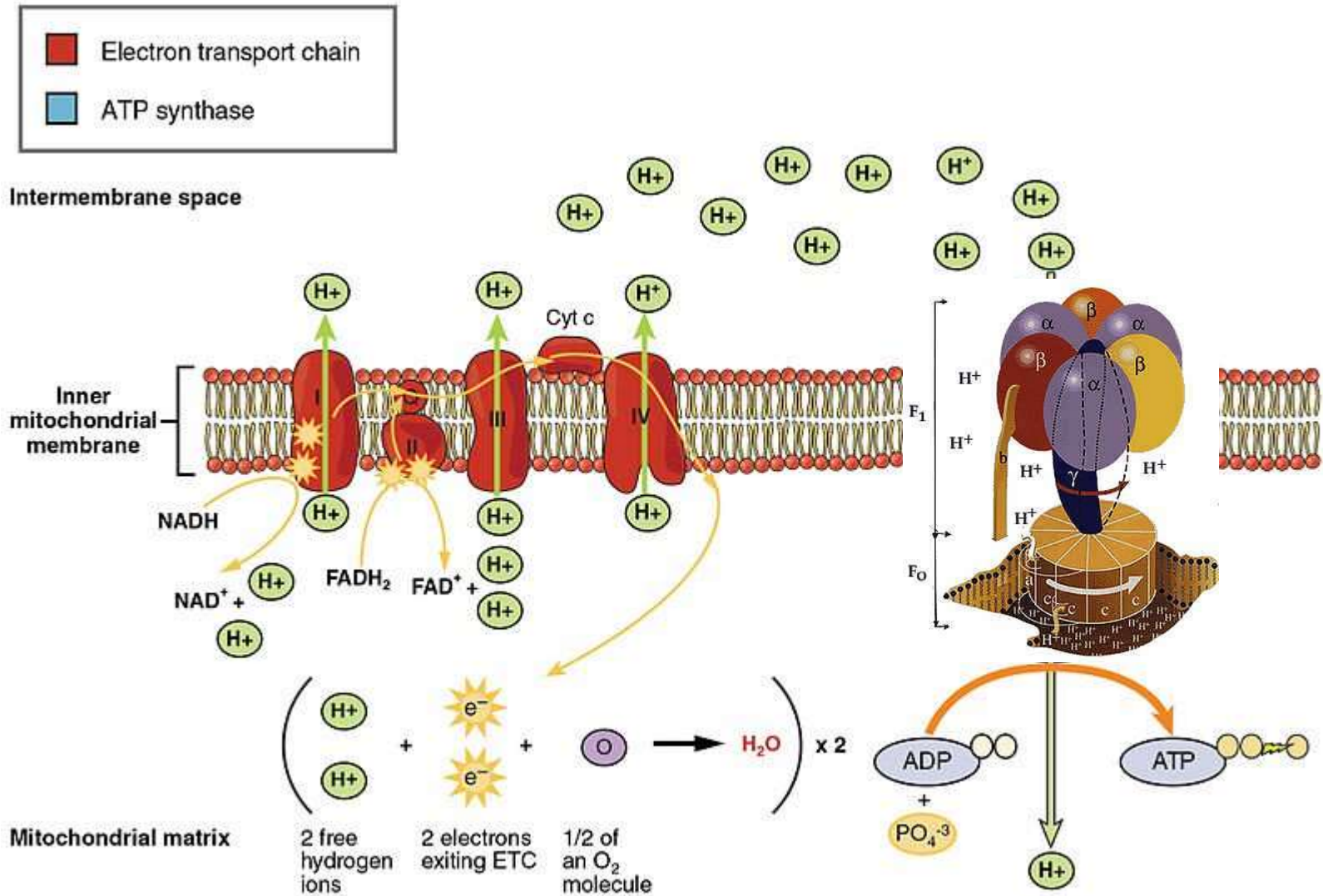
مصرف انرژی

tissue	protein synthesis	Na ⁺ /K ⁺ ATPase	Ca ²⁺ ATPase	other
liver	20%	5-10%	5%	gluconeogenesis (15-40%), substrate recycling (20%), proton leak (20%), urea synthesis (12%)
kidney	6%	40-70%	-	gluconeogenesis (5%)
heart	3%	1-5%	15-30%	actinomyosin ATPase (40-50%), proton leak (15% max)
brain	5%	50-60%	significant	a single cortical action potential was estimated to require 10 ⁸ -10 ⁹ ATP, BNID 111183)
skeletal muscle	17%	5-10%	5%	proton leak (50%), nonmitochondrial (14%)

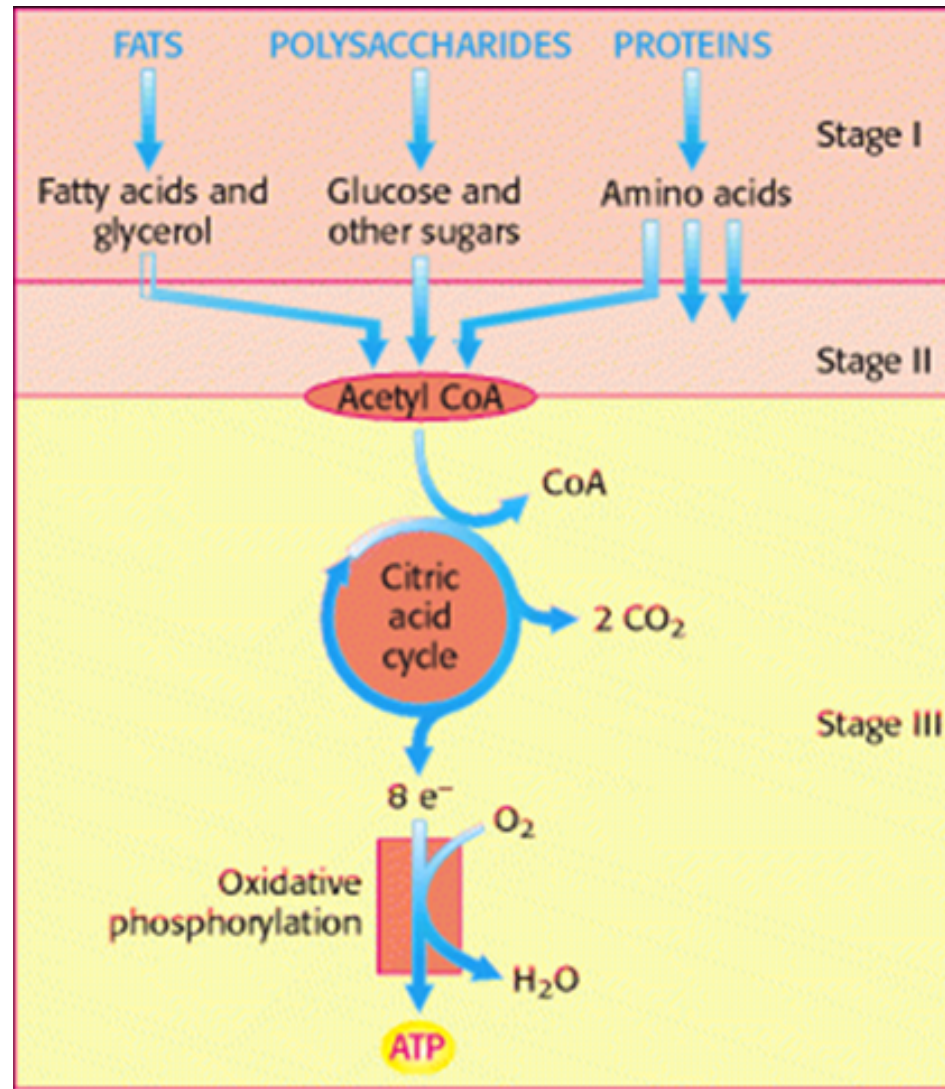
۱- فسفریلاسیون در سطح سوپسترا



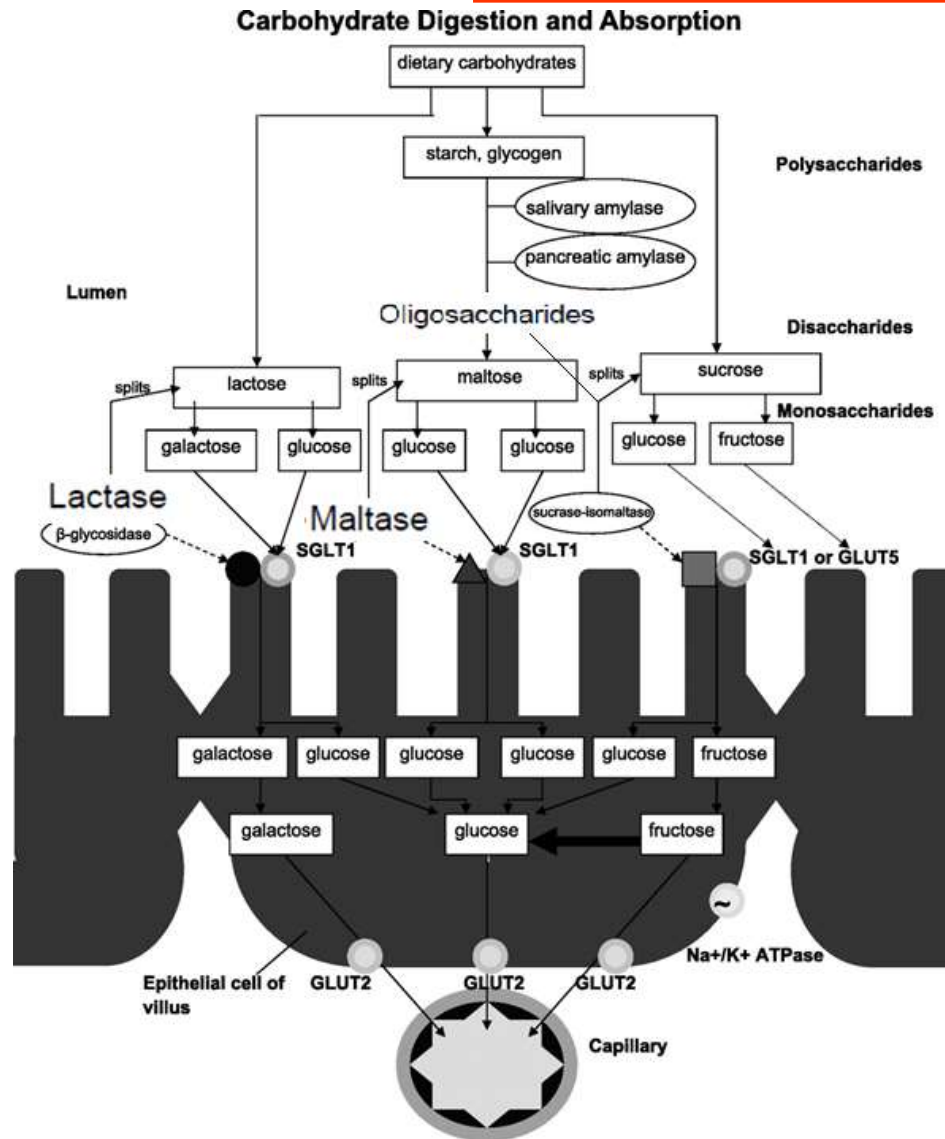
۲- فسفریلاسیون اکسیداتیو



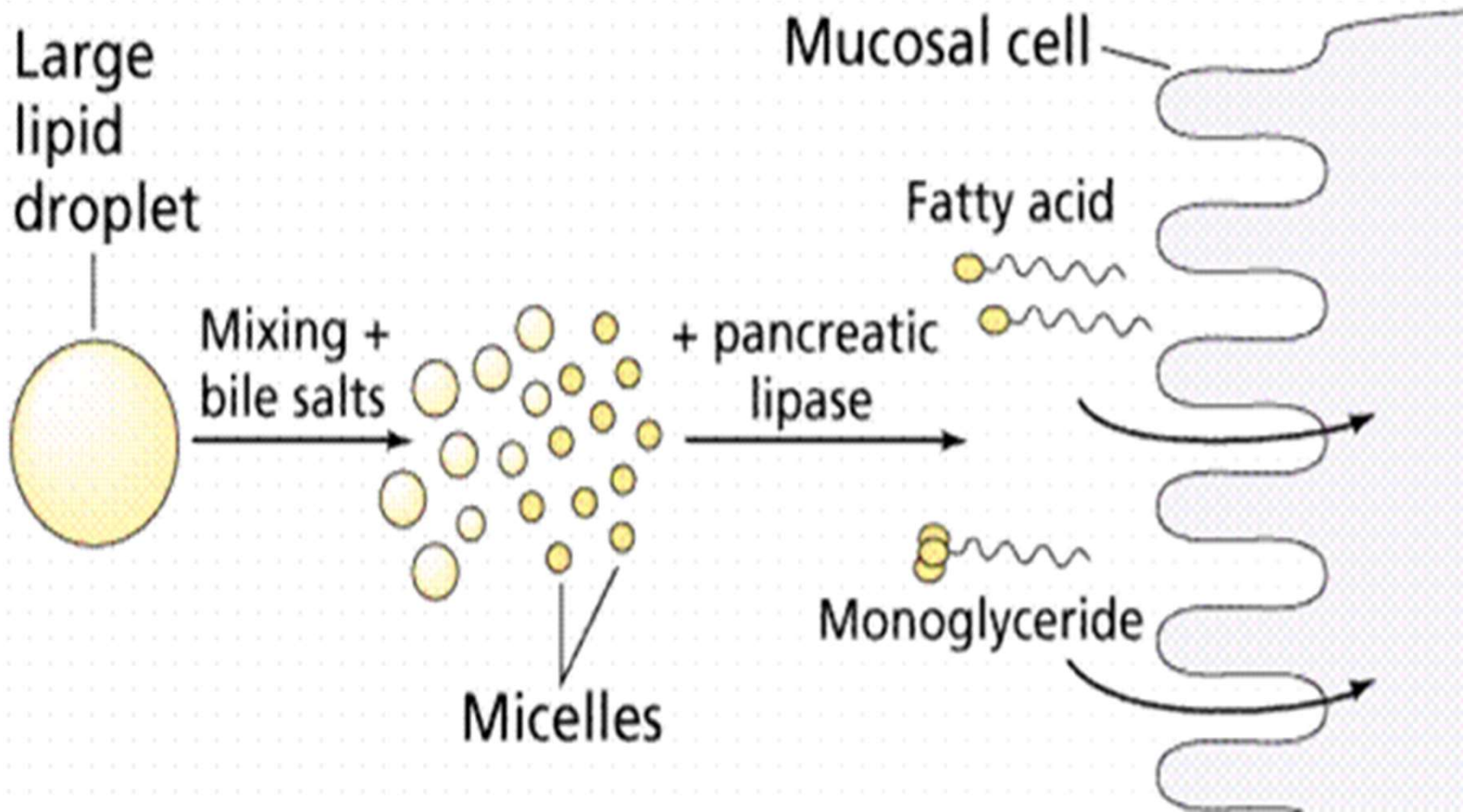
مراحل تولید ATP



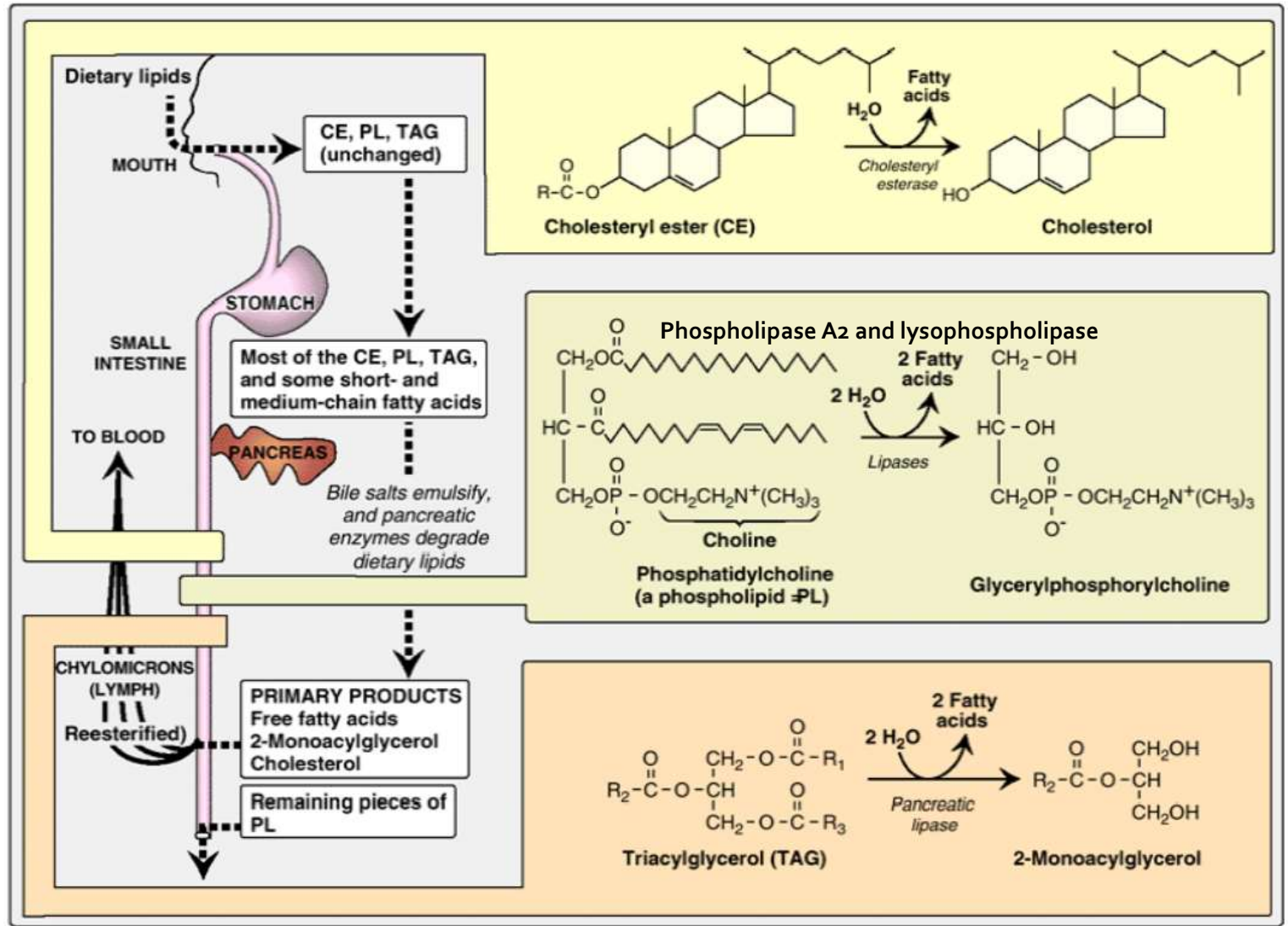
هیدرولیز کربوهیدرات



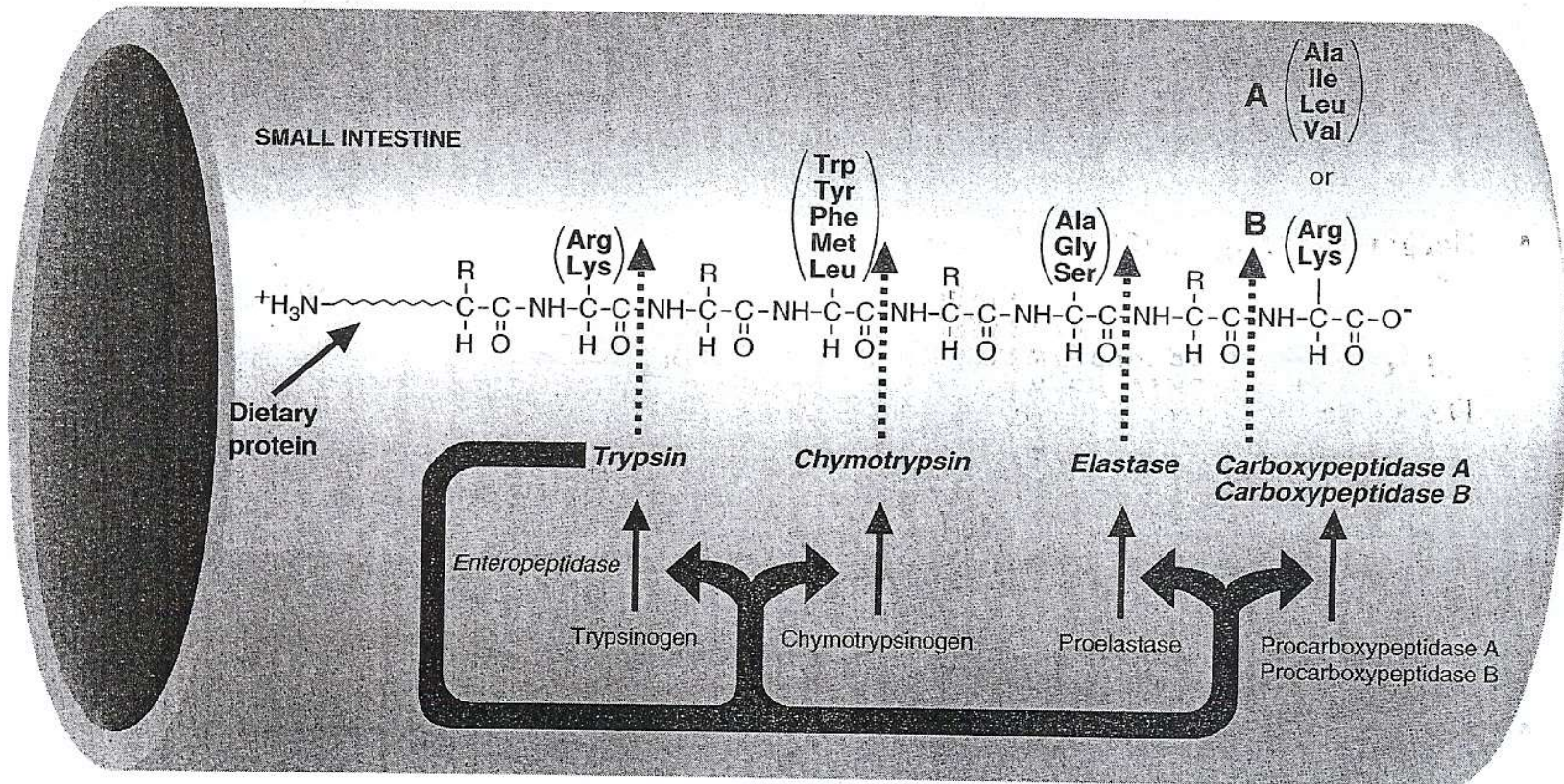
هیدرولیز چربی



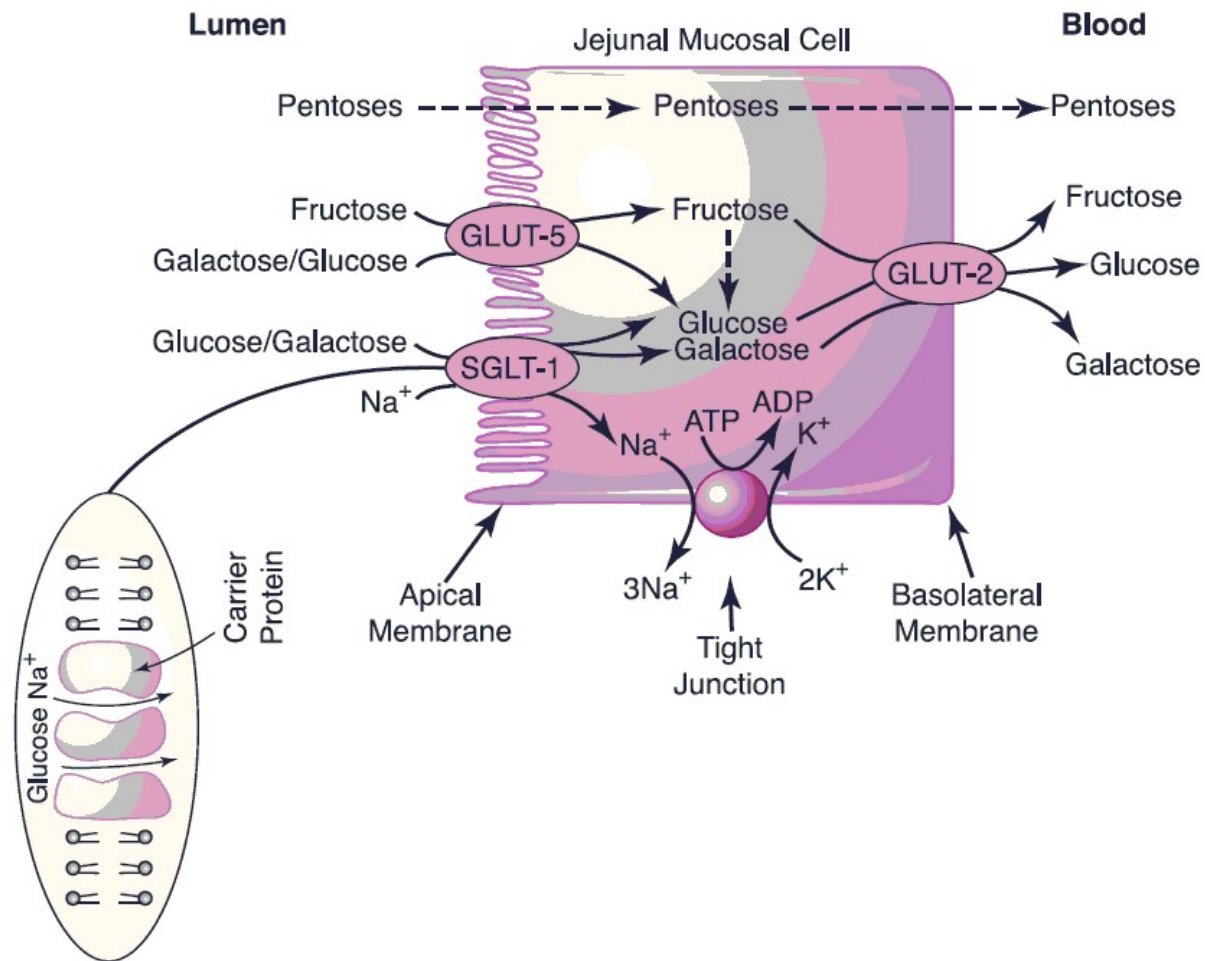
محصولات هضم لیپیدها



هضم آنزیمی پروتئین ها



Intestinal Carbohydrate Transporters



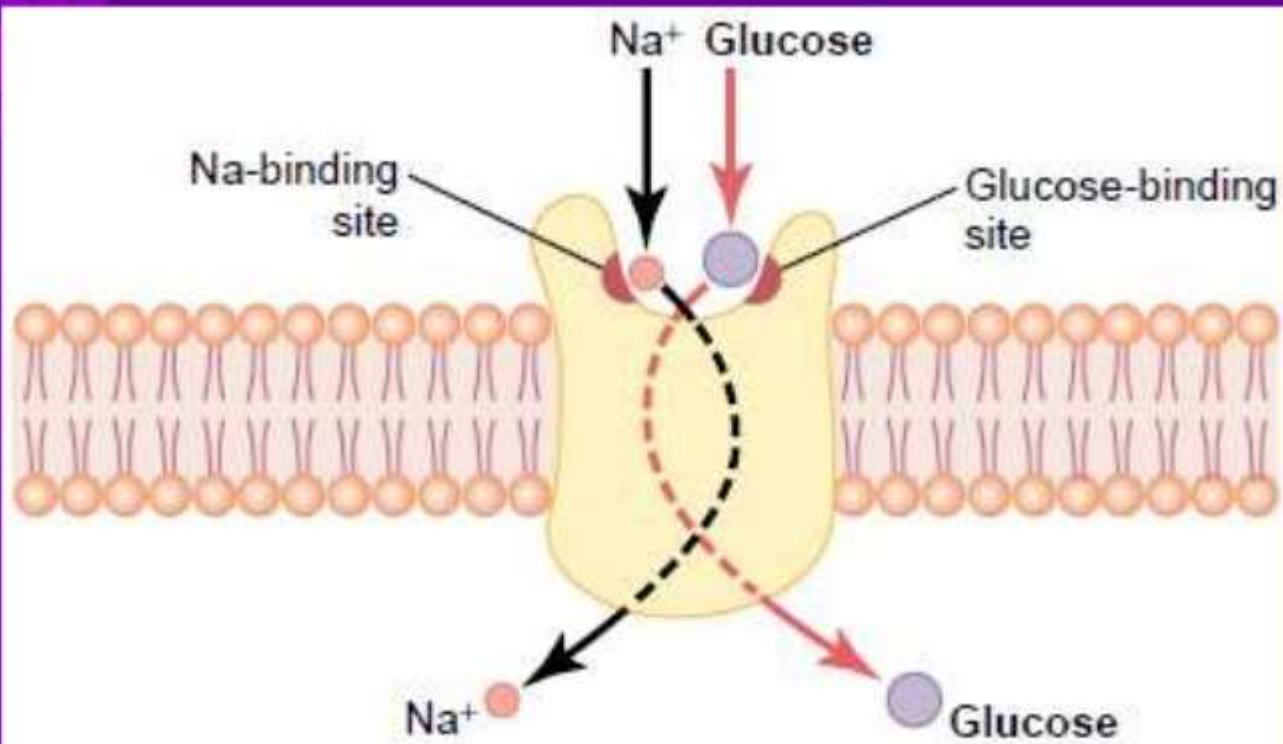


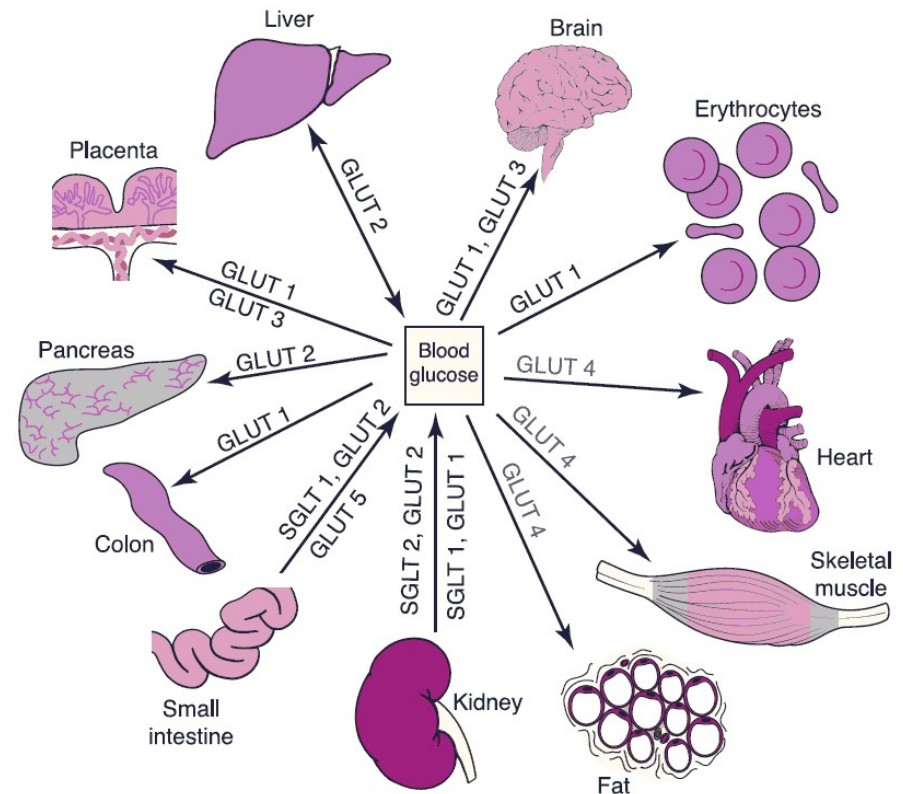
Figure 4-12

Postulated mechanism for sodium co-transport of glucose.

ناقل های گلوکز

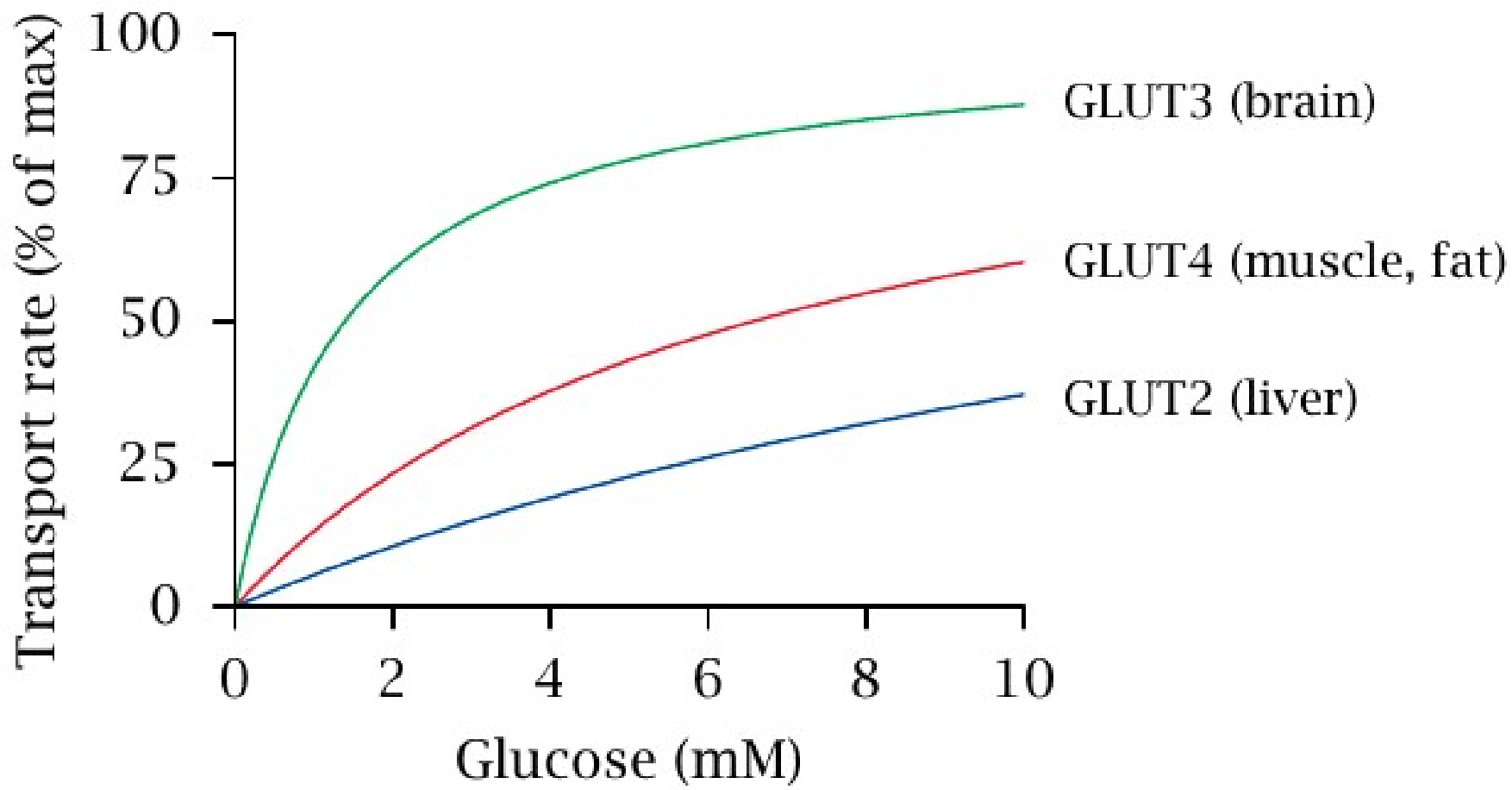
- 14 different types of glucose transporters

- Different K_m
- Hormone-dependent or non dependent
- Energy required or passively transported

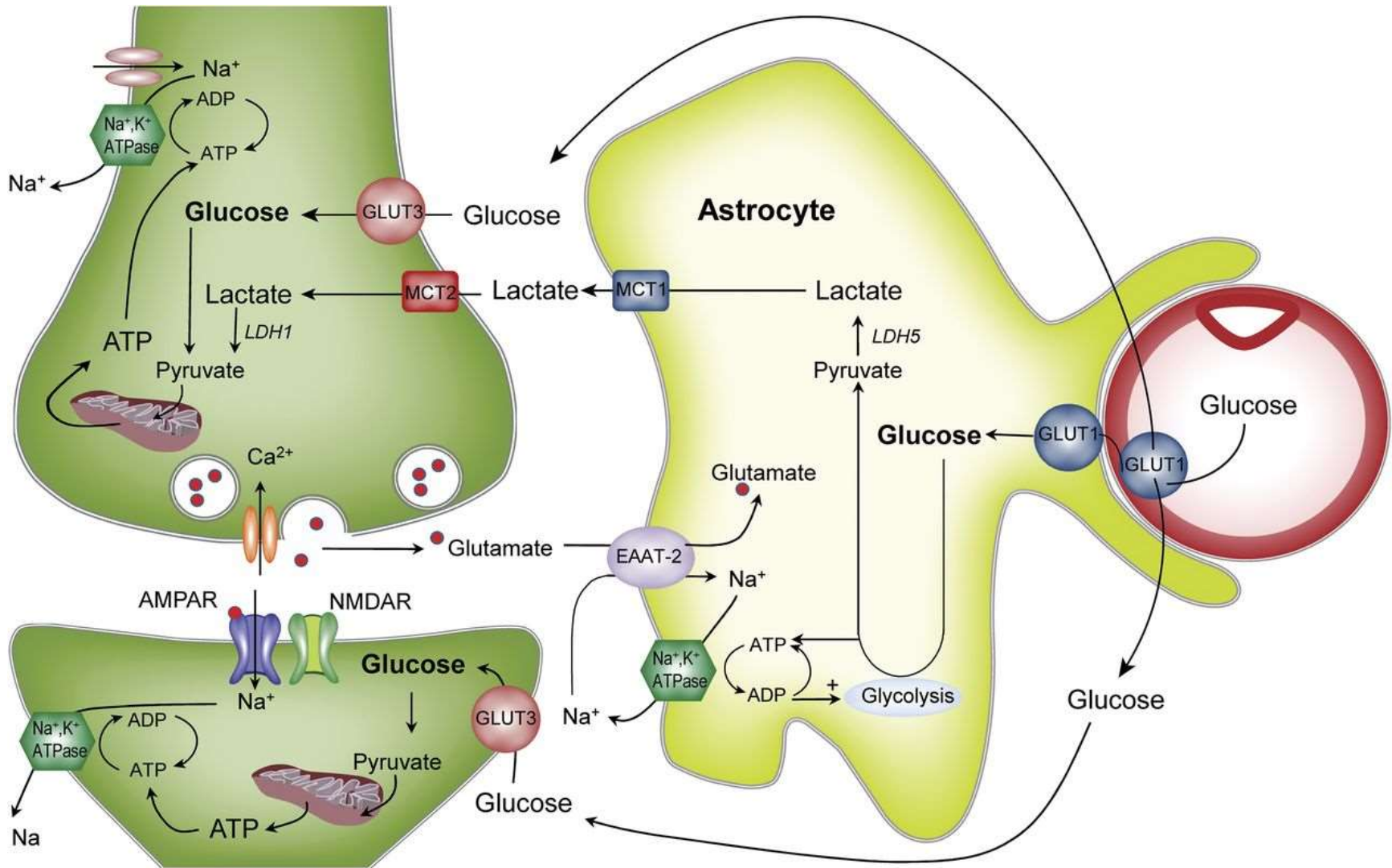


ناقل های گلوکز

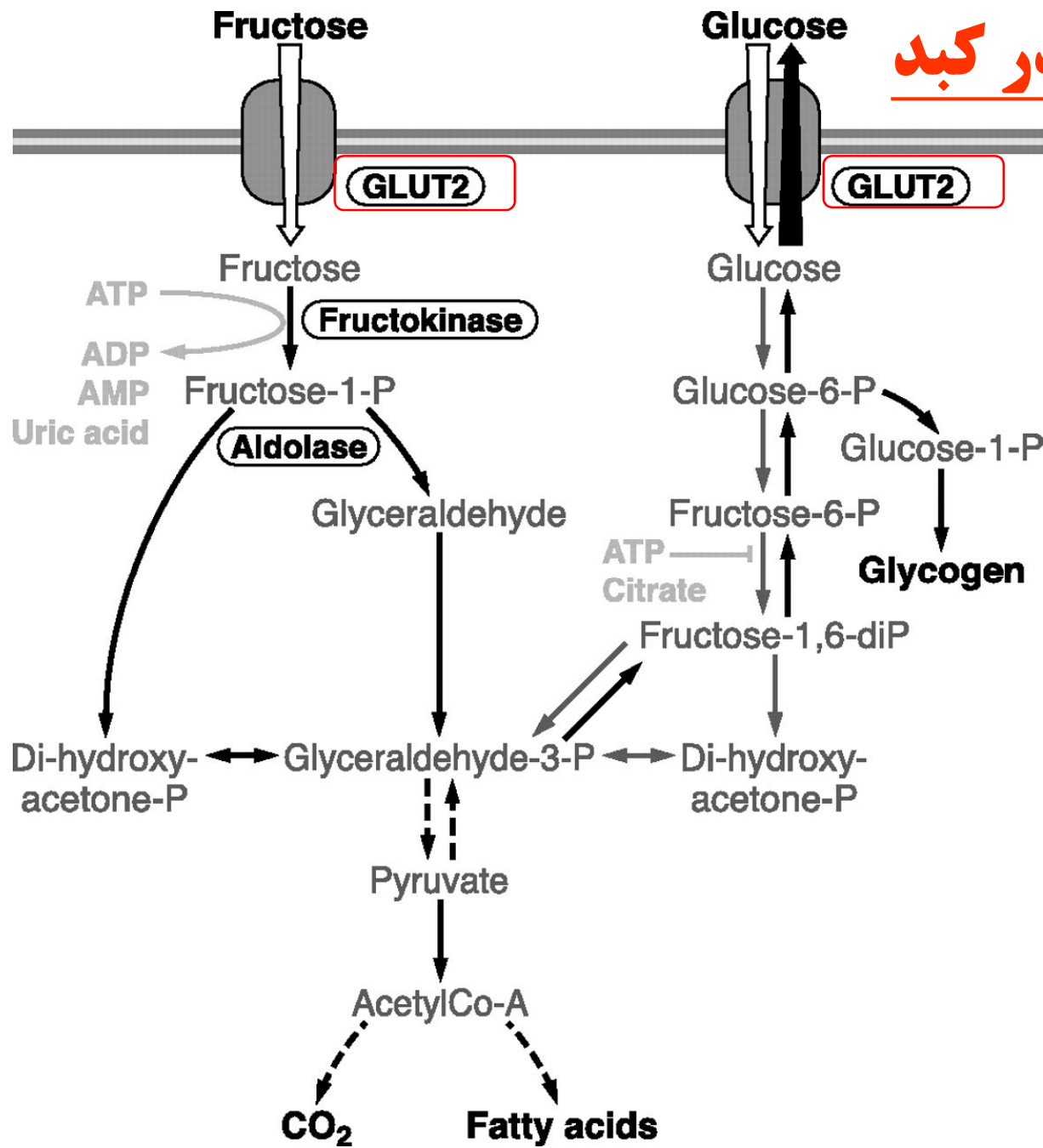
Transporter	Tissue distribution	Special properties
GLUT 1	Most cell	Helps in basal glucose uptake
GLUT 2	Liver, beta cells, hypothalamus, Baso-lateral membrane small intestine.	Carrier for glucose and fructose in liver and intestine
GLUT 3	Neurons, placenta, testes, brain	Basal glucose uptake
GLUT 4	Skeletal and cardiac muscle, fat	Activity increased by insulin
GLUT 5	Mucosal surface in small intestine, sperm, kidneys	Involved in fructose transport



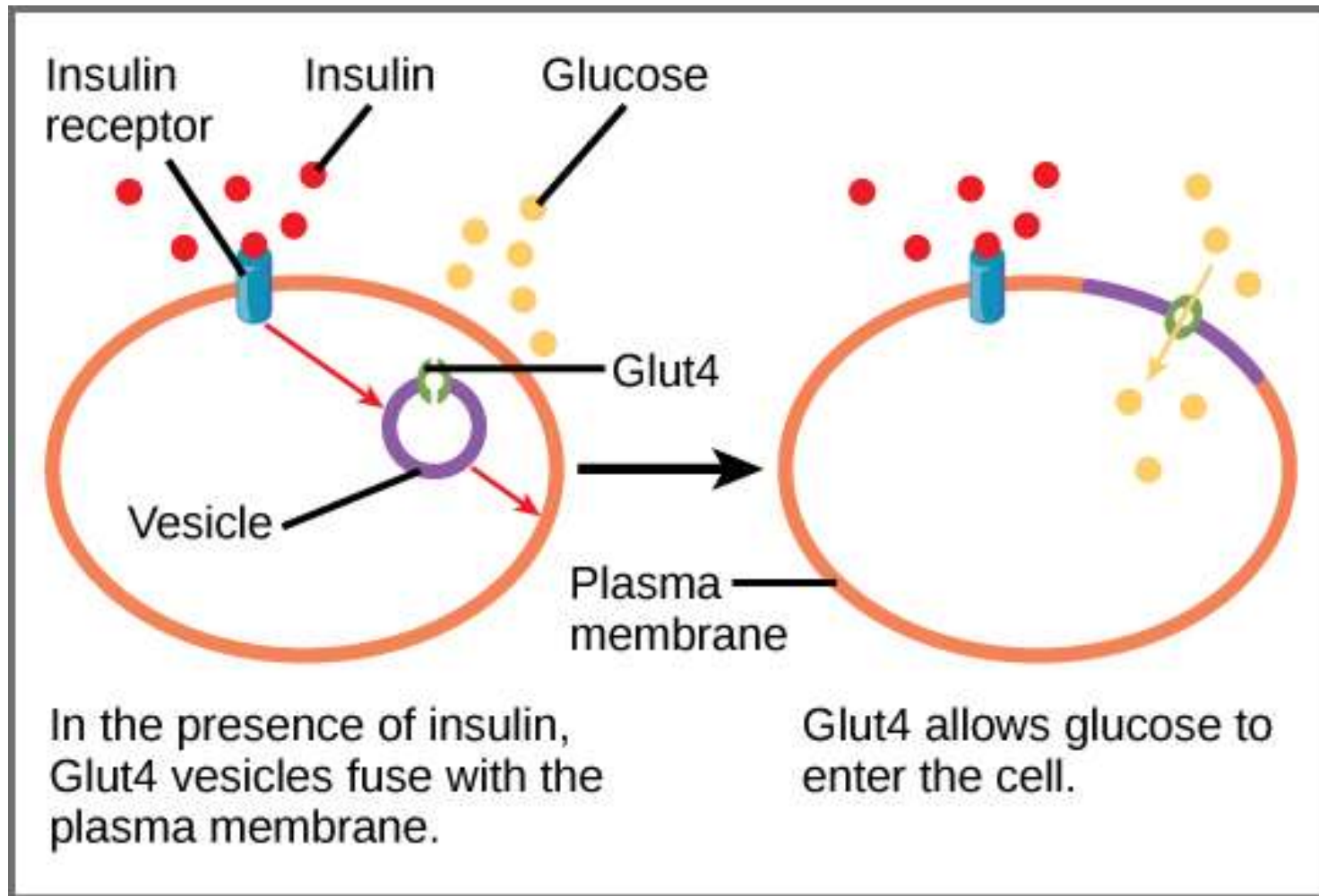
ناقل گلوکز در مغز



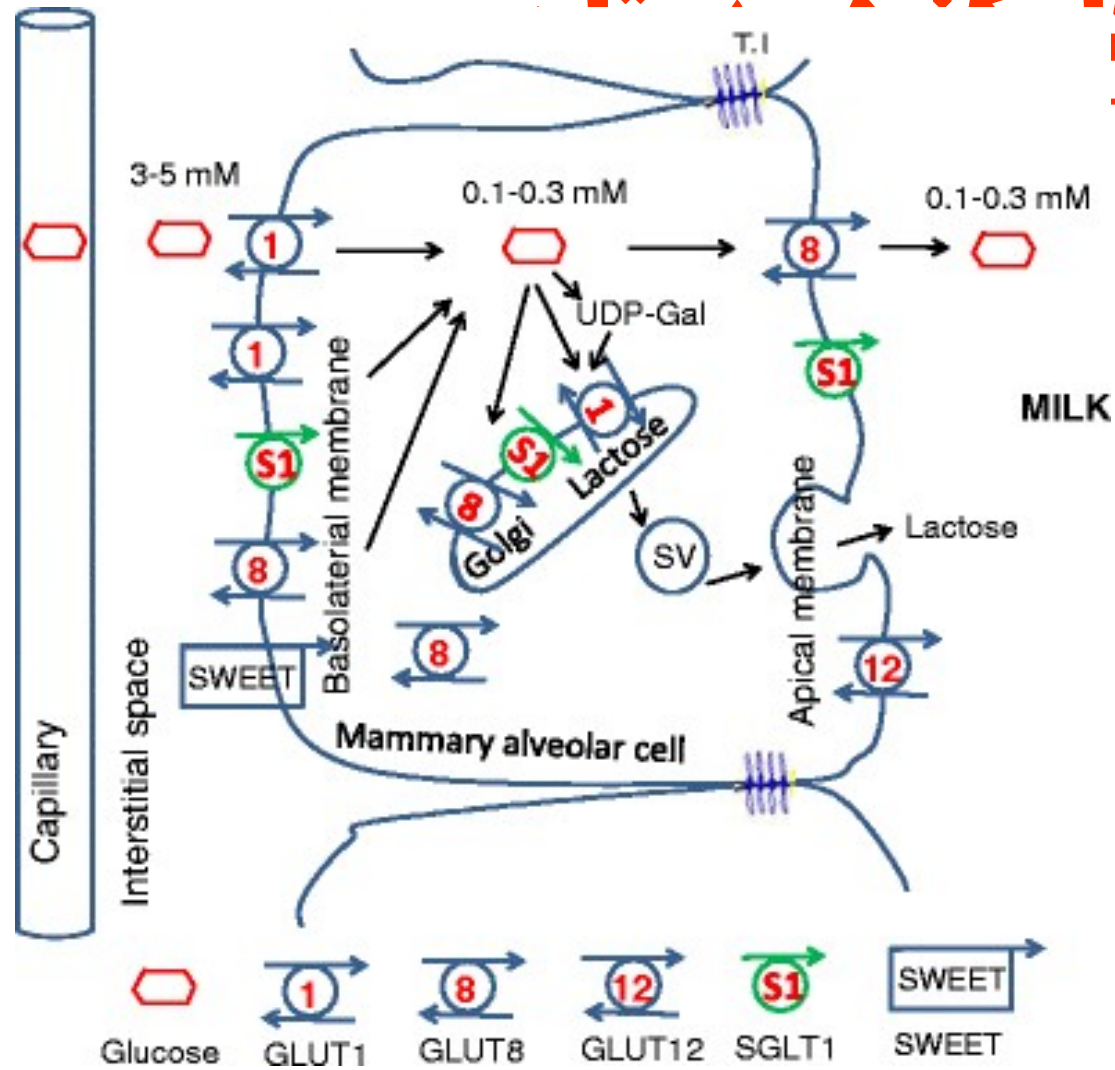
ناقل گلوکز در کبد

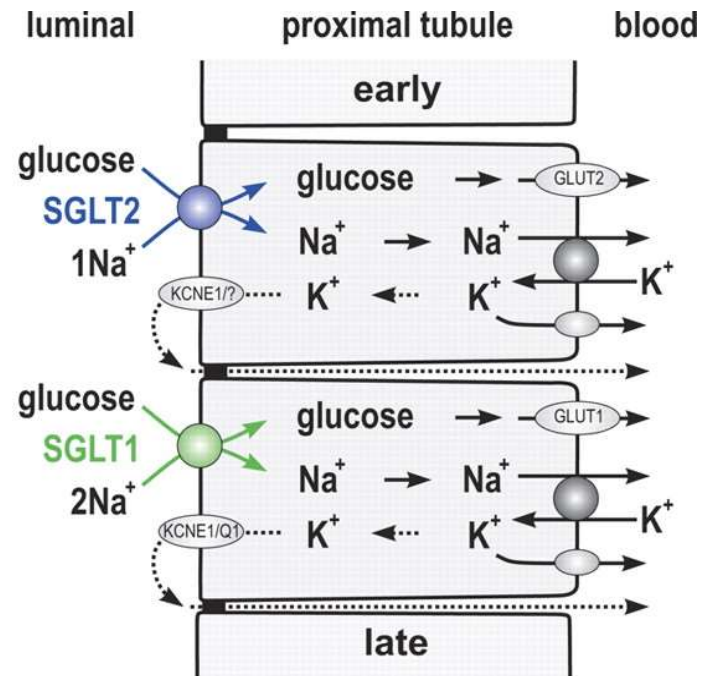
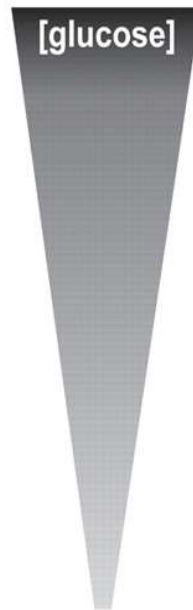
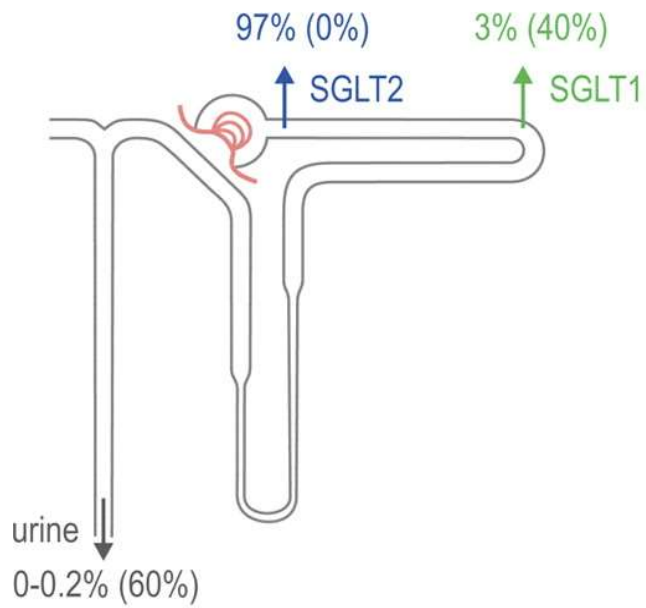


ناقل گلوکز در عضلات و بافت چربی



ناقل 5





BRAIN



Central glucose homeostasis predominantly involves GLUT1 and GLUT3

SKELETAL MUSCLE



ADIPOSE TISSUE



Tissues of insulin stimulated mediated glucose disposal is predominantly mediated by GLUT4

LIVER



Hepatic glucose uptake and output occurs mainly via GLUT2

PANCREAS



BRAIN



Glucose sensing mechanisms in the pancreas and the brain involve GLUT2

INTESTINE



KIDNEY

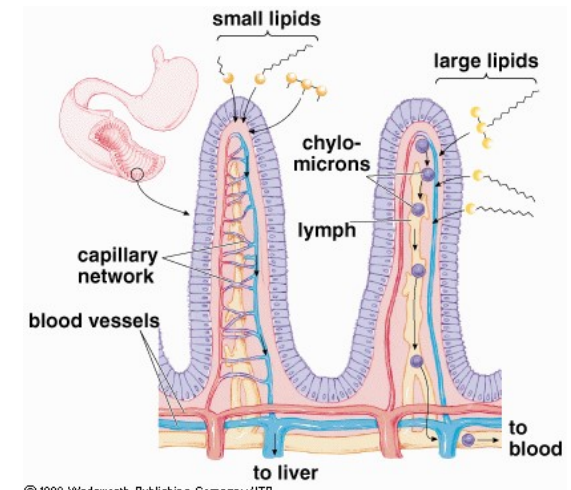
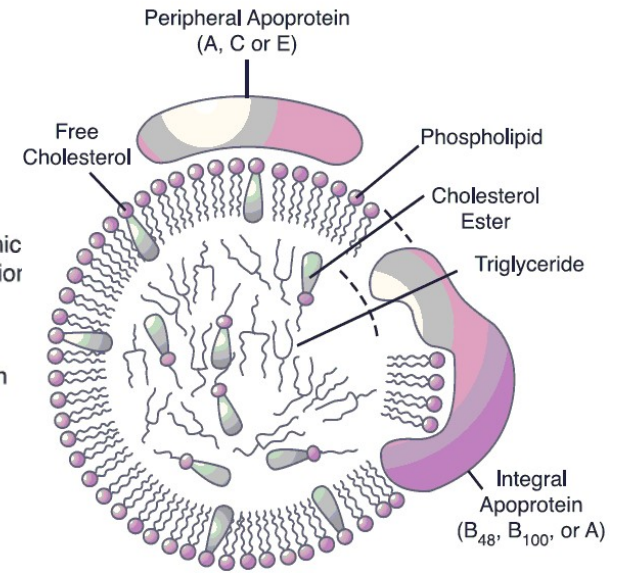
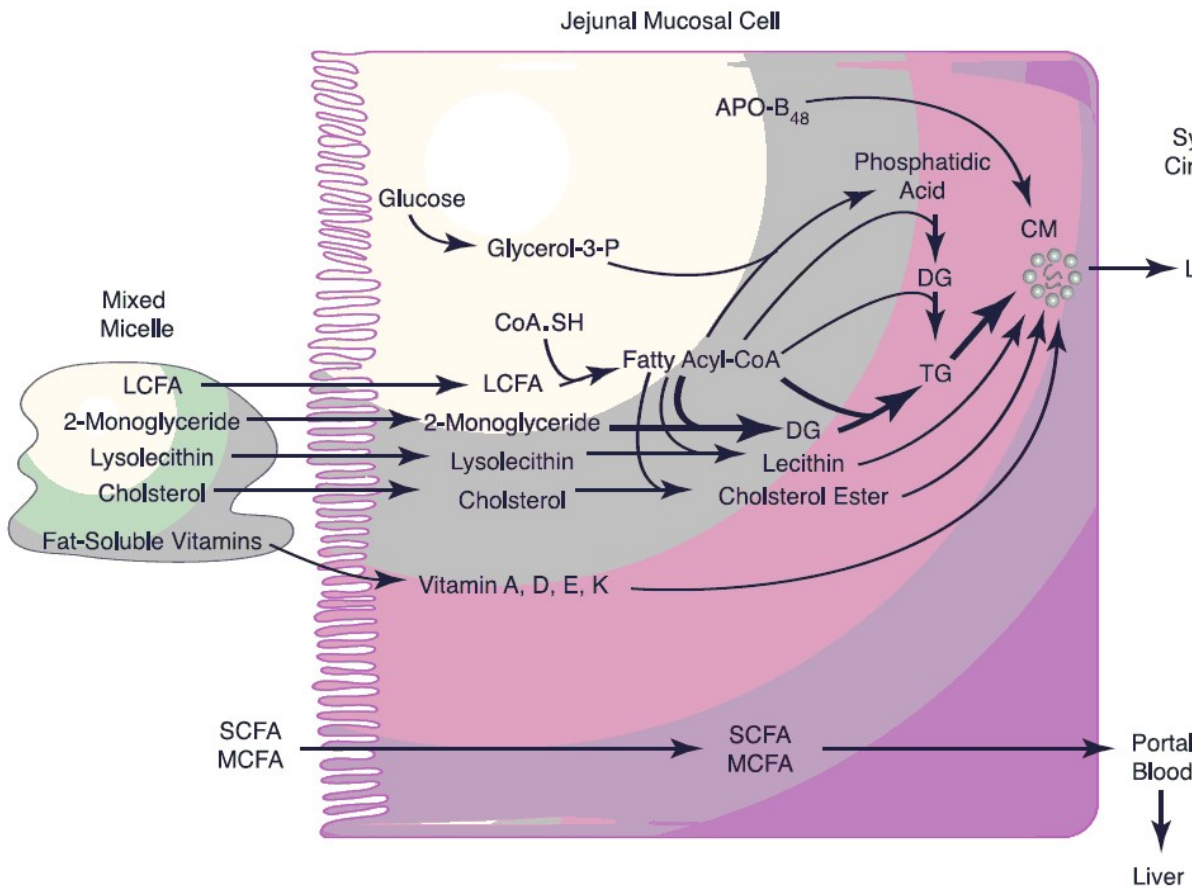


SGLT's mediate the active, ATP dependent hexose absorption in and reabsorption at the luminal site of the epithelium in the intestine and kidney, respectively.

جذب چربی

Lipoprotein Structure

Mucosal Triglyceride Resynthesis and Chylomicron Formation

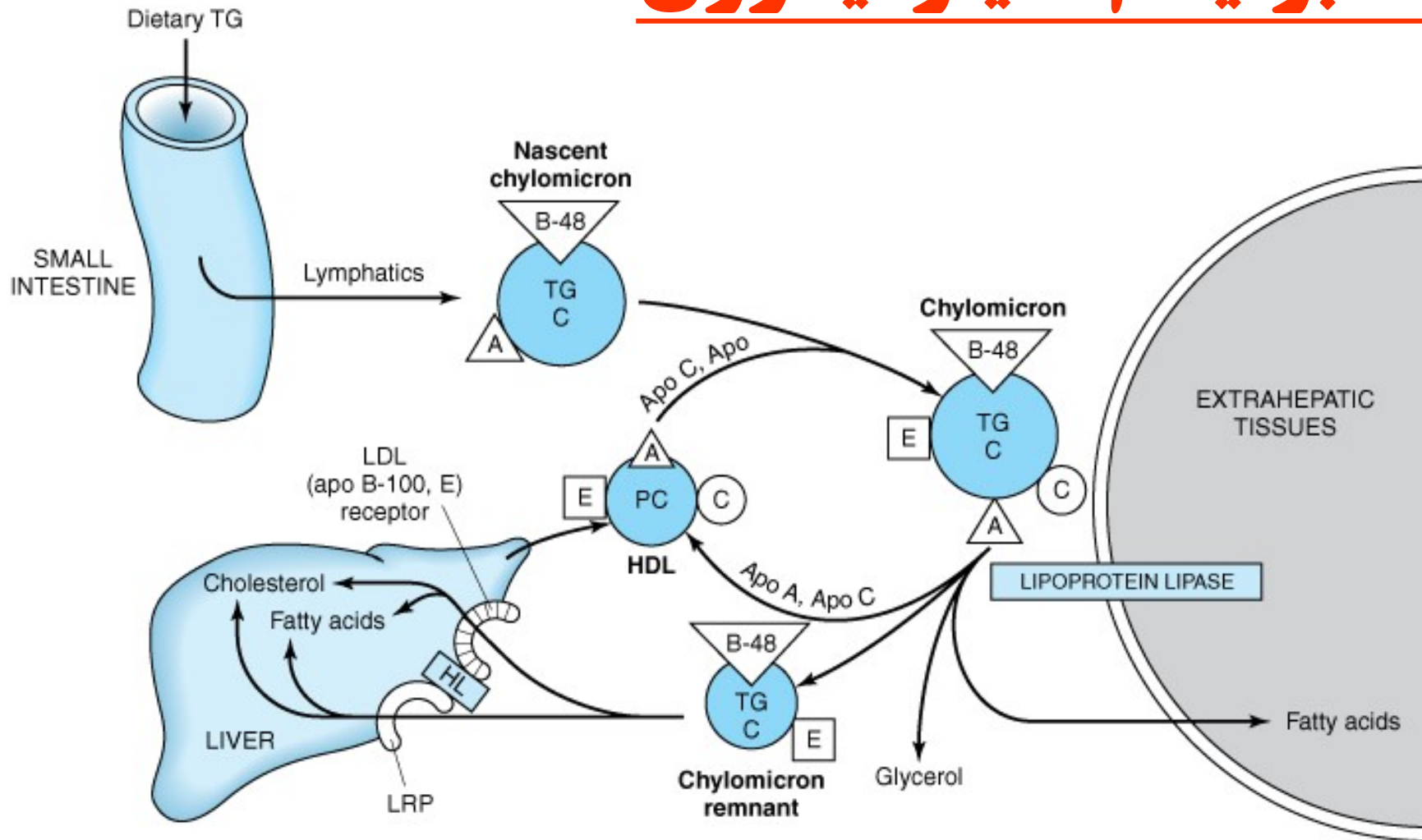


Classification of Lipoproteins

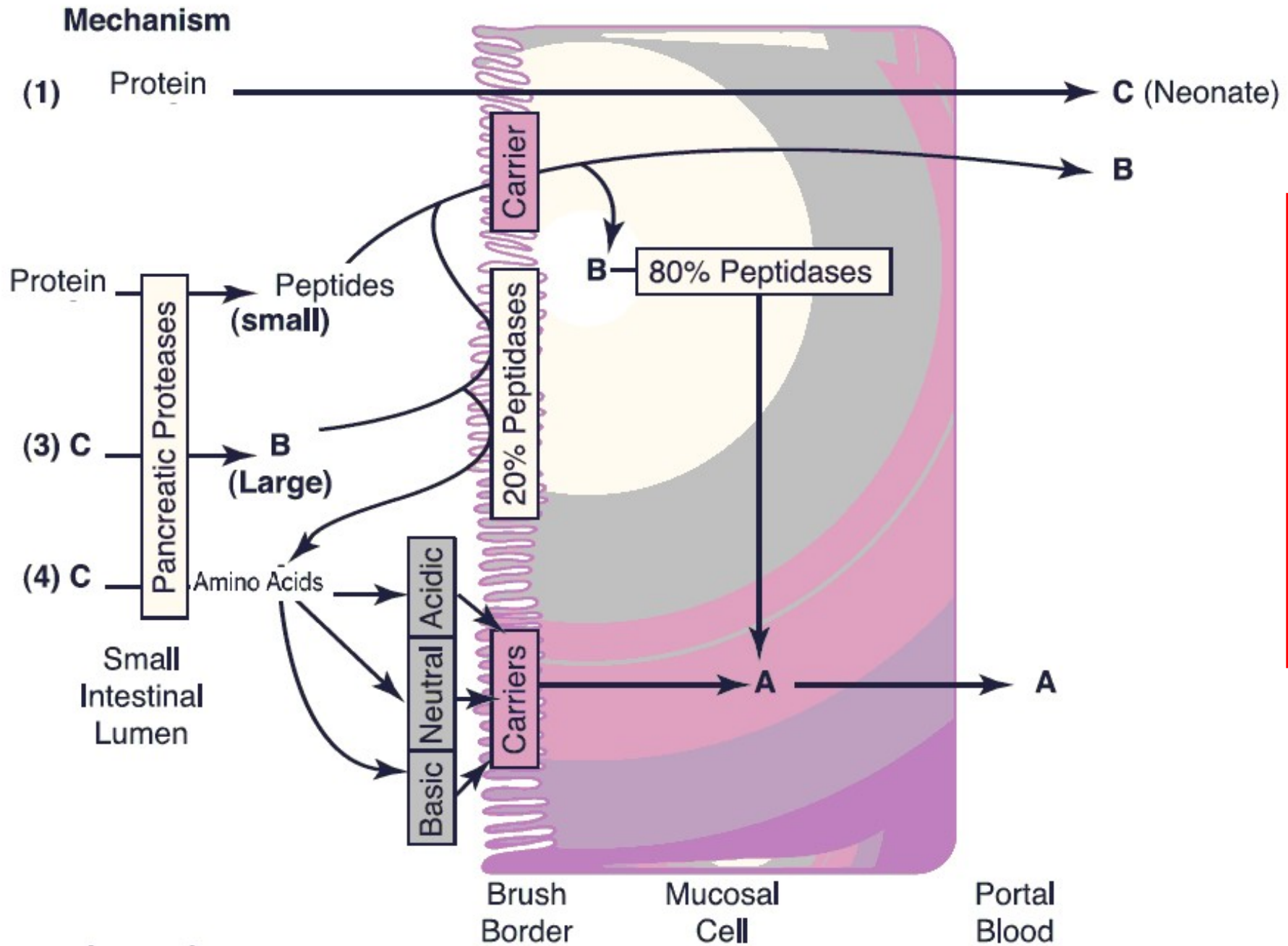
Lipoprotein class	Density (g/mL)	Diameter (nm)	Protein % of dry wt	Phospholipid %	Triacylglycerol % of dry wt
HDL	1.063-1.21	5 – 15	33	29	8
LDL	1.019 – 1.063	18 – 28	25	21	4
IDL	1.006-1.019	25 - 50	18	22	31
VLDL	0.95 – 1.006	30 - 80	10	18	50
chylomicrons	<0.95	100 - 500	1 - 2	7	84

As the lipid content increases, density decreases and size increases, that is why Chylomicrons are least dense but biggest in size, while HDL are rich in proteins, hence most dense but smallest in size.

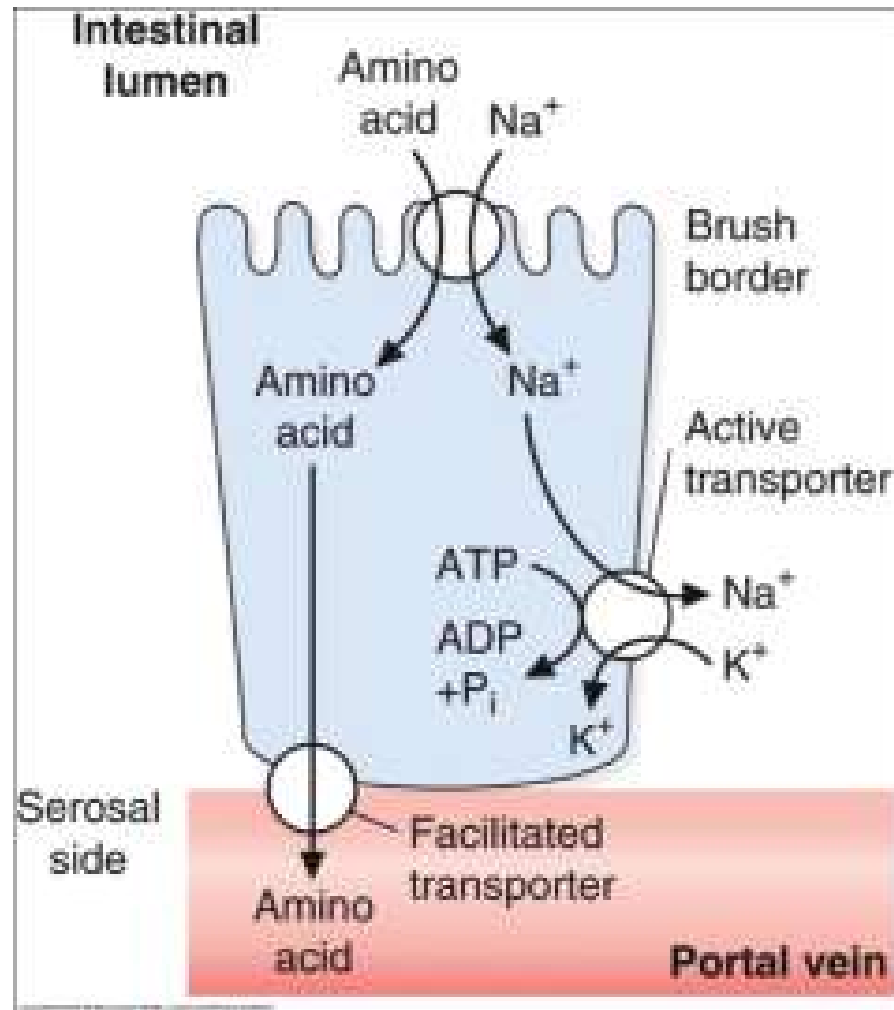
متابولیسیم کایلو میکرون



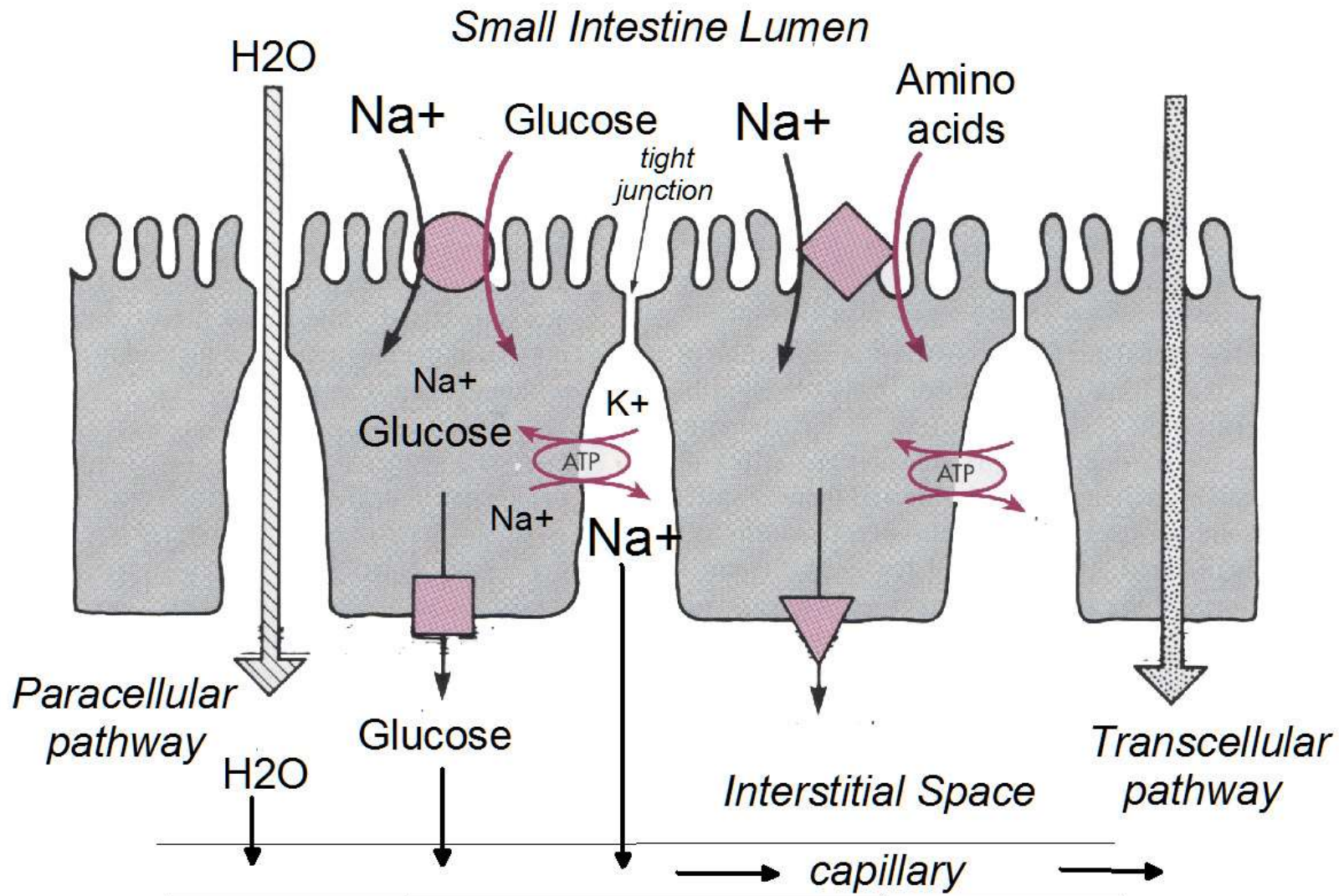
Intestinal Mechanisms for Protein Digestion and Absorption



جذب اسیدهای آمینه

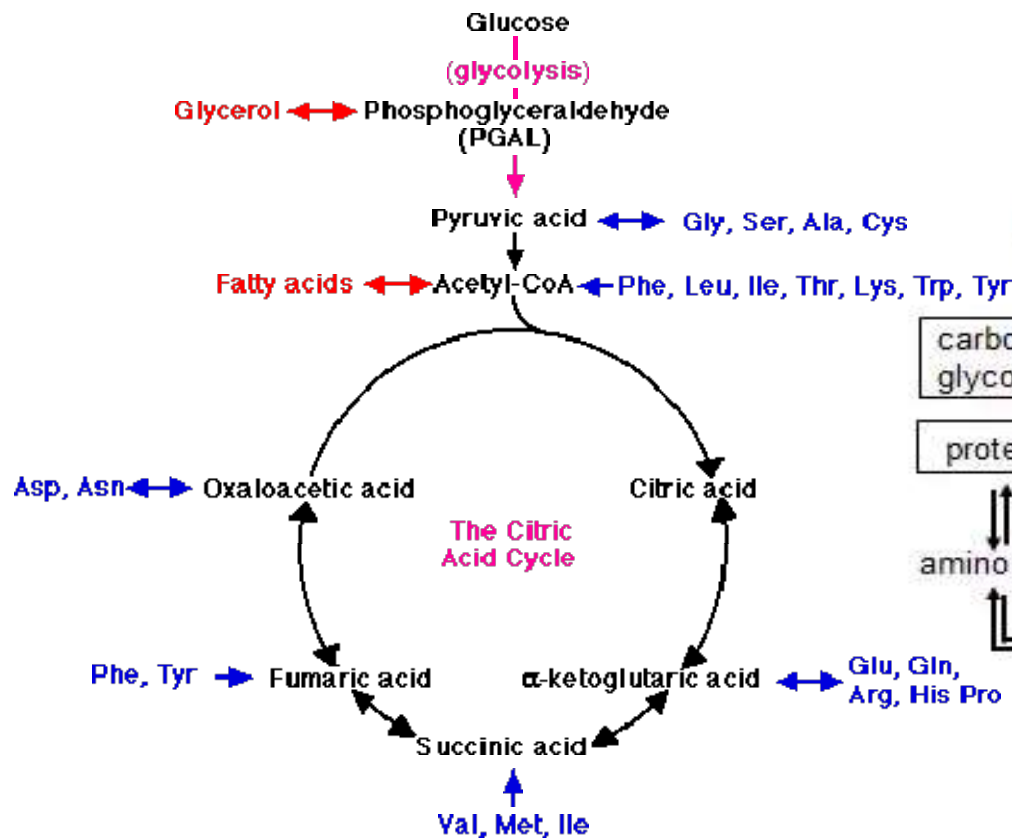


حَرِکَتِ آب

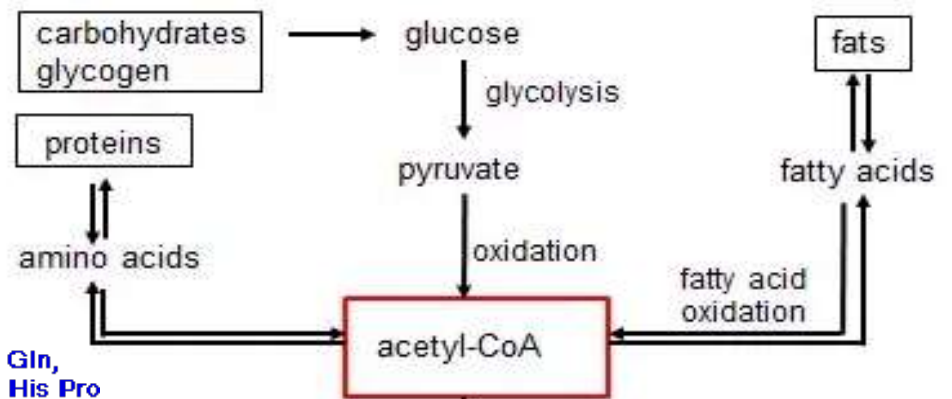


مرحله ۲- تجزیه

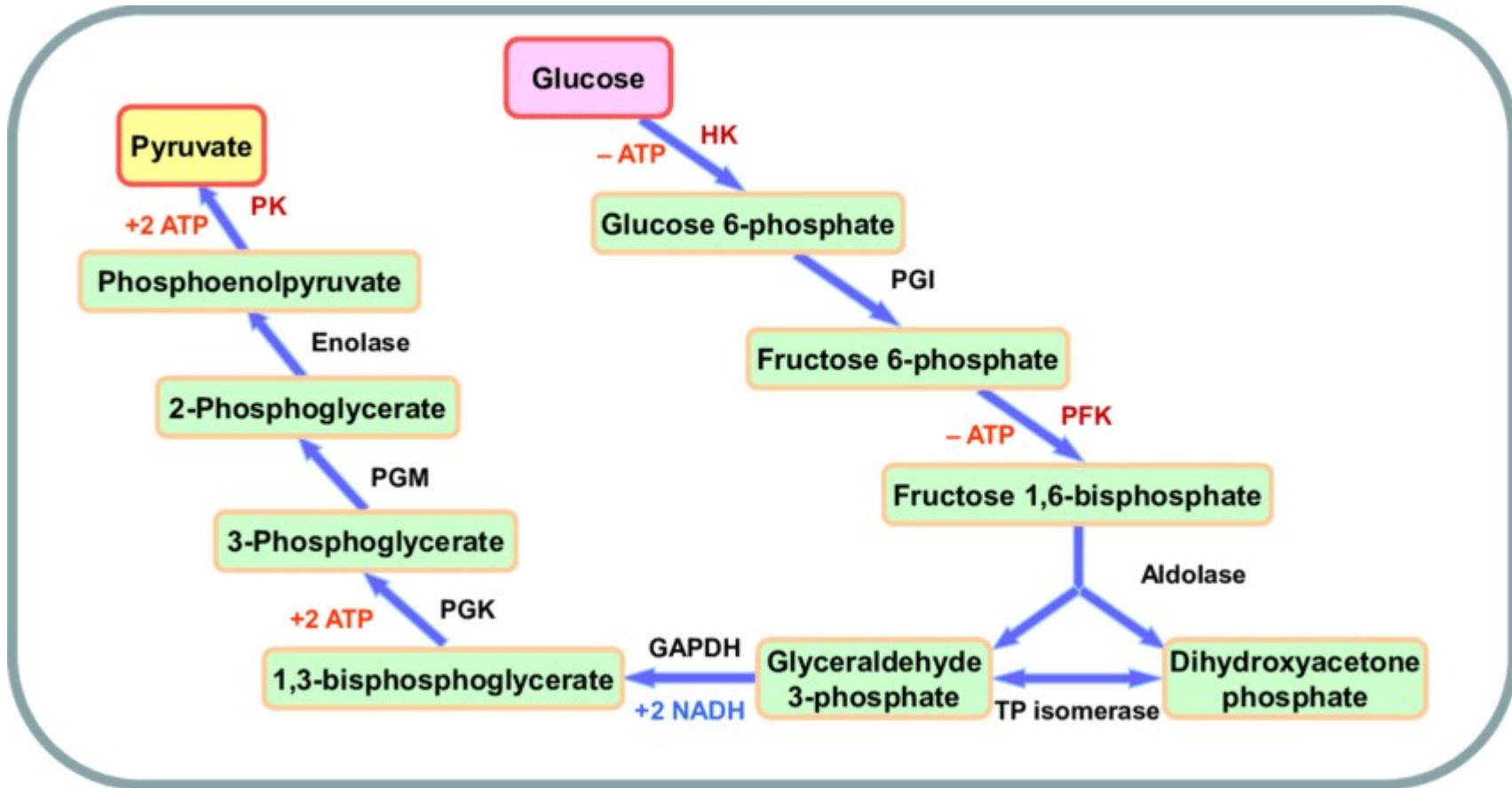
• تولید استیل کوآ



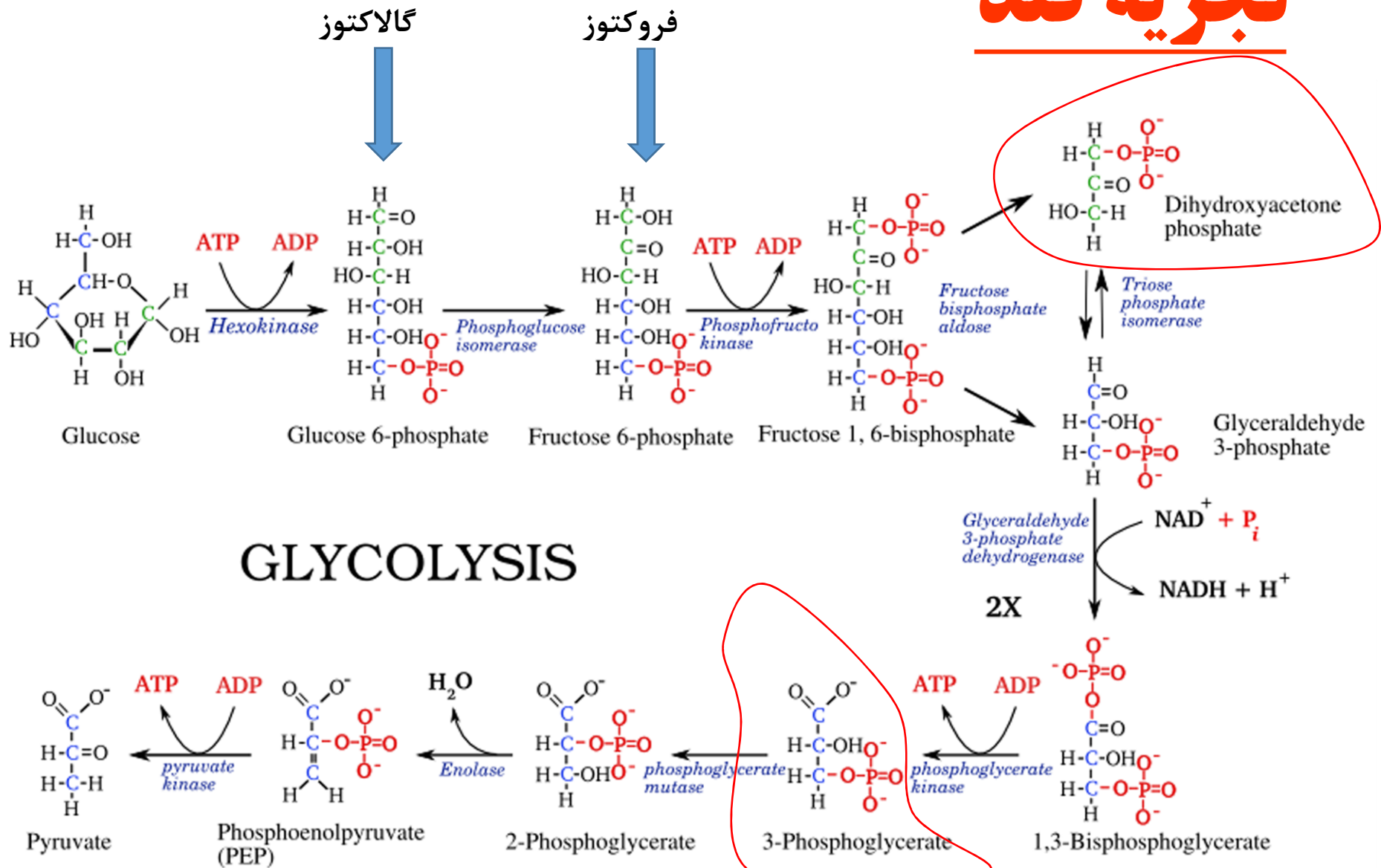
ACETYL CoA – THE CROSSROADS



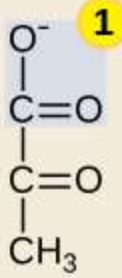
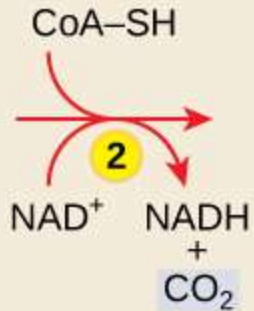
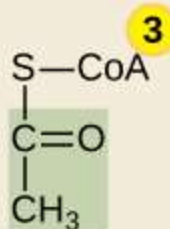
گلیکولیز



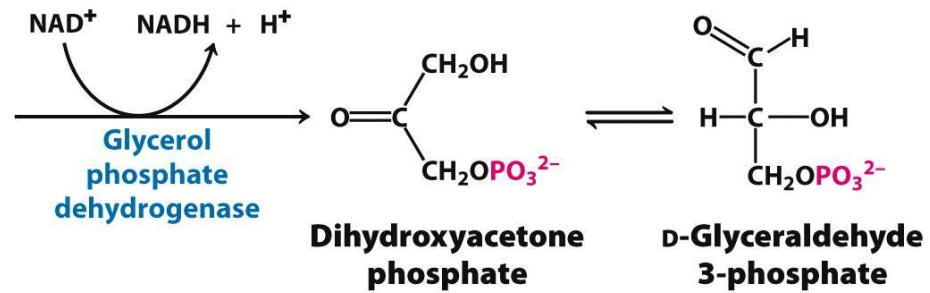
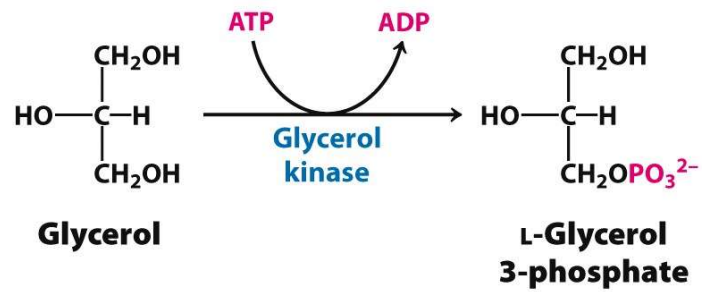
تجزیه قند



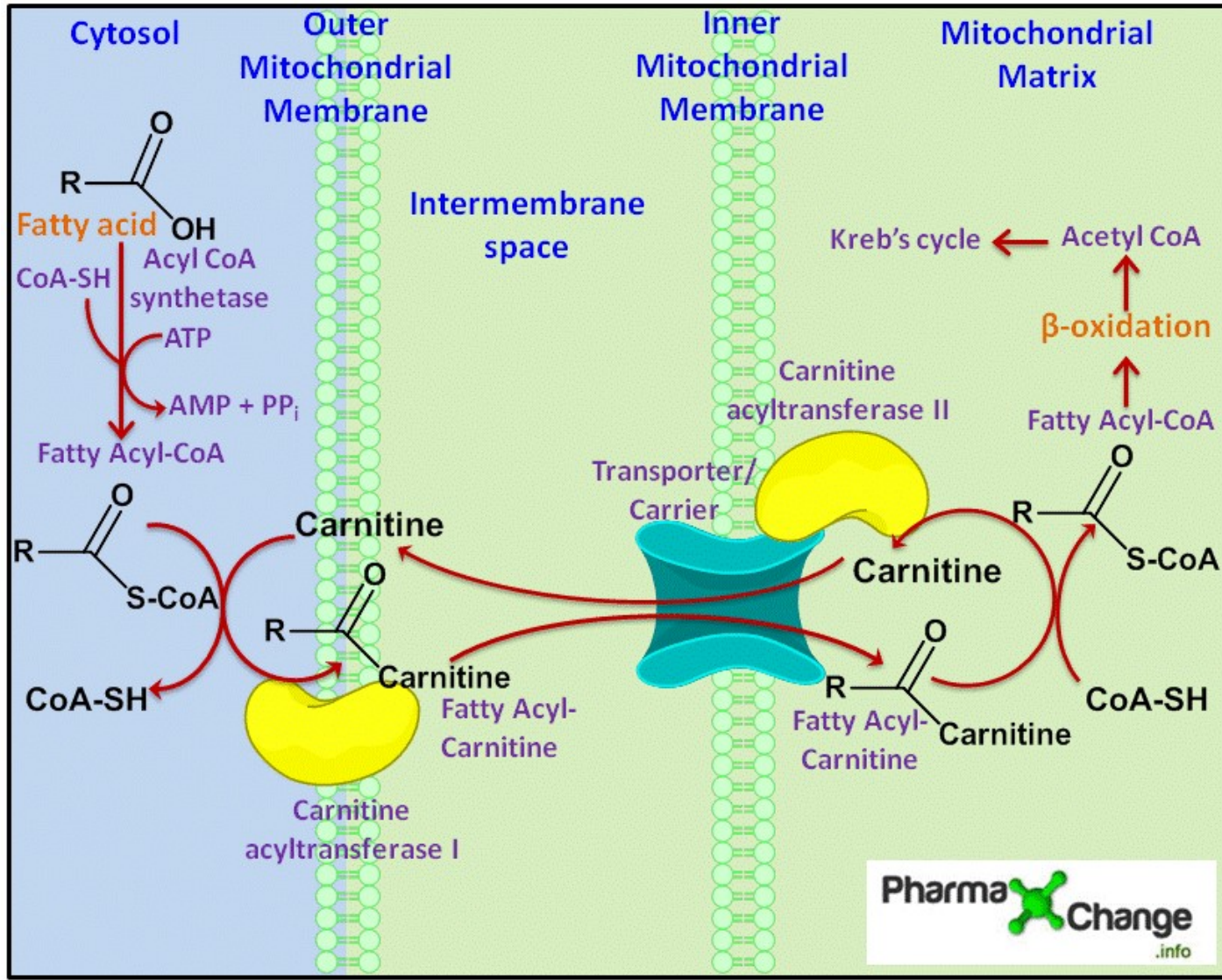
اکسیداسیون پیرووات

Oxidation of Pyruvate		
 <p>Pyruvate</p>	 <p>Oxidation reaction</p>	 <p>Acetyl CoA</p>
<p>1</p> <p>A carboxyl group is removed from pyruvate, releasing carbon dioxide.</p>	<p>2</p> <p>NAD⁺ is reduced to NADH.</p>	<p>3</p> <p>An acetyl group is transferred to coenzyme A, resulting in acetyl CoA.</p>

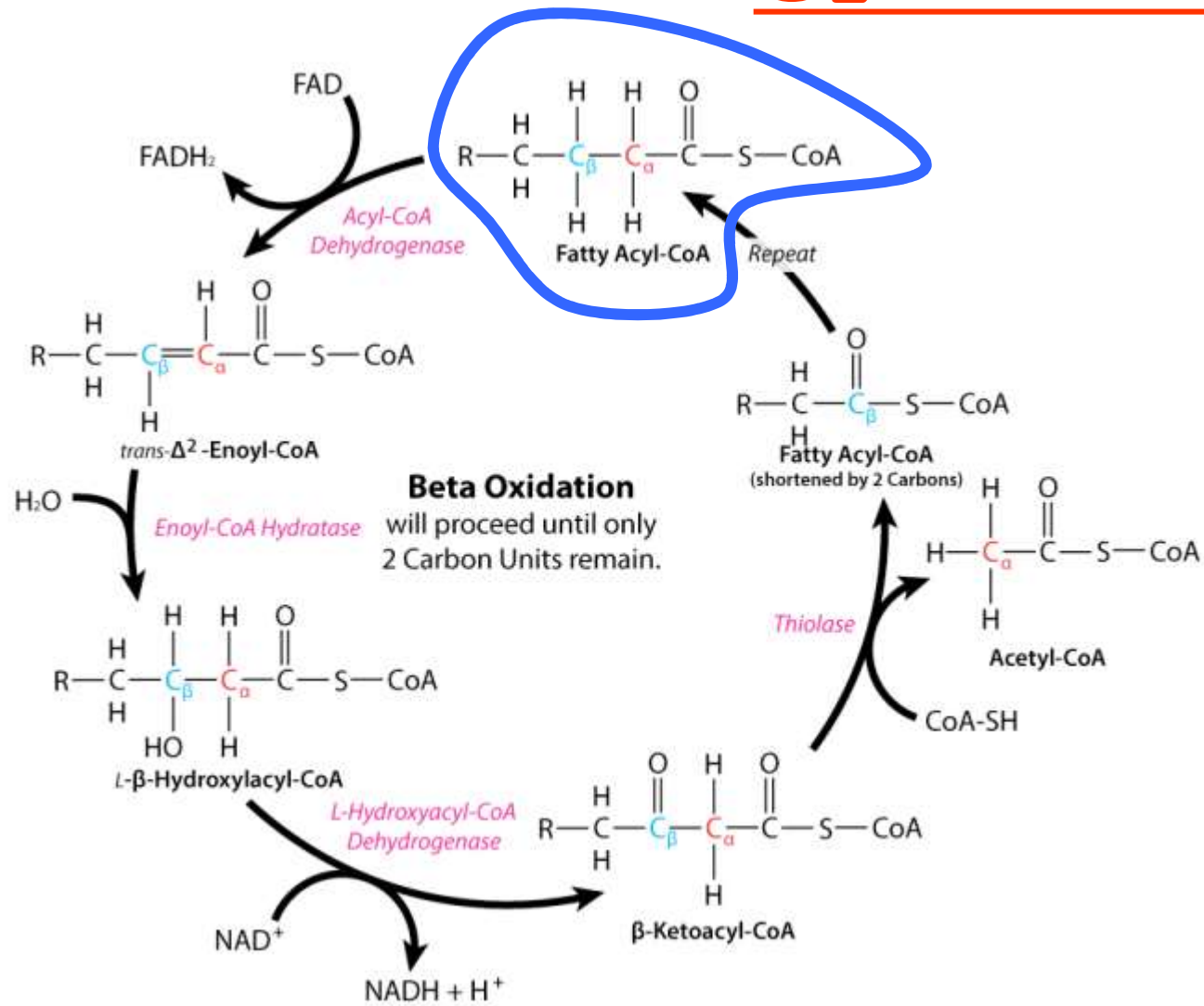
گلیسرول



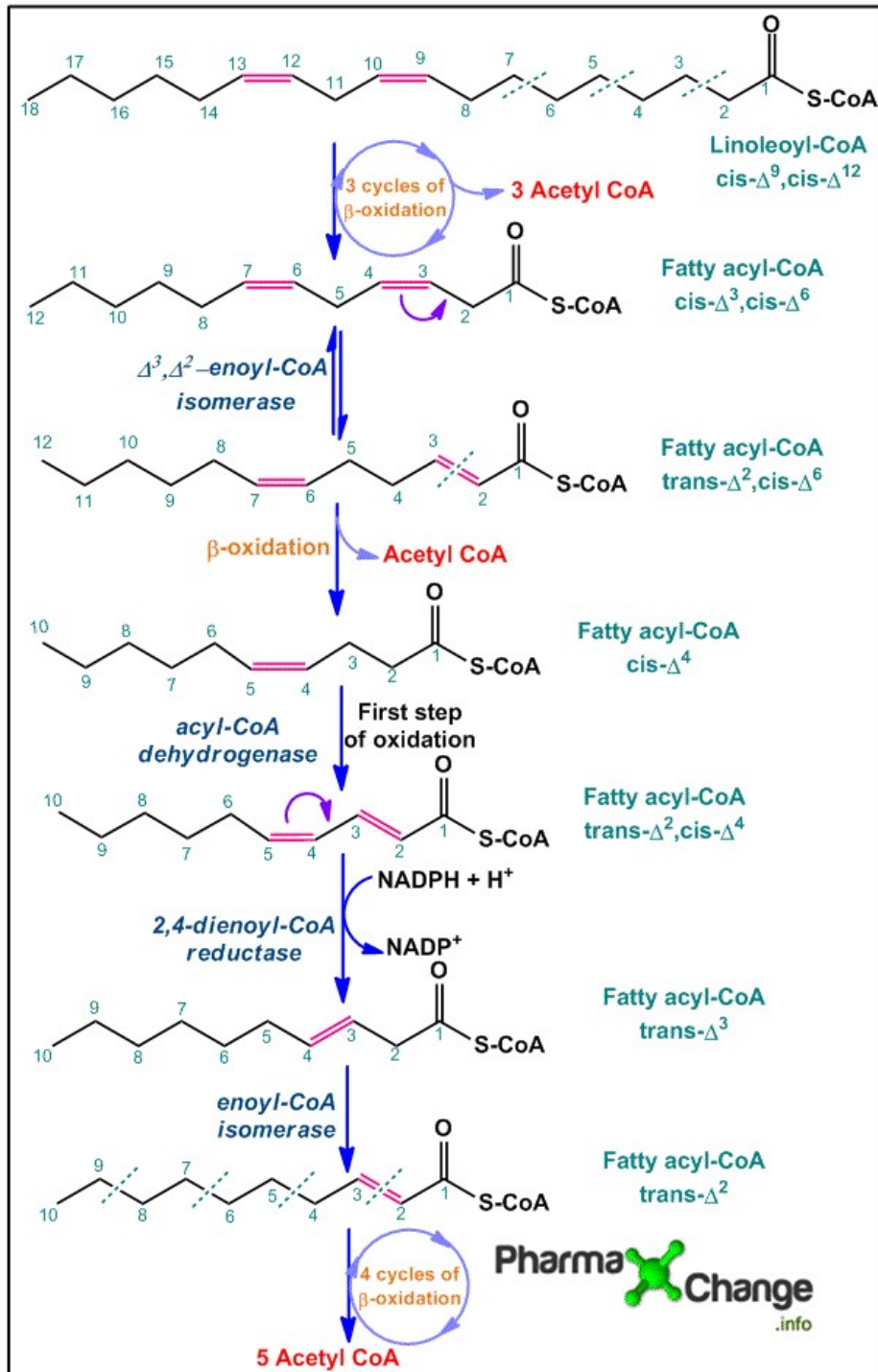
فعال و انتقال سازی اسید چرب



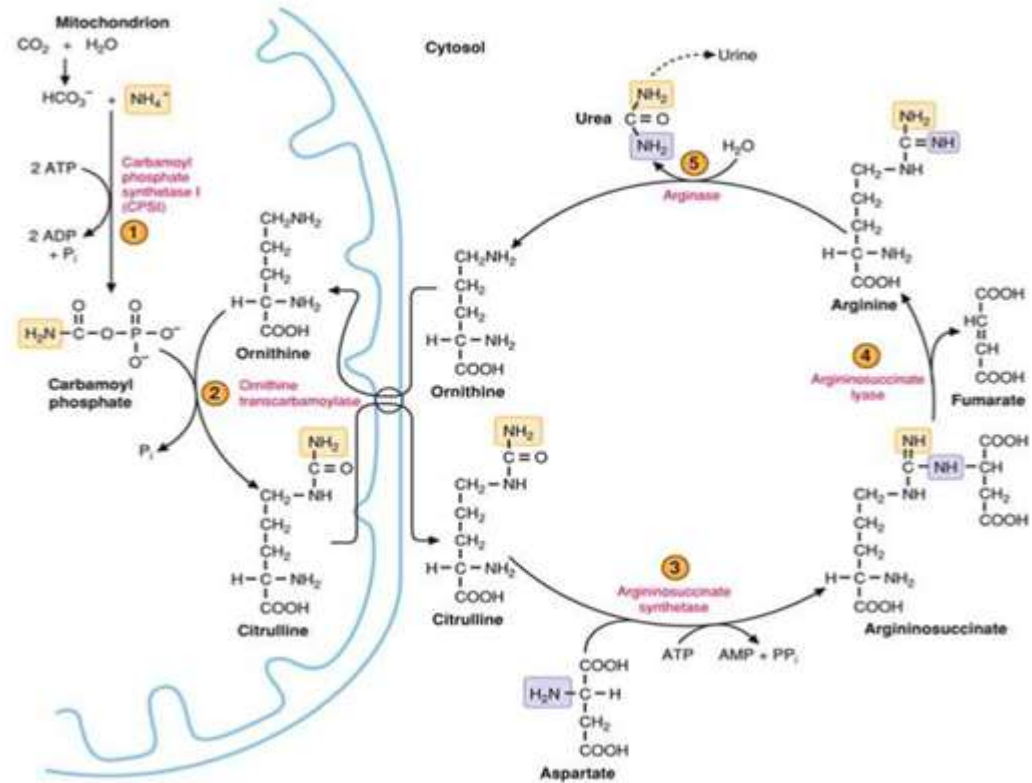
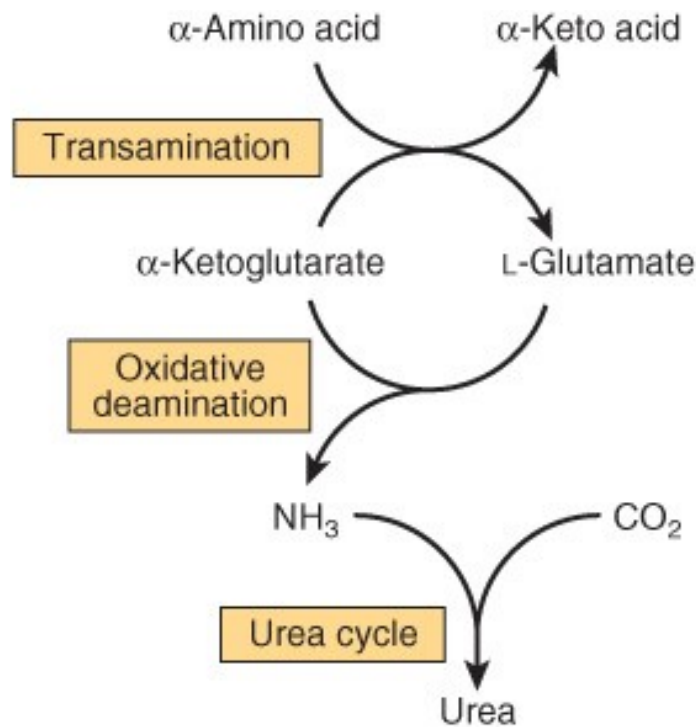
بتا اکسیداسیون



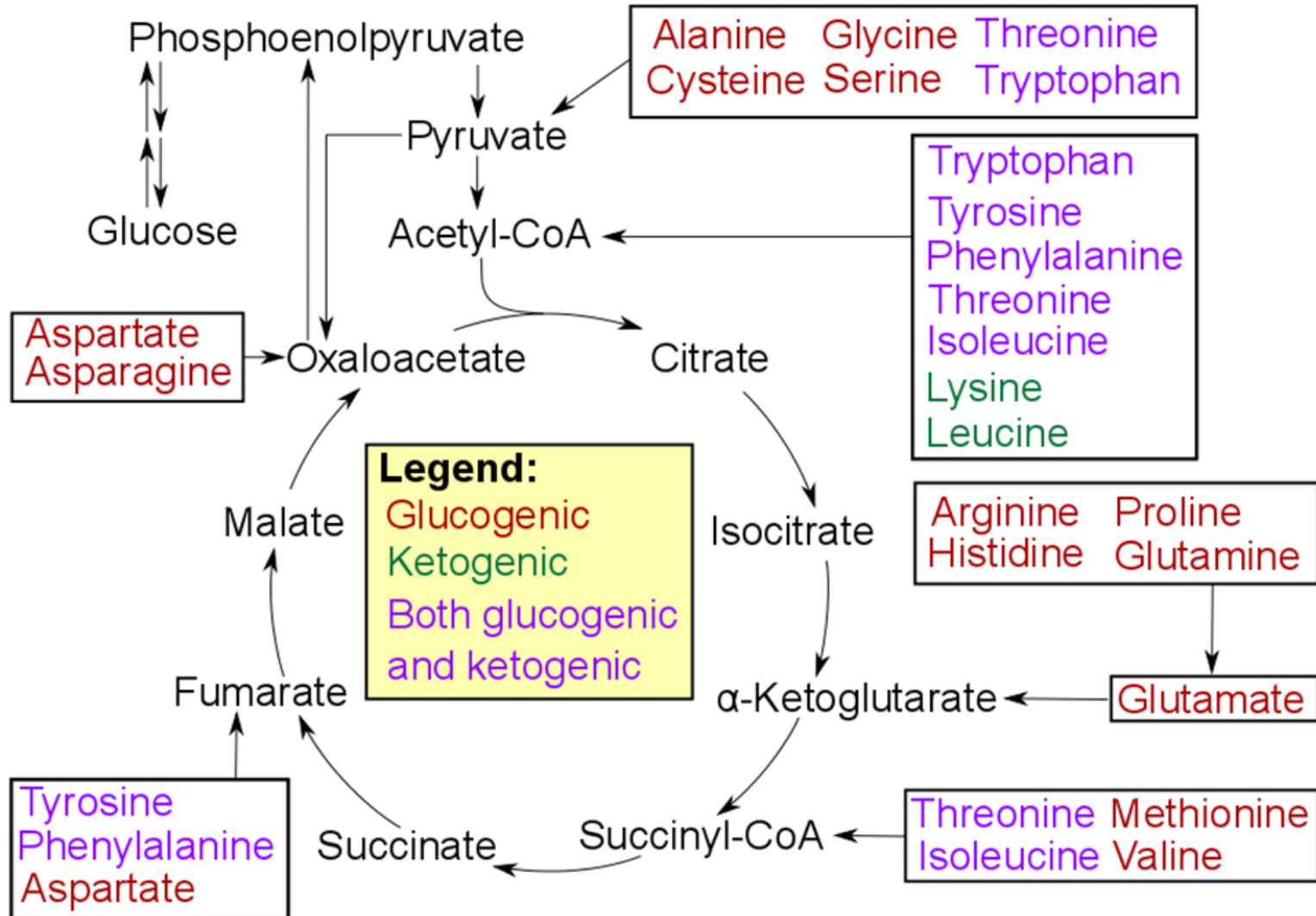
آکسیداسیون UFA



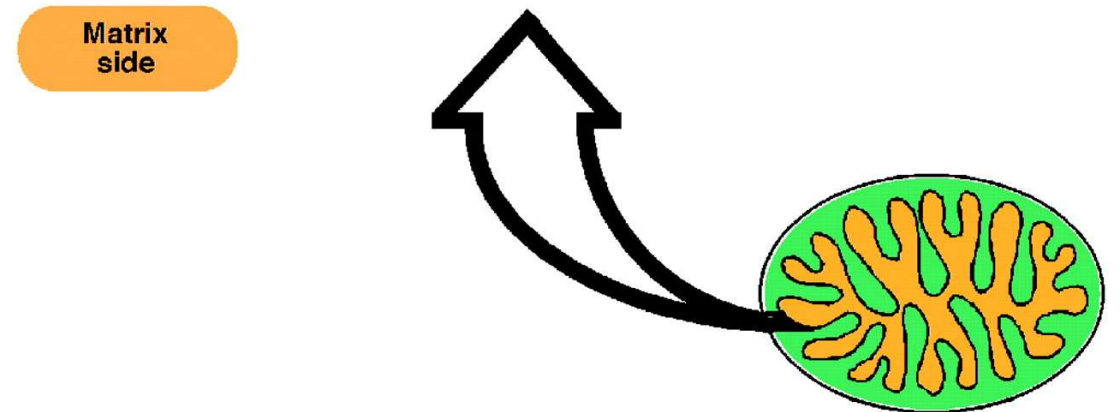
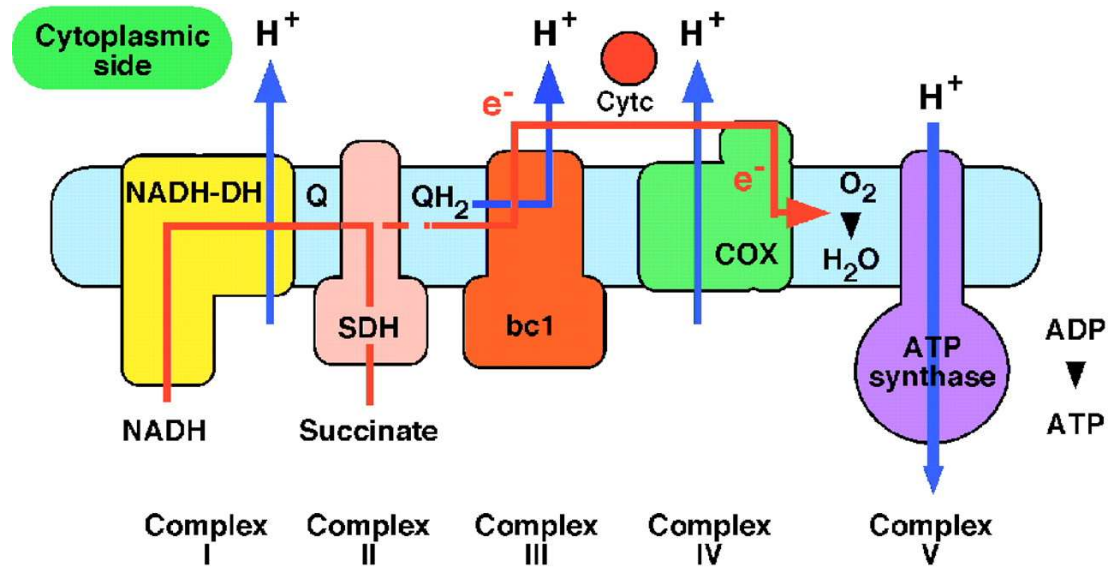
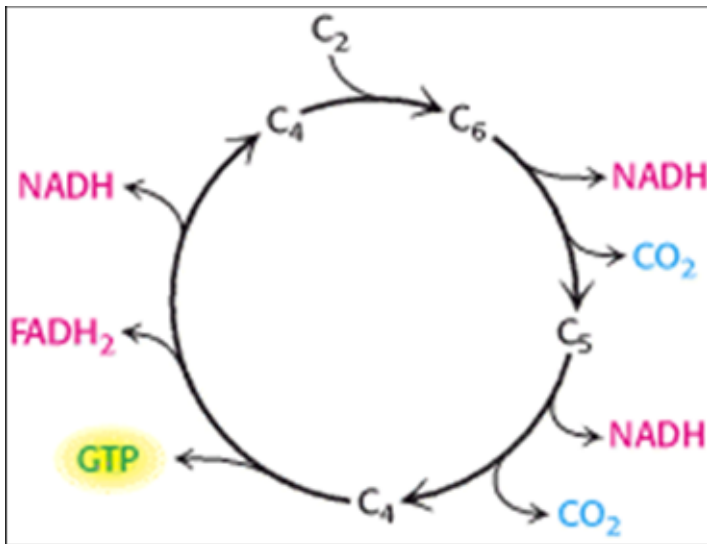
متابولیسم گروه آمین



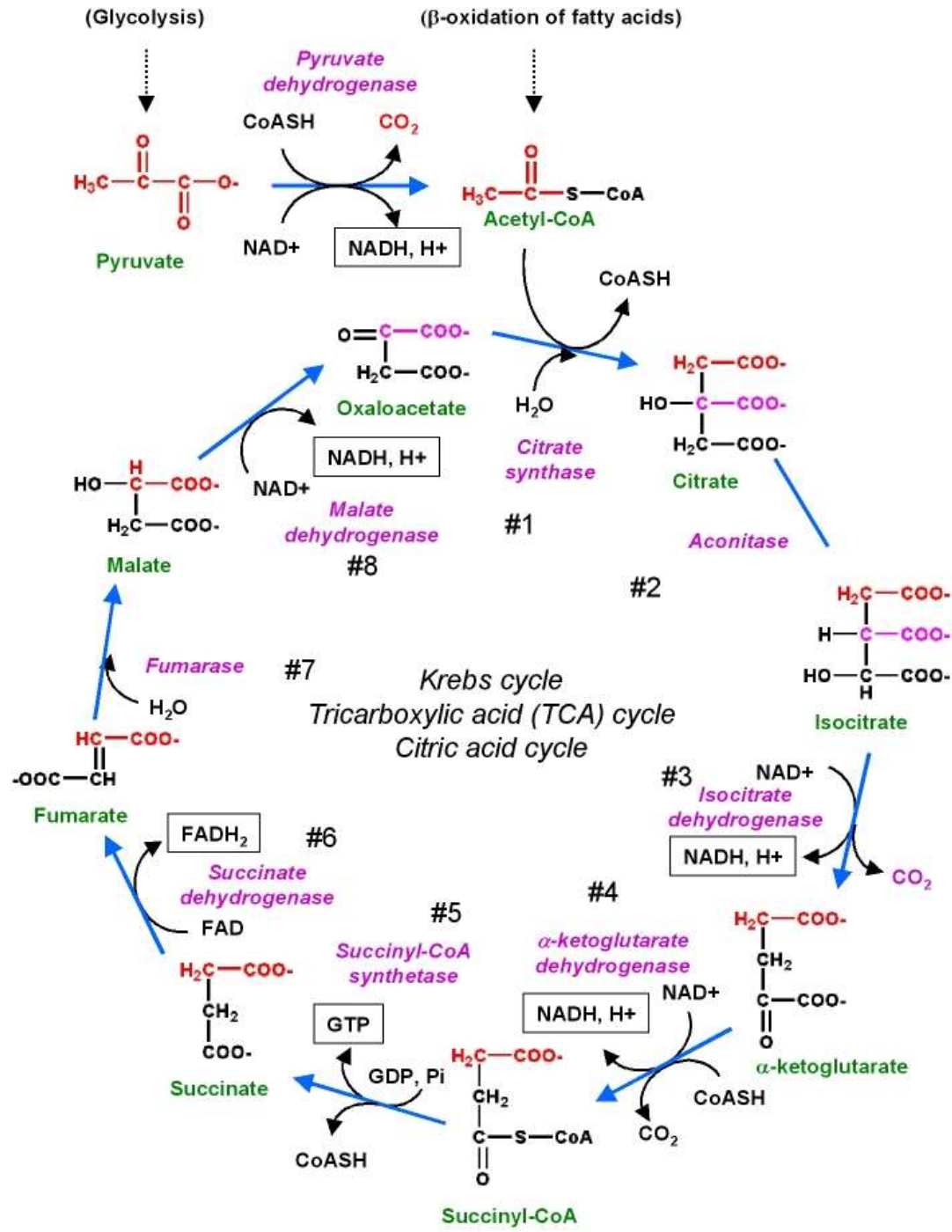
کاتابولیسم بخش آلفا کتو اسید



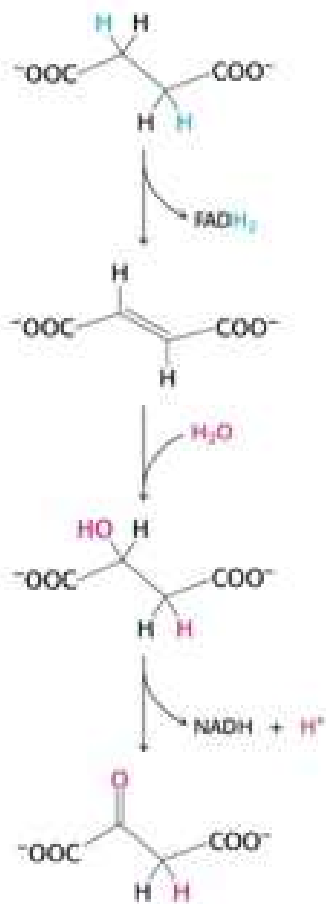
٣- مرحله اکسیداتیو



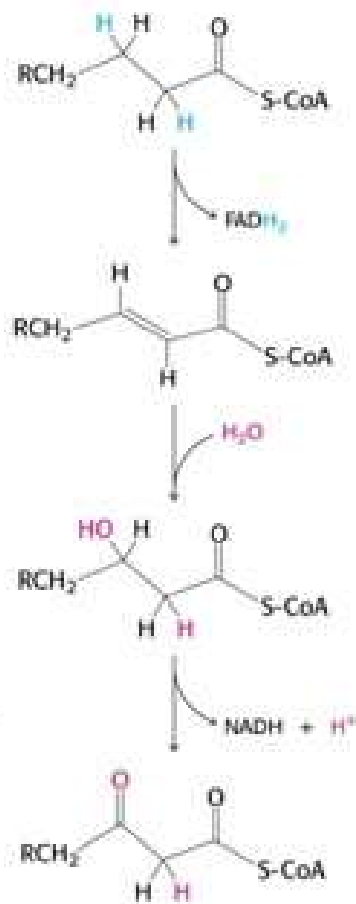
چرخه کربس



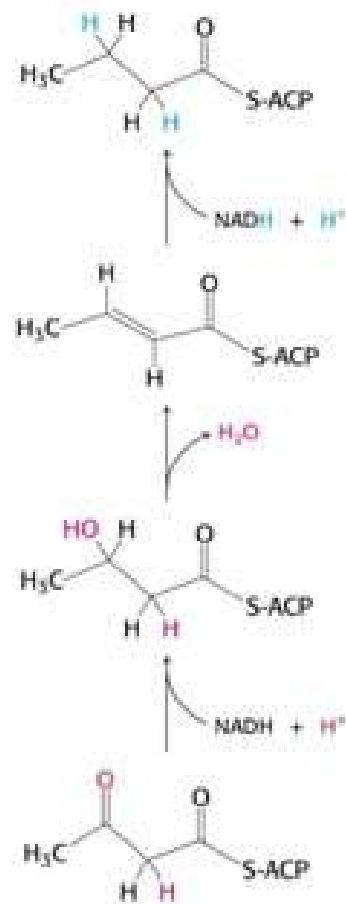
Citric acid cycle



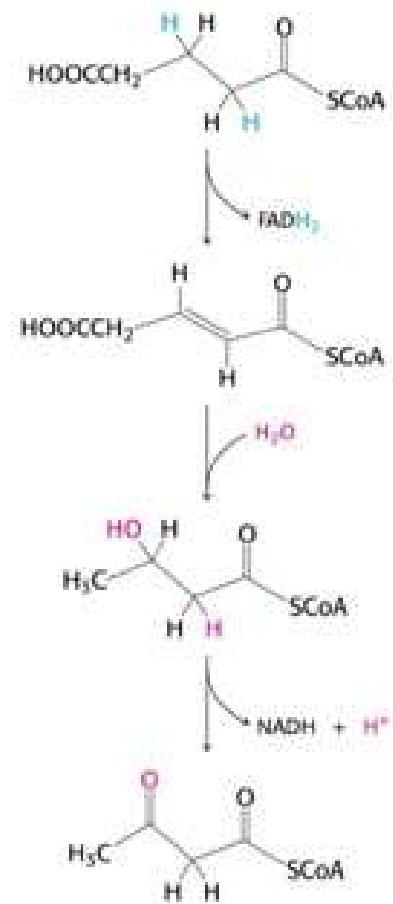
Fatty acid degradation



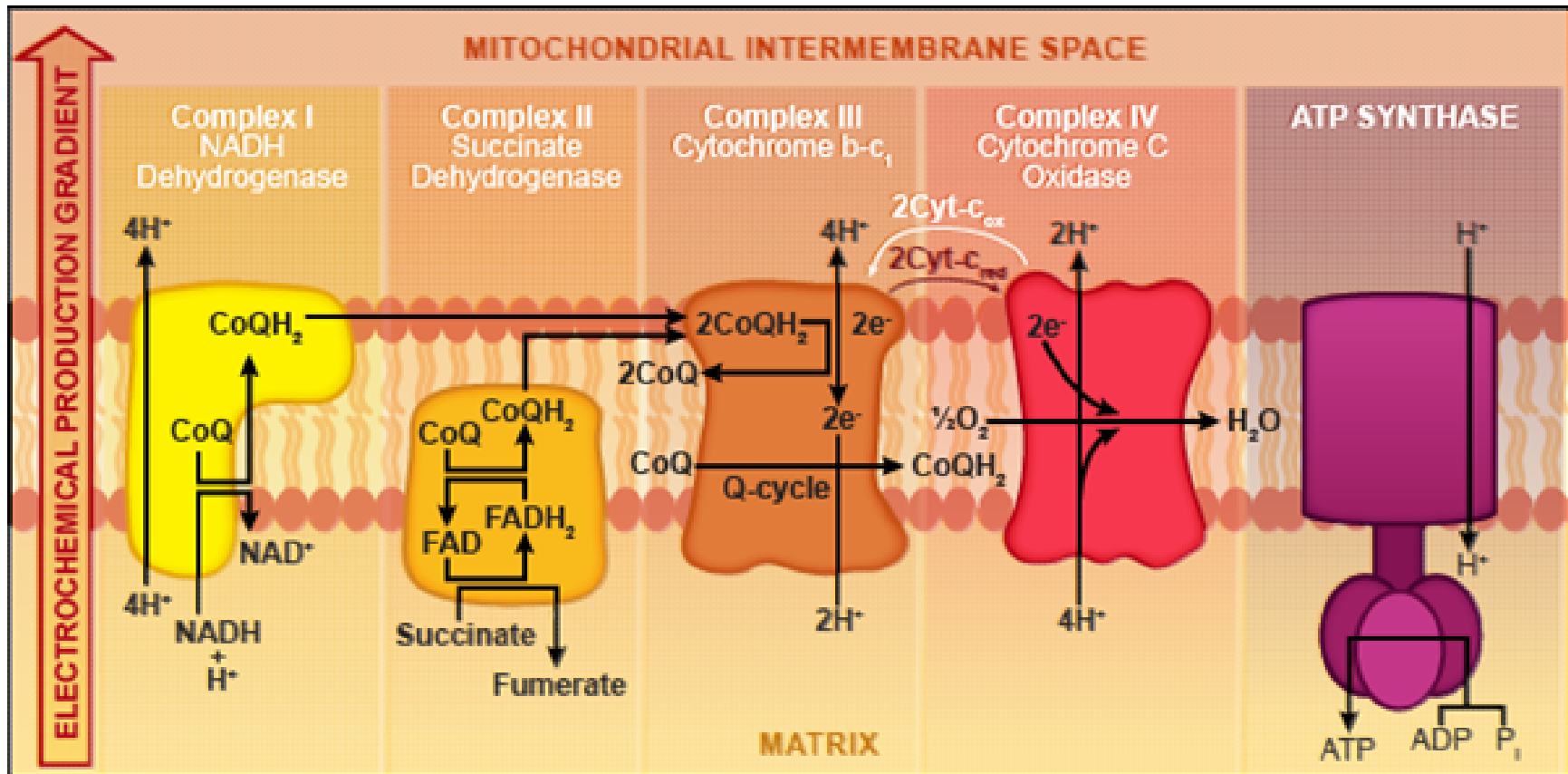
Fatty acid synthesis



Lysine degradation



فسفريلاسيون اڪسيڊاٽيو



بازدارنده ها

Inhibitors and Uncouplers

Table 1. Inhibitors of Respiration and Oxidative Phosphorylation

<u>Site-Specific</u>	<u>Target Complex</u>
Carbon monoxide	IV
Cyanide	IV
Sodium Azide	IV
Rotenone	I
Antimycin A	III
Amytal	I
<u>Phosphorylation</u>	
Oligomycin	F ₀
<u>Uncouplers</u>	
2,4-Dinitrophenol (DNP)	Proton gradient
Trifluorocarbonylcyanide	
Phenylhydrazone (FCCP)	Proton gradient

Any compound that stops electron transport will stop respiration...this means you stop breathing

Electron transport can be stopped by inhibiting ATP synthesis

An uncoupler breaks the connection between ATP synthesis and electron transport

تولید انرژی

