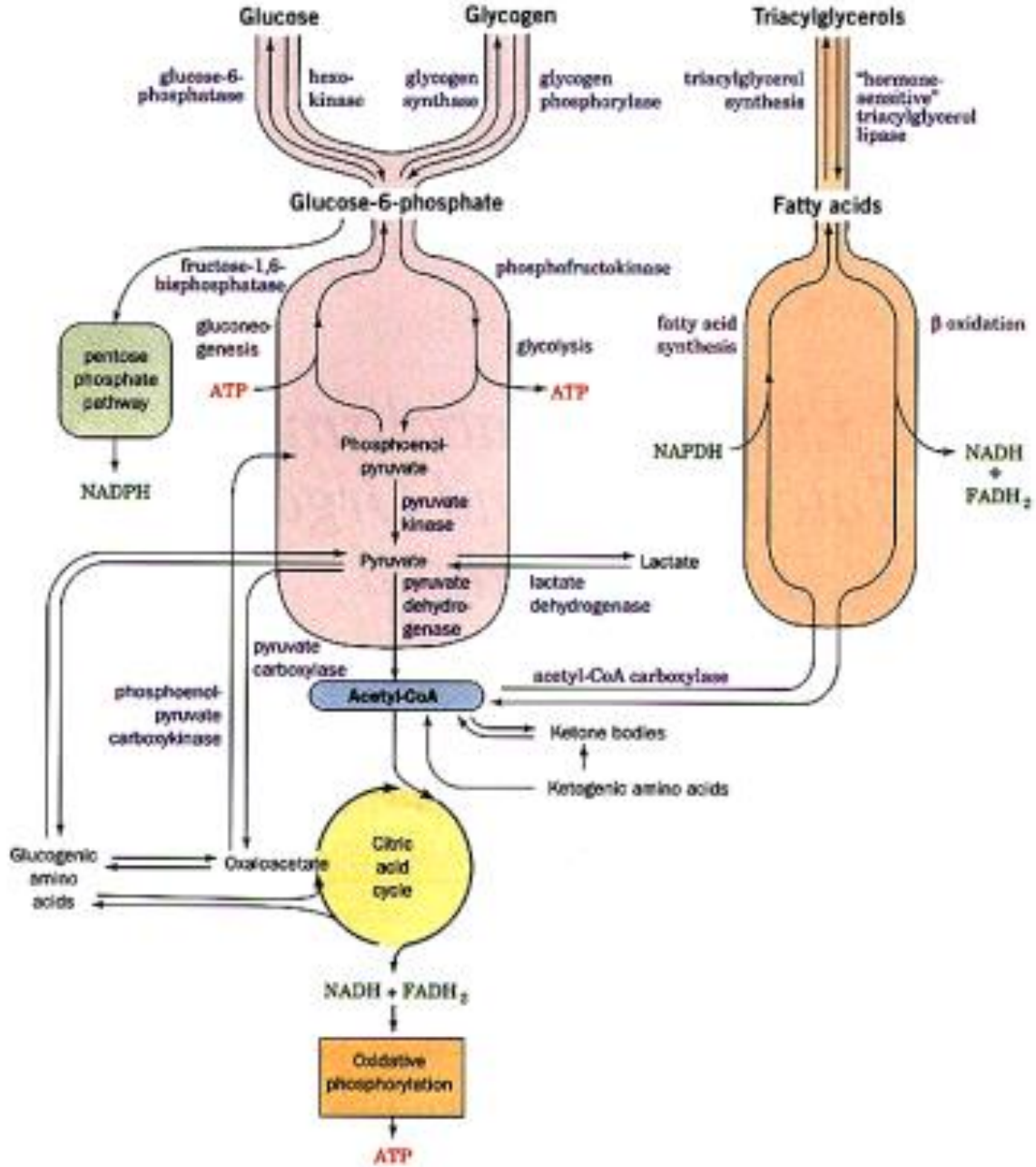
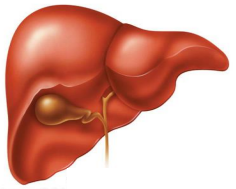
Integração Metabólica



Jejum – Metabolismo de Glicogênio

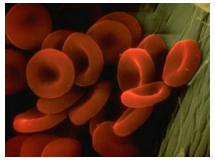
-↓ glicemia

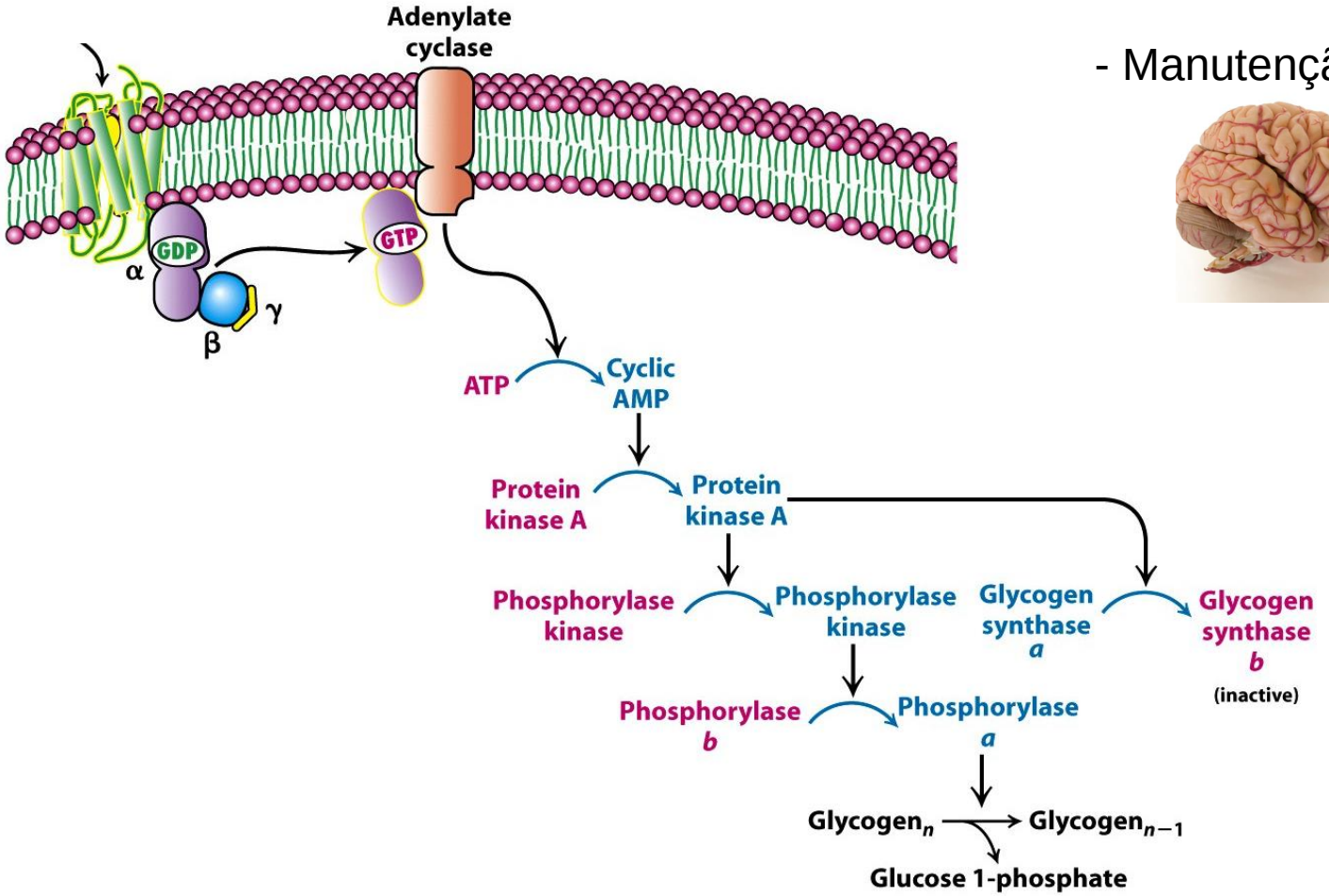
- Secreção de glucagon



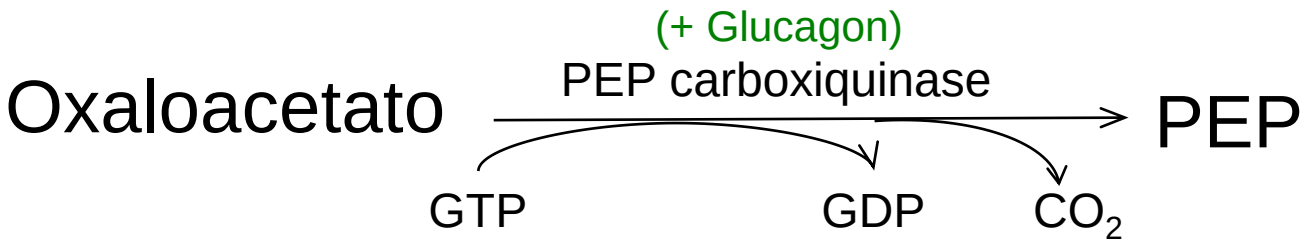
- glicogenólise

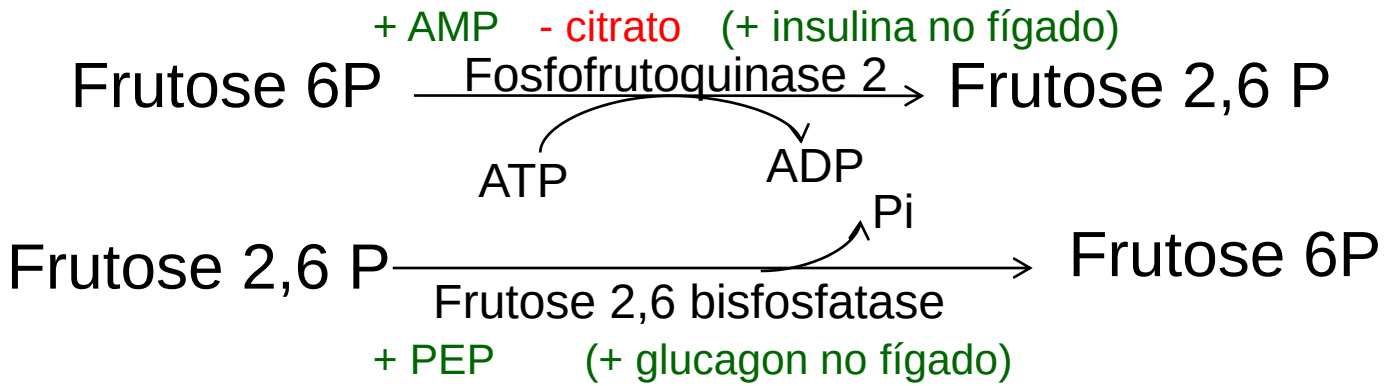
- Manutenção da glicemia

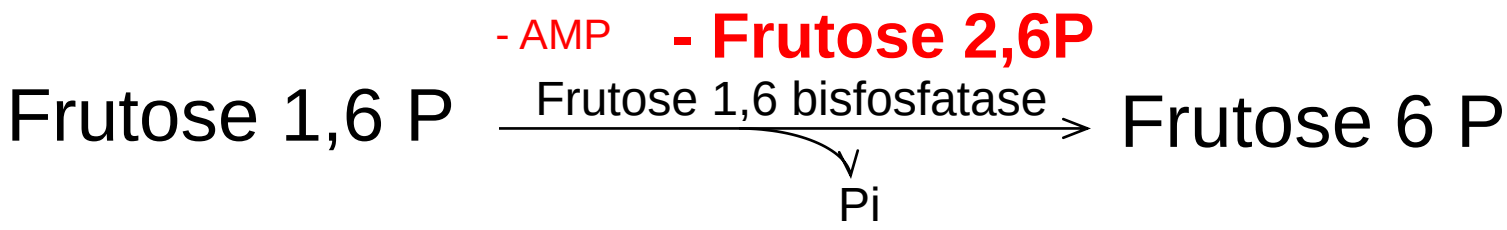




Jejum – Metabolismo de Glicose



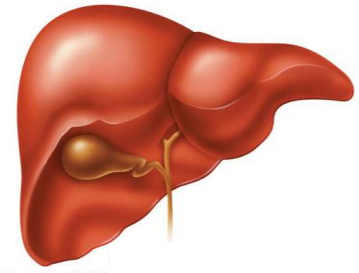




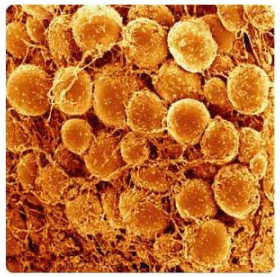
Jejum – Metabolismo de Glicose

Aminoácidos

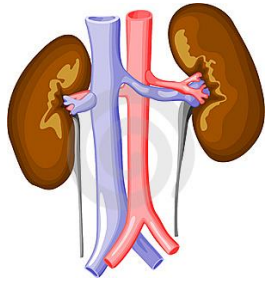
Gliconeogênese

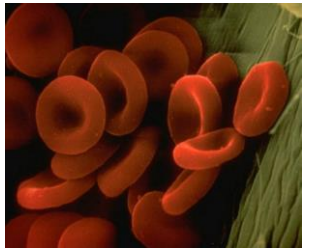


Glicólise



Ácidos graxos
(fonte de ATP)

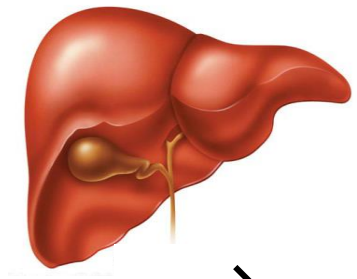


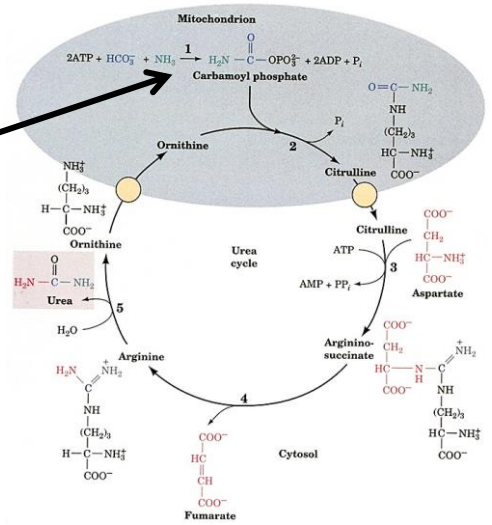


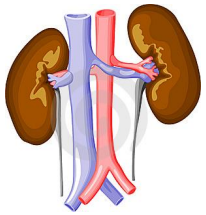
Jejum – Metabolismo de Aminoácidos

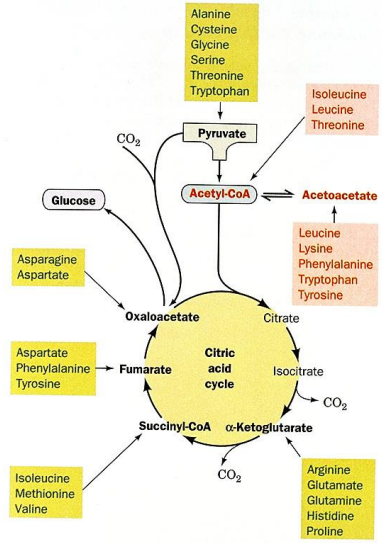
- Ubiquitinação de proteínas
- Degradação a aminoácidos, transaminação
- exportação de alanina + glutamina

+arginina

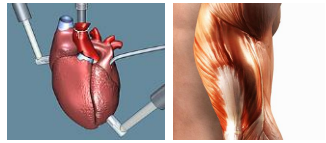




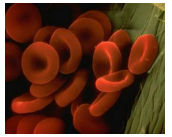




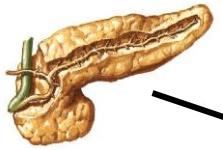
Corpos cetônicos



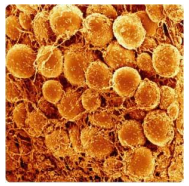
Glicose

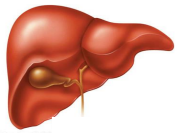


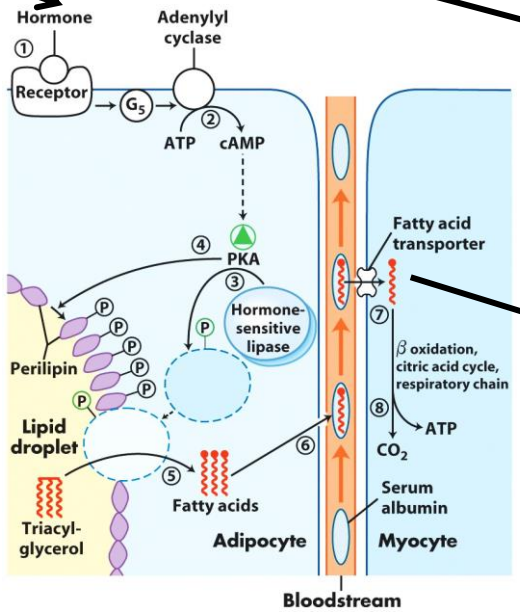
Jejum – Metabolismo de Lipídeos

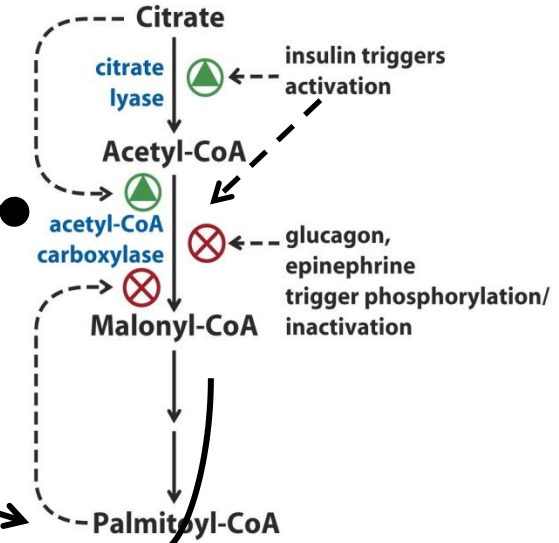


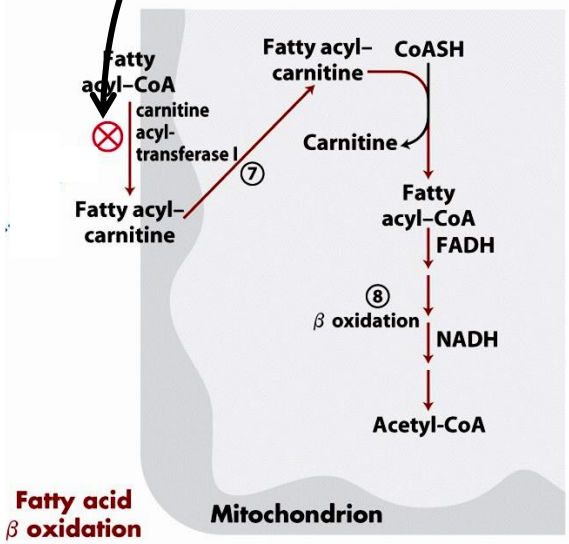
glucagon











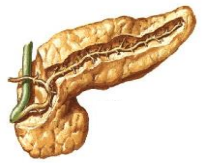
↑ Degradação de TAG

↑ β oxidação

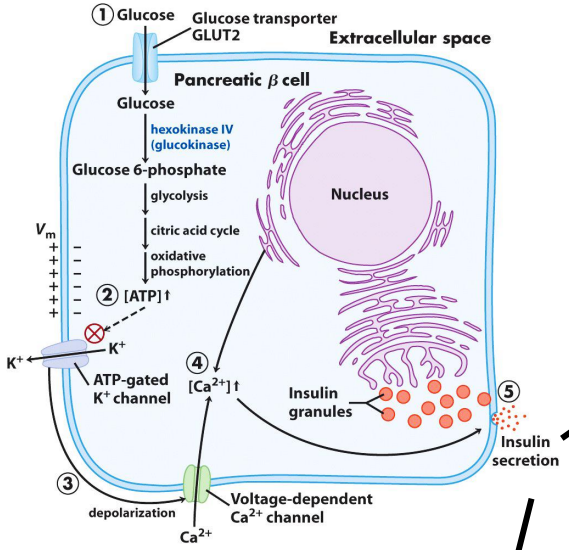
↓ biossíntese de ácidos graxos

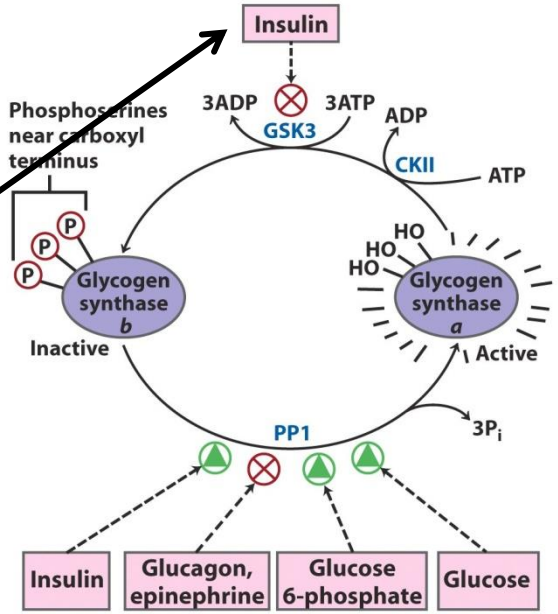
TCA e OxPhos?

Período Pós-Prandial – Metabolismo de Glicogênio

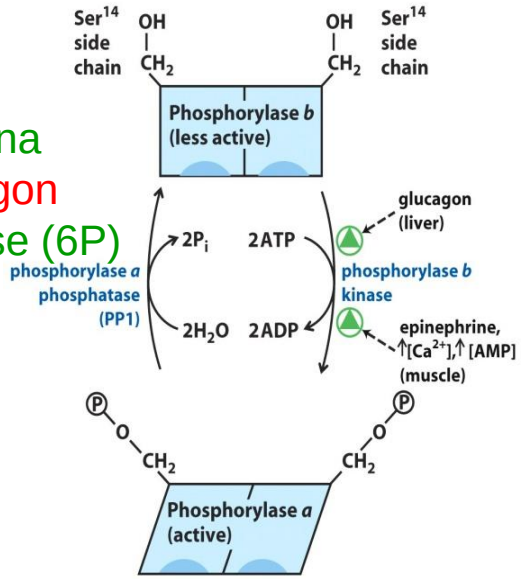


↑ glicemia



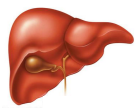


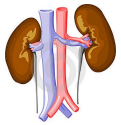
+ insulina
- glucagon
+ glicose (6P)



↓ glicogenólise

↑ glicogênese



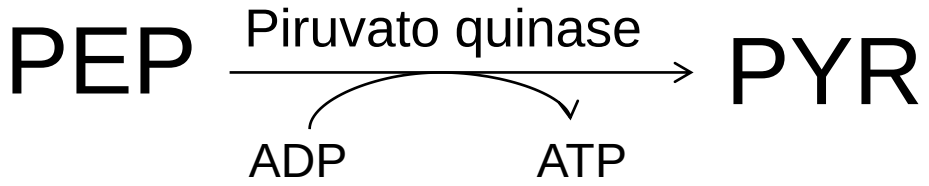


Período Pós-Prandial – Metabolismo de Glicose

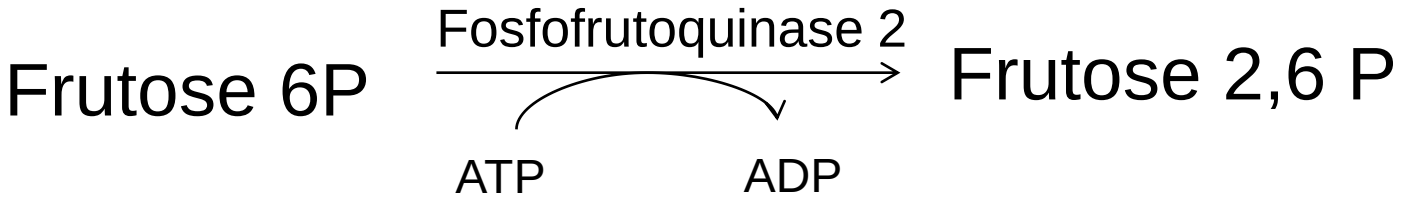
(+ insulina no fígado) (- glucagon no fígado)

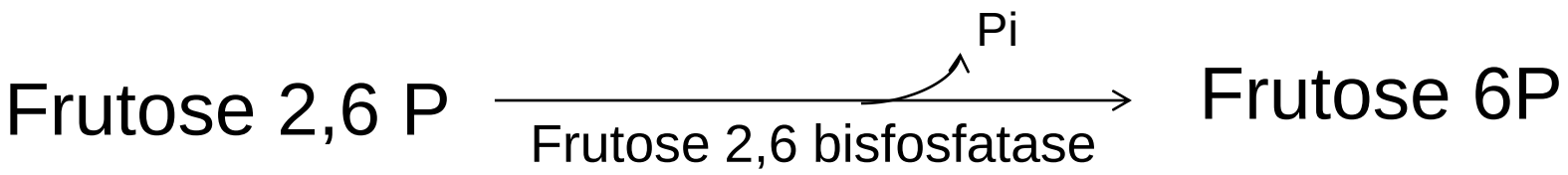
- alanina (no fígado) - ATP

+ Frutose 1,6P



+ AMP - citrato (+ insulina no fígado)

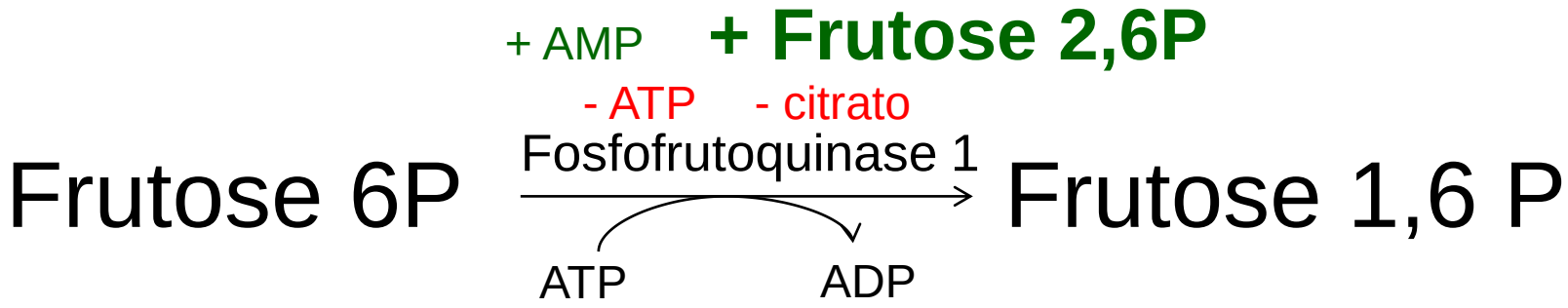


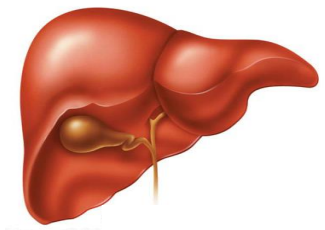


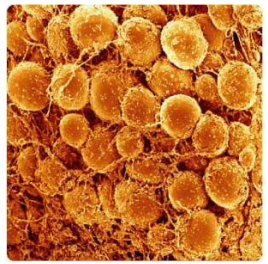
+ PEP

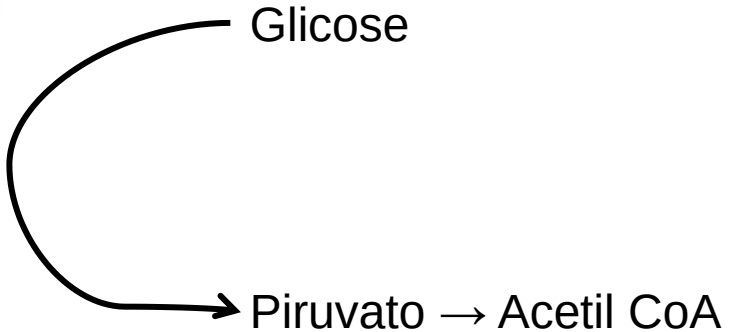
(+ glucagon no fígado)

Período Pós-Prandial – Metabolismo de Glicose

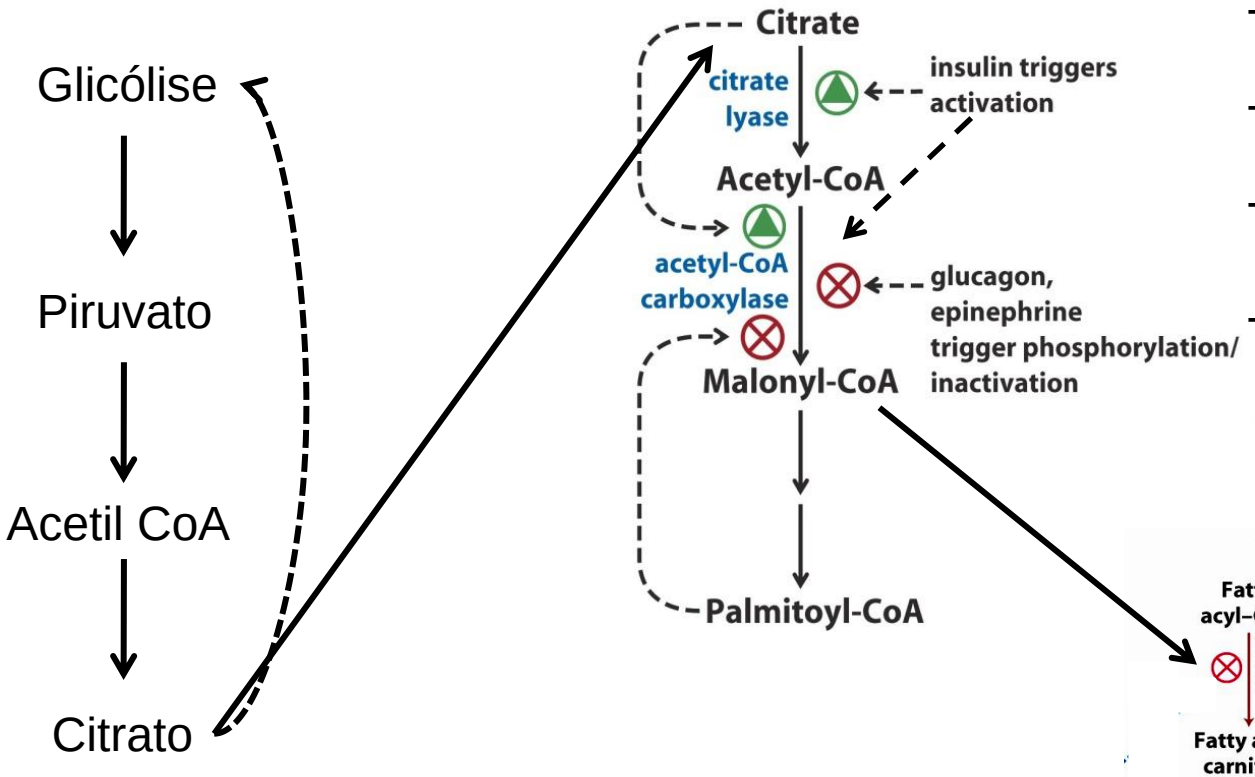




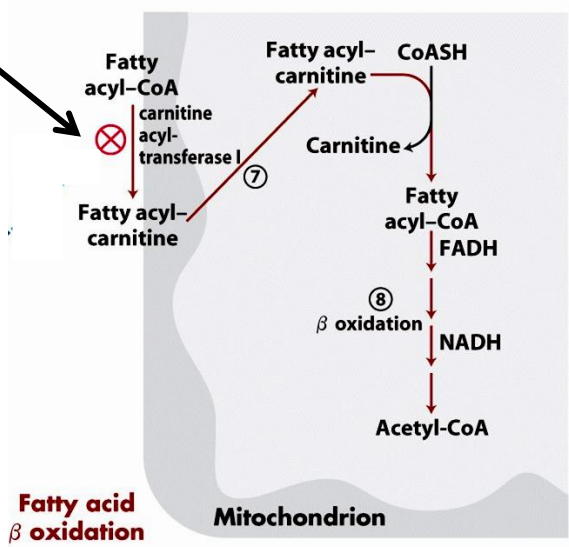




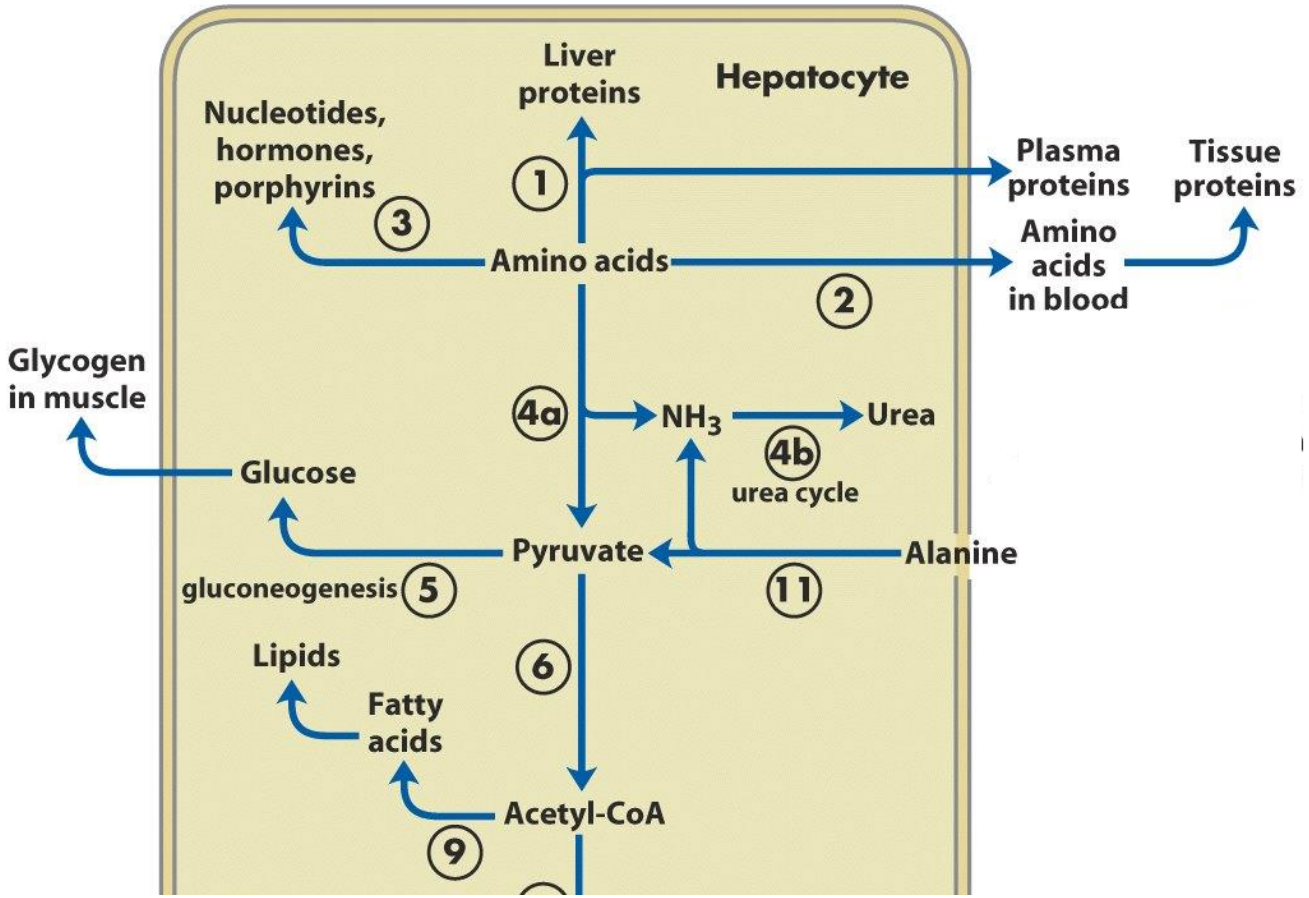
Período Pós-Prandial – Metabolismo de Lipídeos



- Biossíntese de TAG
- ↓ degradação de TAG
- ↓ β oxidação
- TCA e OxPhos?



Período Pós-Prandial – Metabolismo de Aminoácidos



Caso Clínico

- Furão de 5 anos, há 2 meses apresenta baixa atividade física.
  Há 1 mês, arrasta as pernas traseiras.
  Hoje, apresenta tremores pelo corpo todo.

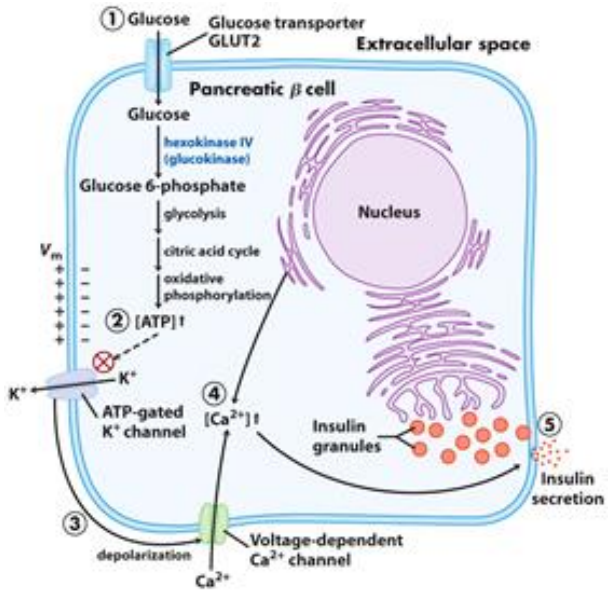
Ao exame clínico: bem nutrido, com musculatura preservada. Pouco ativo.

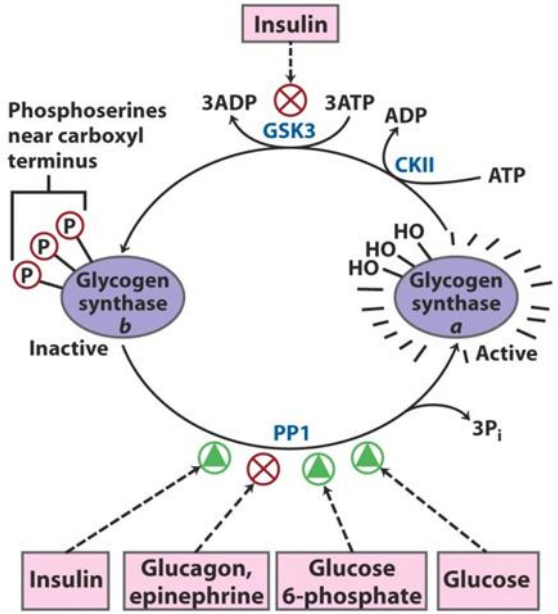
Glicemia: 65 mg/dL (normal 85-120 mg/dL)

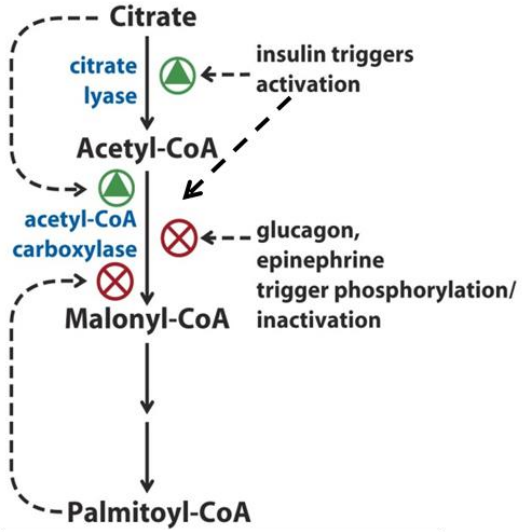
Foi corrigida a glicemia com glicose intravenosa, tremores desapareceram e o mostrou-se novamente ativo.
Após 2 horas, novamente apresentou episódio hipoglicêmico.

Insulinoma = crescimento anormal de células β, com hipoglicemia

Insulinoma







(+ insulina no fígado) (- glucagon no fígado)
- alanina (no fígado) - ATP
+ Frutose 1,6P

PEP —(Piruvato quinase; ADP, ATP)→ PYR

+ AMP - citrato (+ insulina no fígado)

Frutose 6P —(Fosfofrutoquinase 2; ATP, ADP)→ Frutose 2,6 P

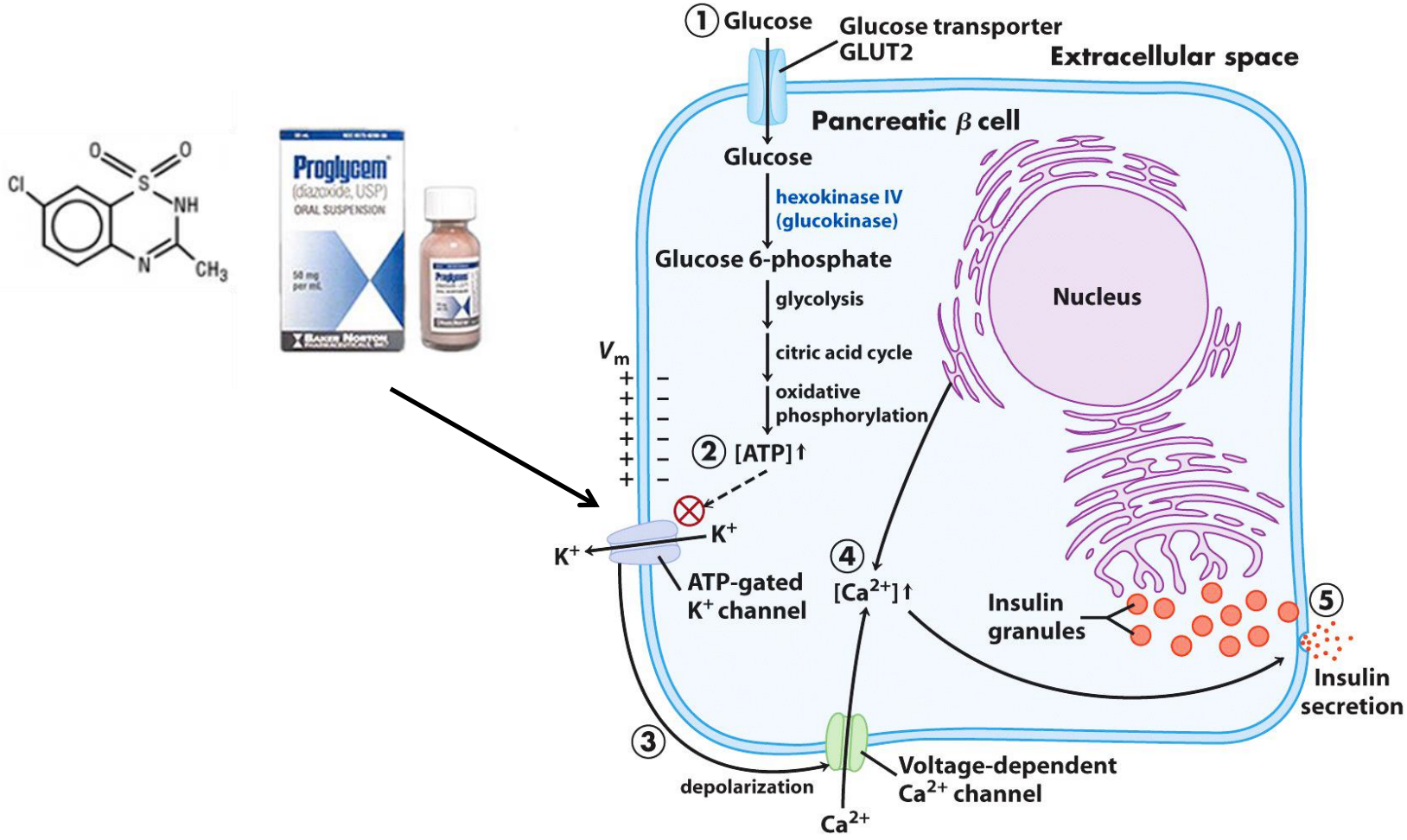
Frutose 2,6 P —(Pi; Frutose 2,6 bisfosfatase)→ Frutose 6P

+ PEP
(+ glucagon no fígado)

+ AMP **+ Frutose 2,6P**
- ATP - citrato

Frutose 6P —(Fosfofrutoquinase 1; ATP, ADP)→ Frutose 1,6 P

Insulinoma - tratamento



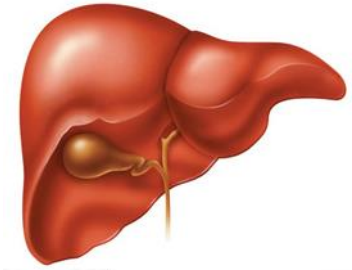
Caso Clínico

- Criança de 10 anos é trazida ao pronto socorro por apresentar fome e sede em excesso há algumas semanas. Urina frequentemente pela casa e aparenta ter perdido peso recentemente. Nesse dia, mostra-se sonolenta e confuse.

Ao exame: levemente desidratada, com baixa densidade muscular, hálito cetônico

Exames clínicos:	glicemia = 550 mg/dL	(normal = 60-125 mg/dL)
	uréia = 45 mg/dL	(normal = 15-40 mg/dL)
	ALT = 120 UI/L	(normal, 80-290 UI/L)
	Creatinina = 0,4 mg/dL	(normal, 0,2-0,6 mg/dL)
	Ácidos graxos livres = 1,8 mmol/L	(normal, 0,3 - 0,8 mmol/L)
	Corpos cetônicos = 290 mg/L	(normal, ~30 mg/L)

Diabetes tipo I = falta de secreção de insulina

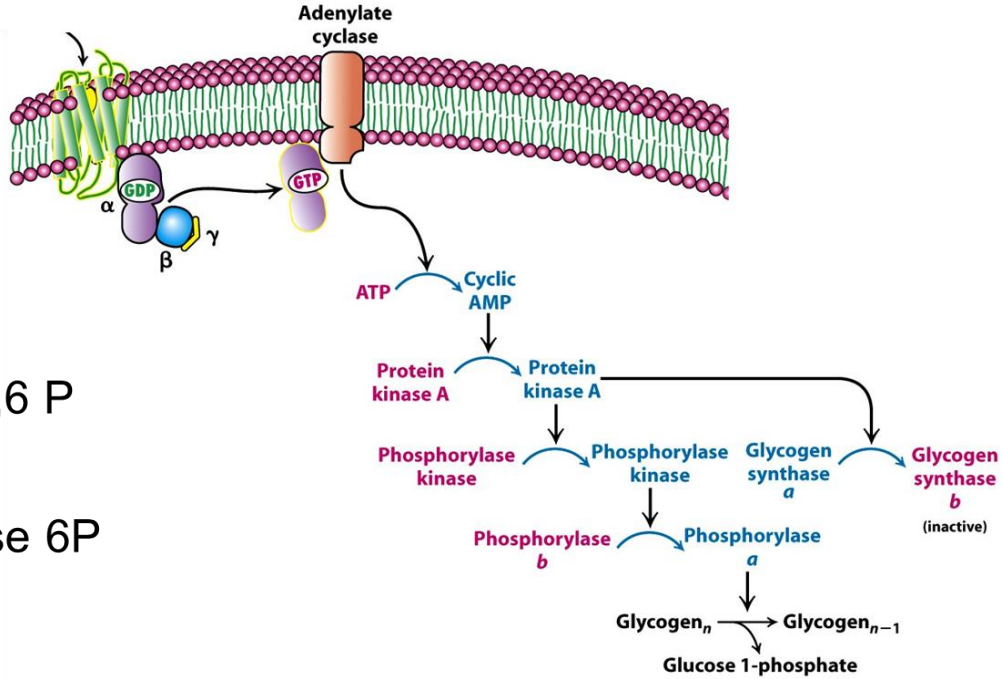


Diabetes tipo I

glicemia = 550 mg/dL (normal = 60-125 mg/dL)

(+ insulina no fígado) (- glucagon no fígado)
- alanina (no fígado) - ATP
+ Frutose 1,6P

PEP —(Piruvato quinase; ADP → ATP)→ PYR



+ AMP - citrato (+ insulina no fígado)

Frutose 6P —(Fosfofrutoquinase 2; ATP → ADP)→ Frutose 2,6 P

Frutose 2,6 P —(Frutose 2,6 bisfosfatase; Pi)→ Frutose 6P

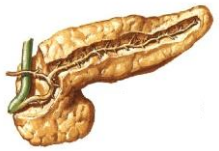
+ PEP
(+ glucagon no fígado)

- AMP **- Frutose 2,6P**

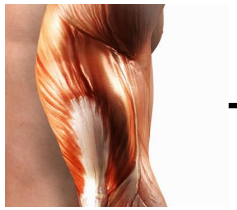
Frutose 1,6 P —(Frutose 1,6 bisfosfatase; Pi)→ Frutose 6 P

Diabetes tipo I

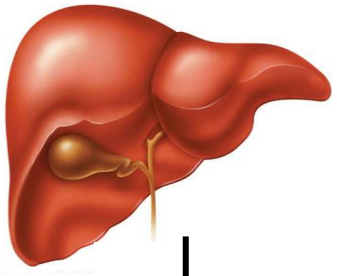
uréia = 45 mg/dL (normal = 15-40 mg/dL)
ALT = 120 UI/L (normal = 80-290 UI/L)
Creatinine = 0,4 mg/dL (normal = 0,2-0,6 mg/dL)



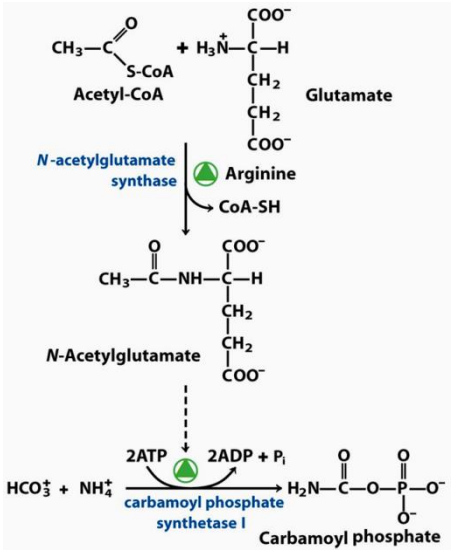
glucagon →



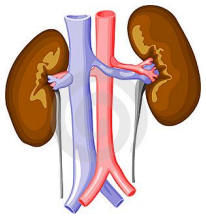
alanina
glutamina →



arginina ↓

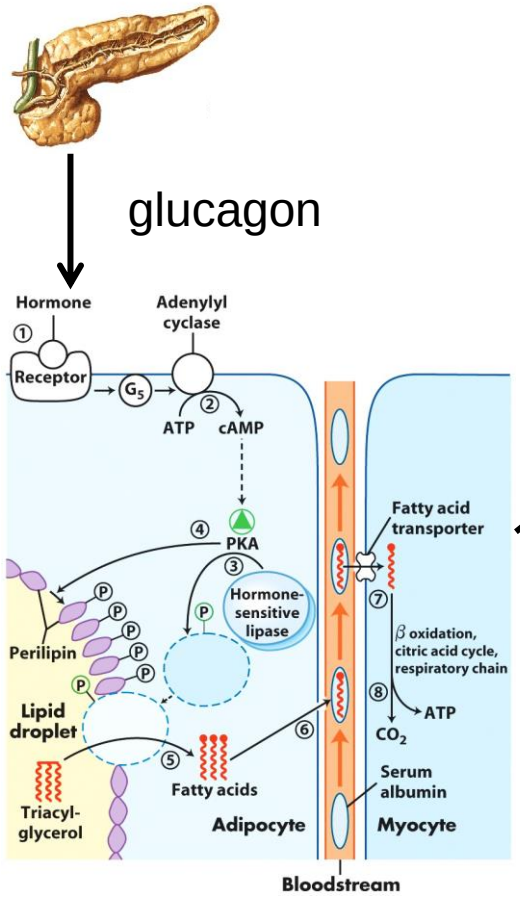


← ↑ Uréia



Diabetes tipo I

Ácidos graxos livres = 1,8 mmol/L (normal, 0,3 - 0,8 mmol/L)
Corpos cetônicos = 290 mg/L (normal, ~30 mg/L)

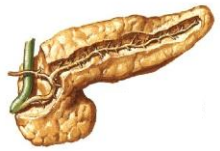


↑ ácidos graxos circulantes

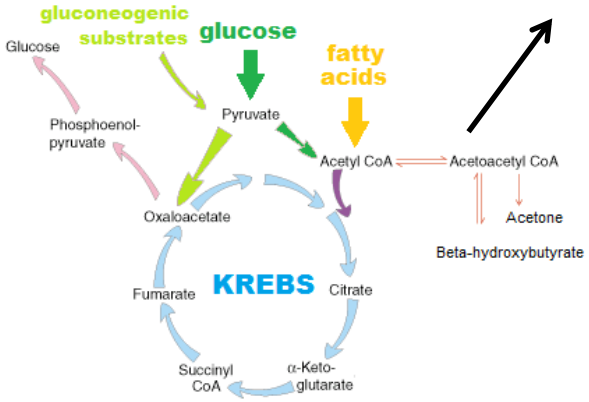
Diabetes tipo I

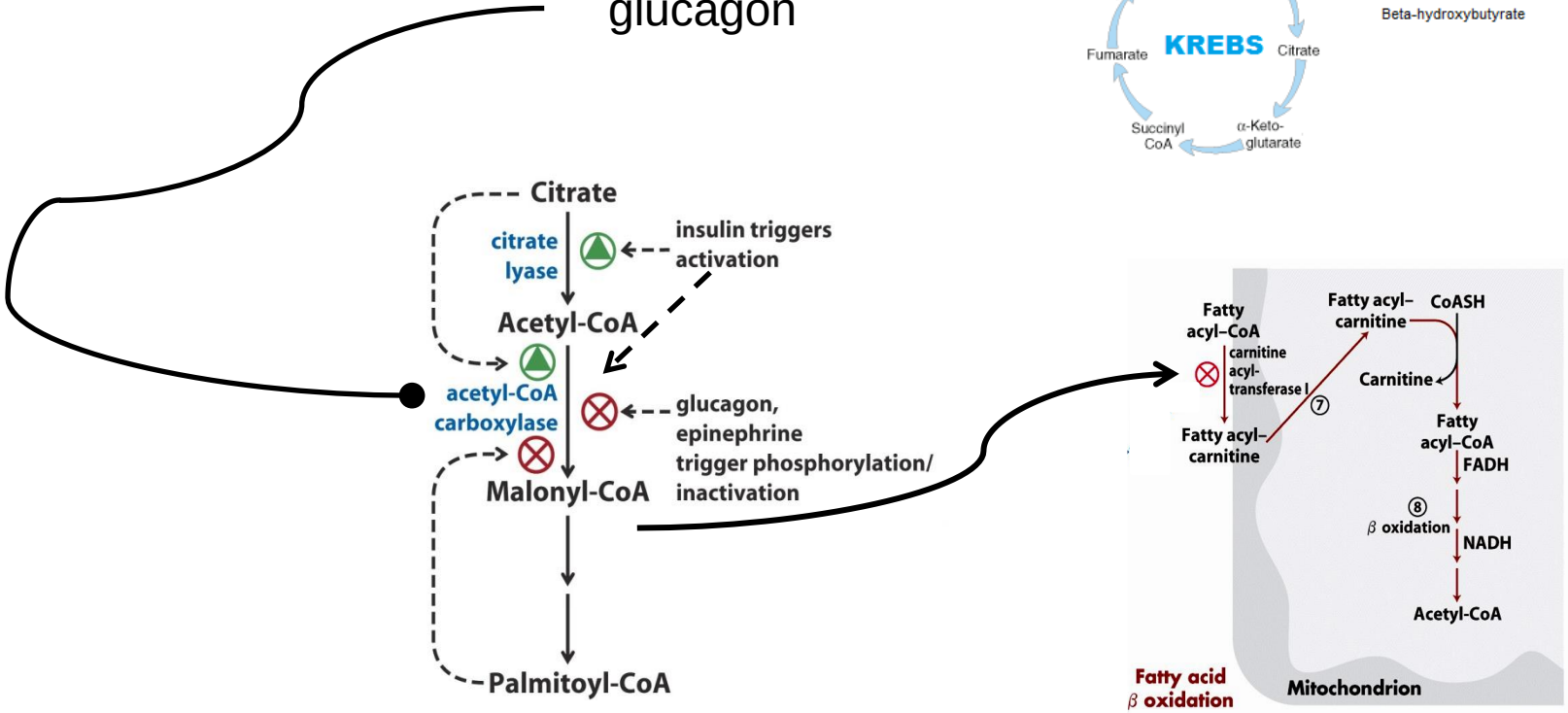
Ácidos graxos livres = 1,8 mmol/L (normal, 0,3 - 0,8 mmol/L)
Corpos cetônicos = 290 mg/L (normal, ~30 mg/L)

↑ corpos cetônicos

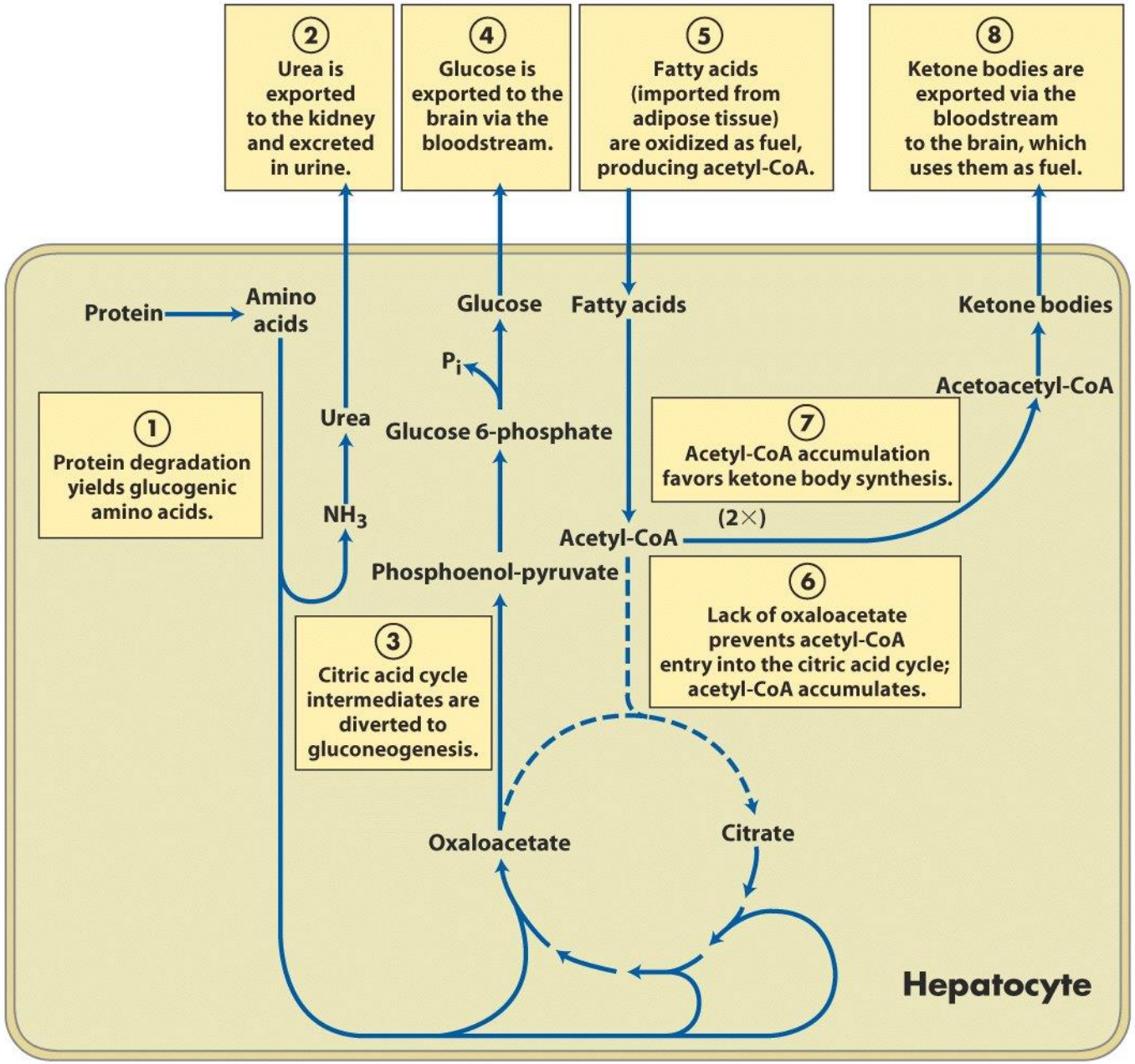


glucagon





Diabetes Mellitus I



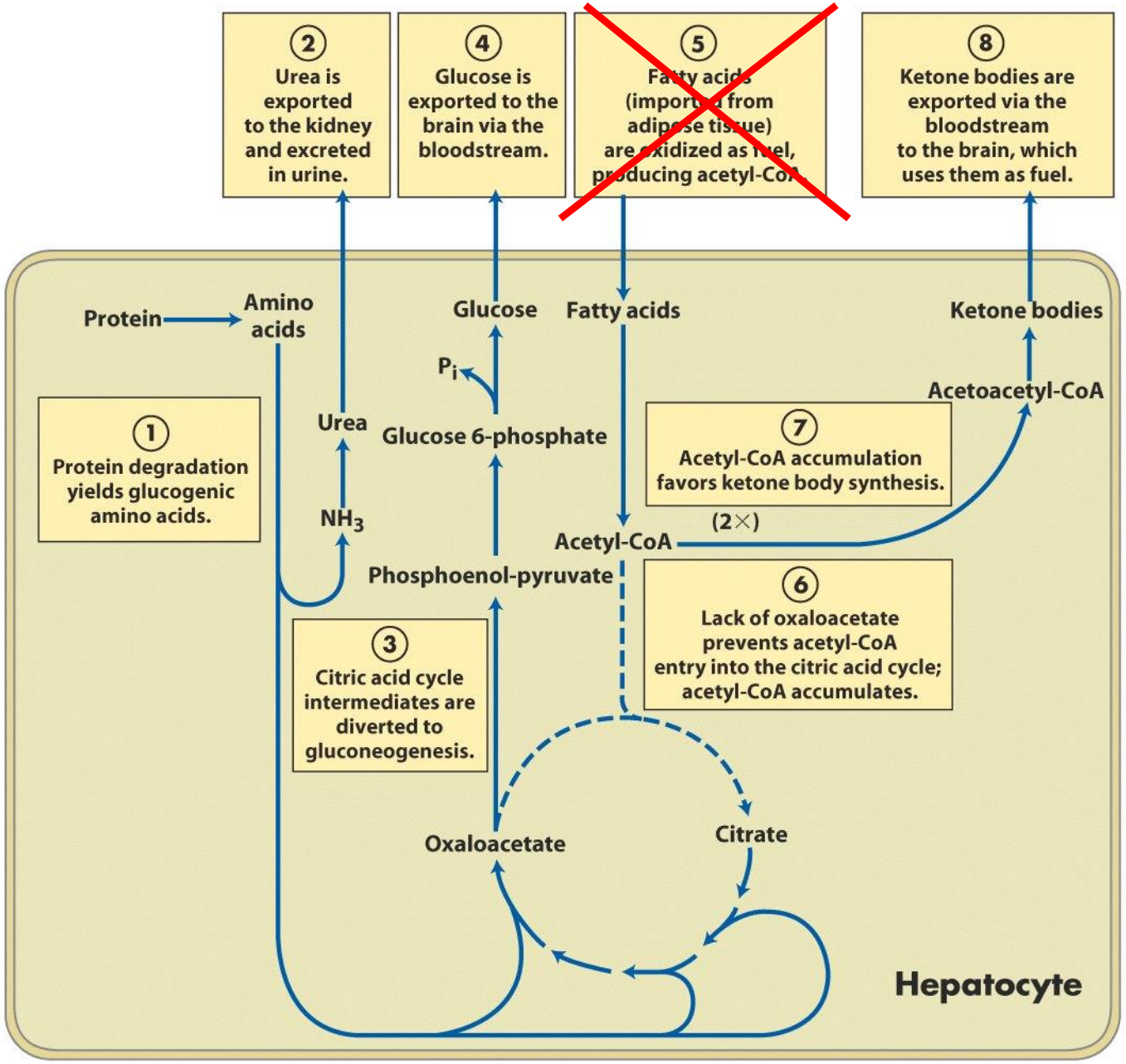
Caso Clínico

- Paciente de 63 anos, assintomático, obeso

	9/10/2009		Catalyst Dx Chemistry Analyzer (Show Details)
Glucose	542	71 – 159 mg/dL	
BUN	32	16 – 36 mg/dL	
Creatinine	1.7	0.8 – 2.4 mg/dL	
BUN/Creatinine Ratio	19		
Phosphorus	3.4	3.1 – 7.5 mg/dL	
Calcium	10.0	7.8 – 11.3 mg/dL	
Total Protein	8.1	5.7 – 8.9 g/dL	
Albumin	3.5	2.3 – 3.9 g/dL	
Globulin	4.6	2.8 – 5.1 g/dL	
ALB/Glob Ratio	0.8		
ALT	31	12 – 130 U/L	
ALP	47	14 – 111 U/L	
GGT	0	0 – 1 U/L	
Bilirubin - Total	0.1	0.0 – 0.9 mg/dL	
Cholesterol	173	65 – 225 mg/dL	

Diabetes tipo II = falta de resposta a insulina

Diabetes Mellitus II ≈ Jejum



Erros comuns que não podem acontecer na Prova!

- Não descrever mecanismos moleculares
- “Célula pensante”
- Metabolismo em círculos
- Uso indevido do termo “alostérico”
- Esquecer estrutura e função de moléculas
- Não saber fosforilação oxidativa e efeito de moduladores
- Não saber fotossíntese
- Não saber fazer reação global
- Não saber fazer conta de ATPs com moduladores resporatórios