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C5730 Biochemie - seminář

Mgr. Lukáš Faltinek

podzim 2024

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Krebsův cyklus

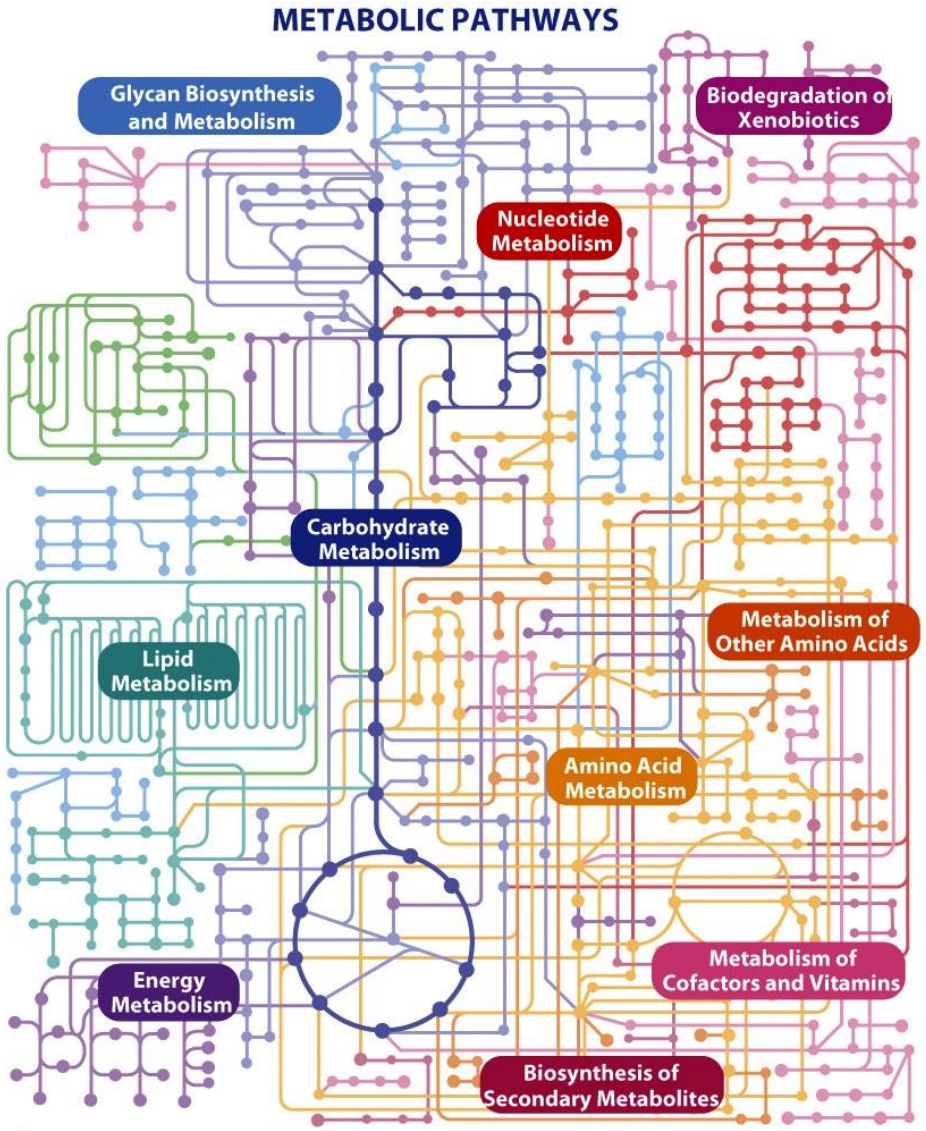

Figure 15-1
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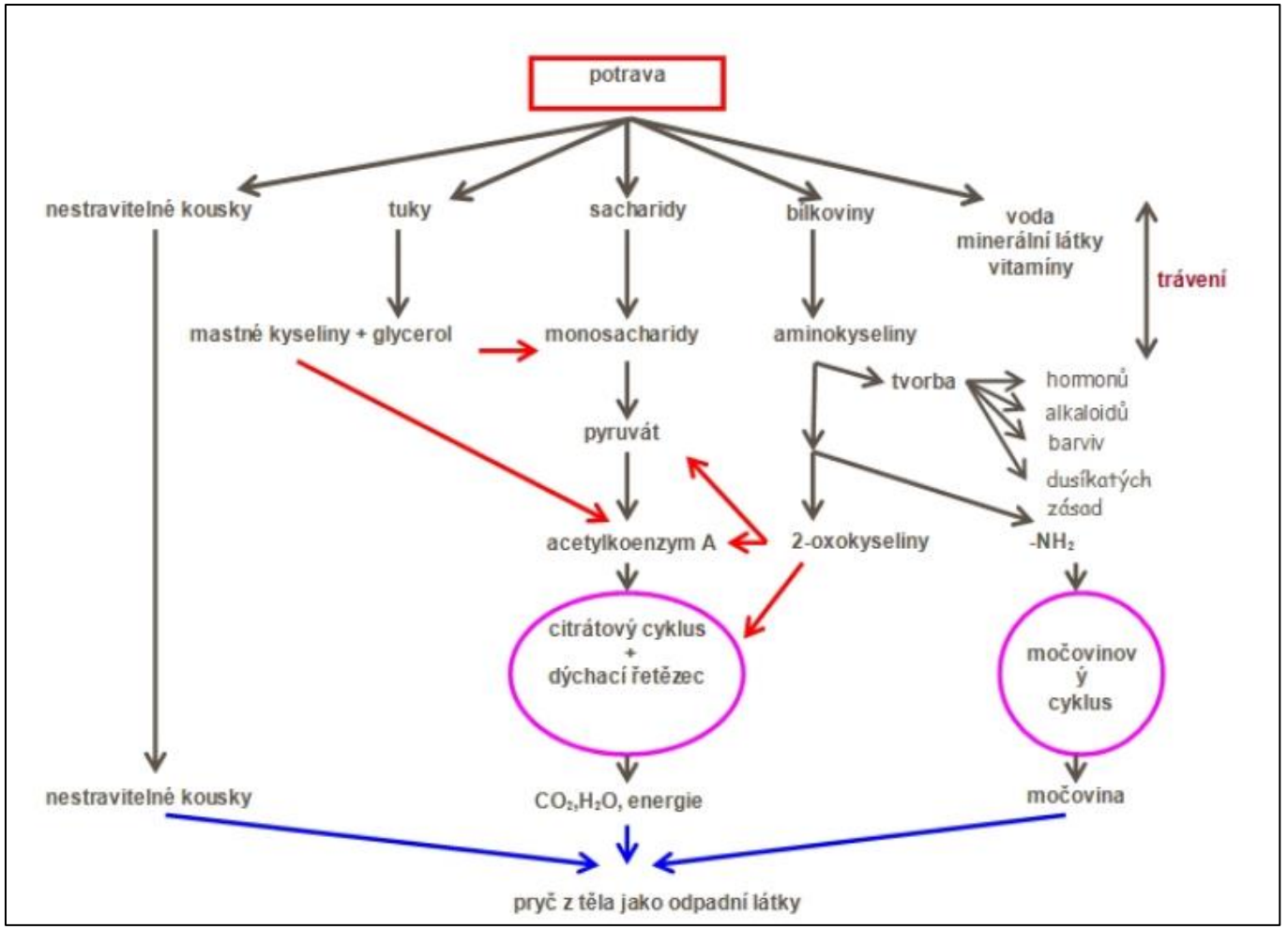

http://www.studiumbiochemie.cz/metabolismus

Hans Krebs, 1900–1981

Krebsův cyklus

- metabolická dráha spojující metabolismus sacharidů, lipidů a bílkovin
- anabolický i katabolický charakter (**amfibolický**)
- druhá fáze buněčného dýchání (spřažen s respiračním řetězcem)

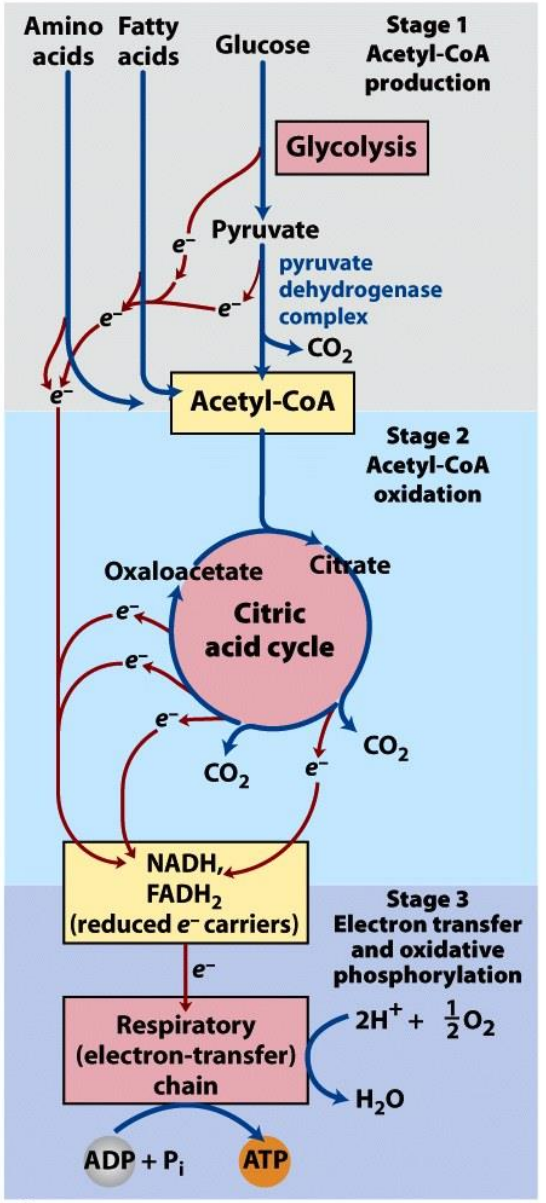

Figure 16-1
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Tvorba acetylkoenzymu A

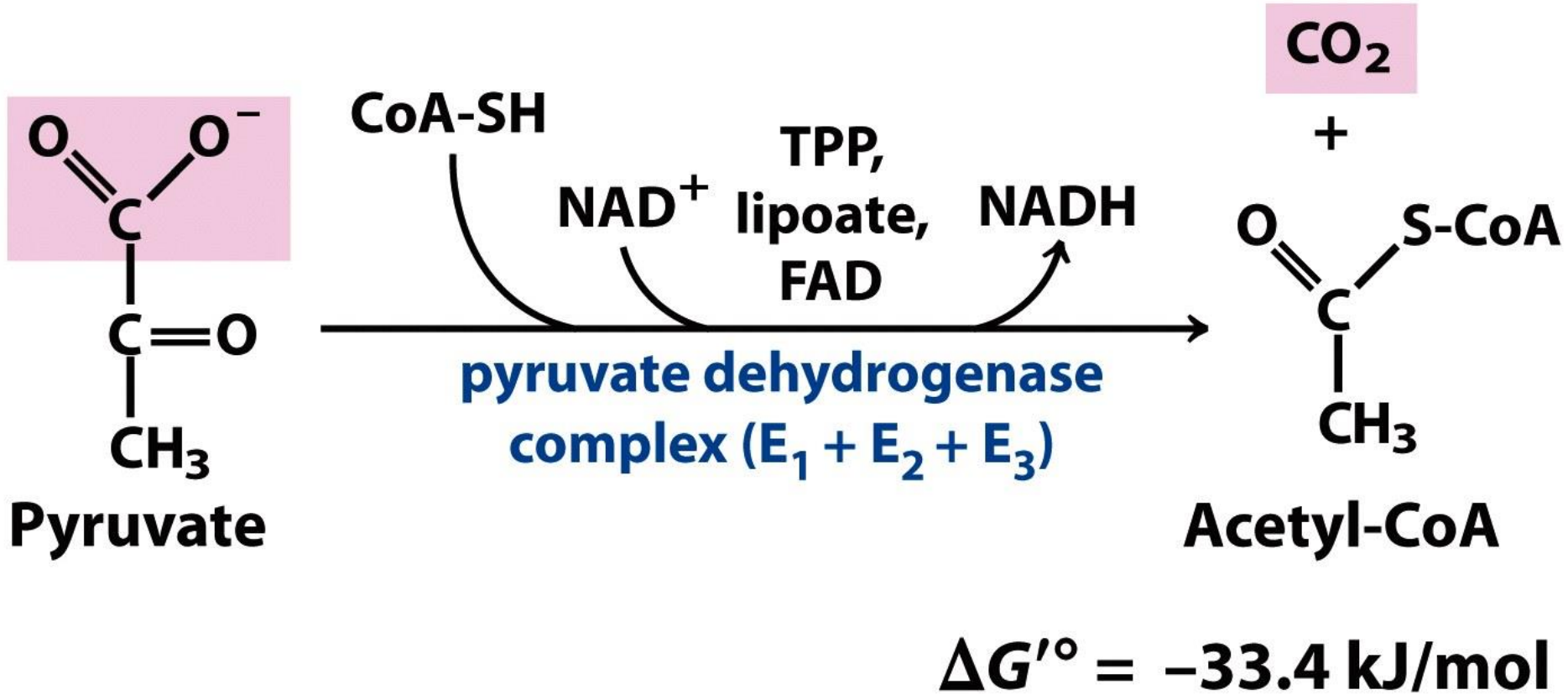

Figure 16-2
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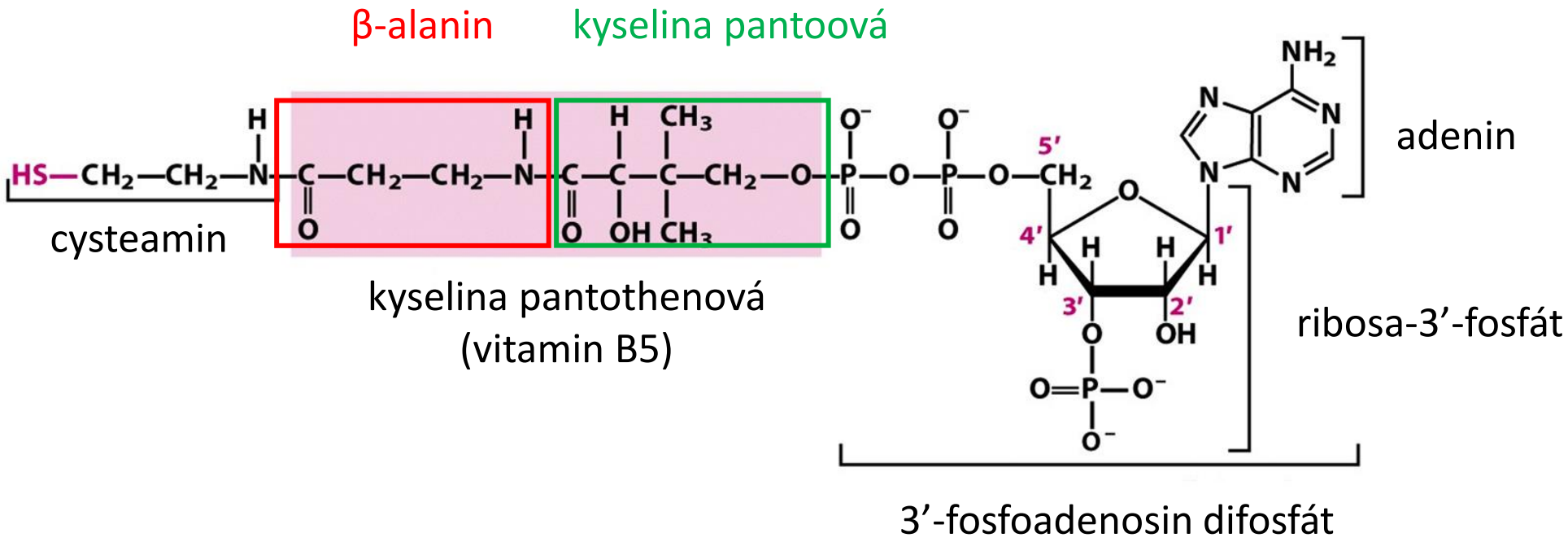
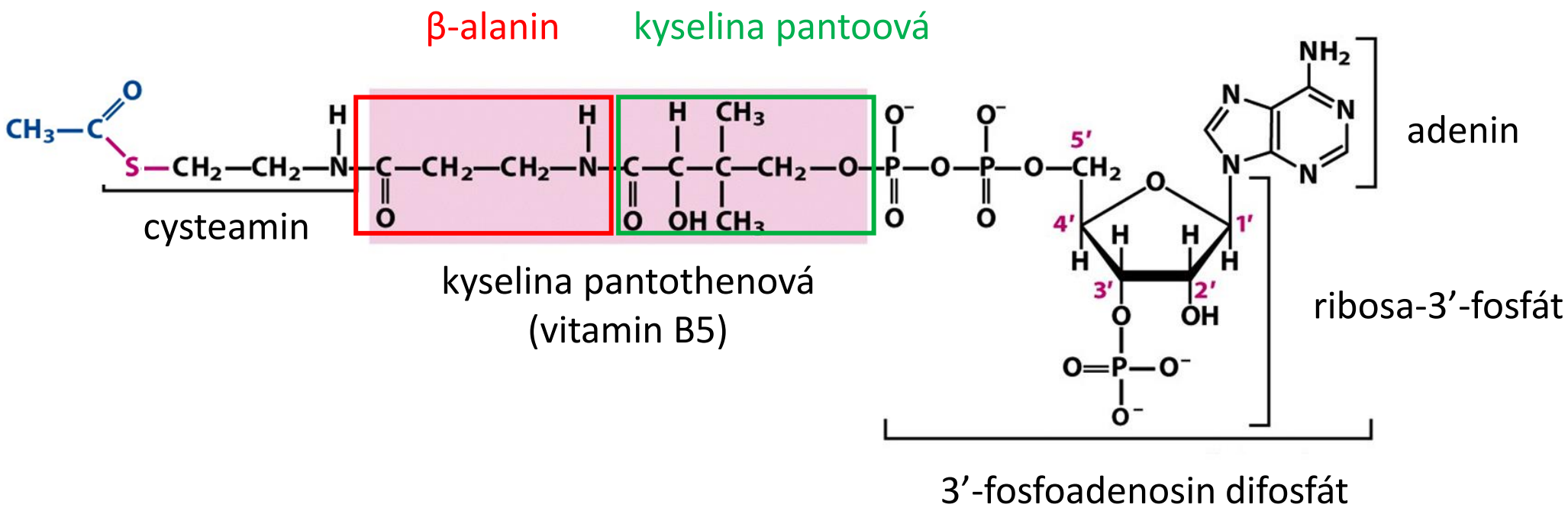
Struktura koenzymu A



Struktura acetylkoenzymu A



Krebsův cyklus

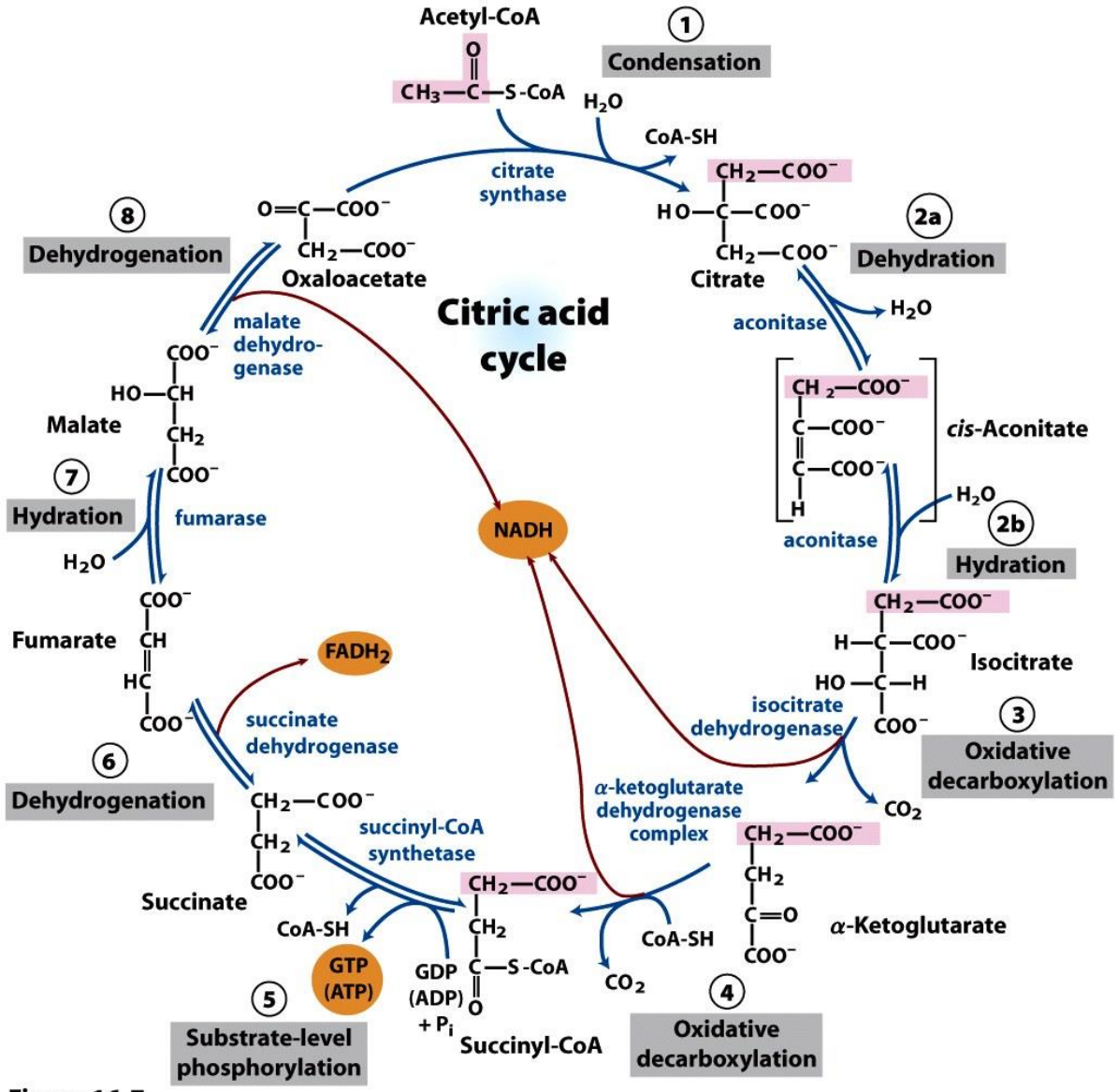


Figure 16-7
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Krebsův cyklus

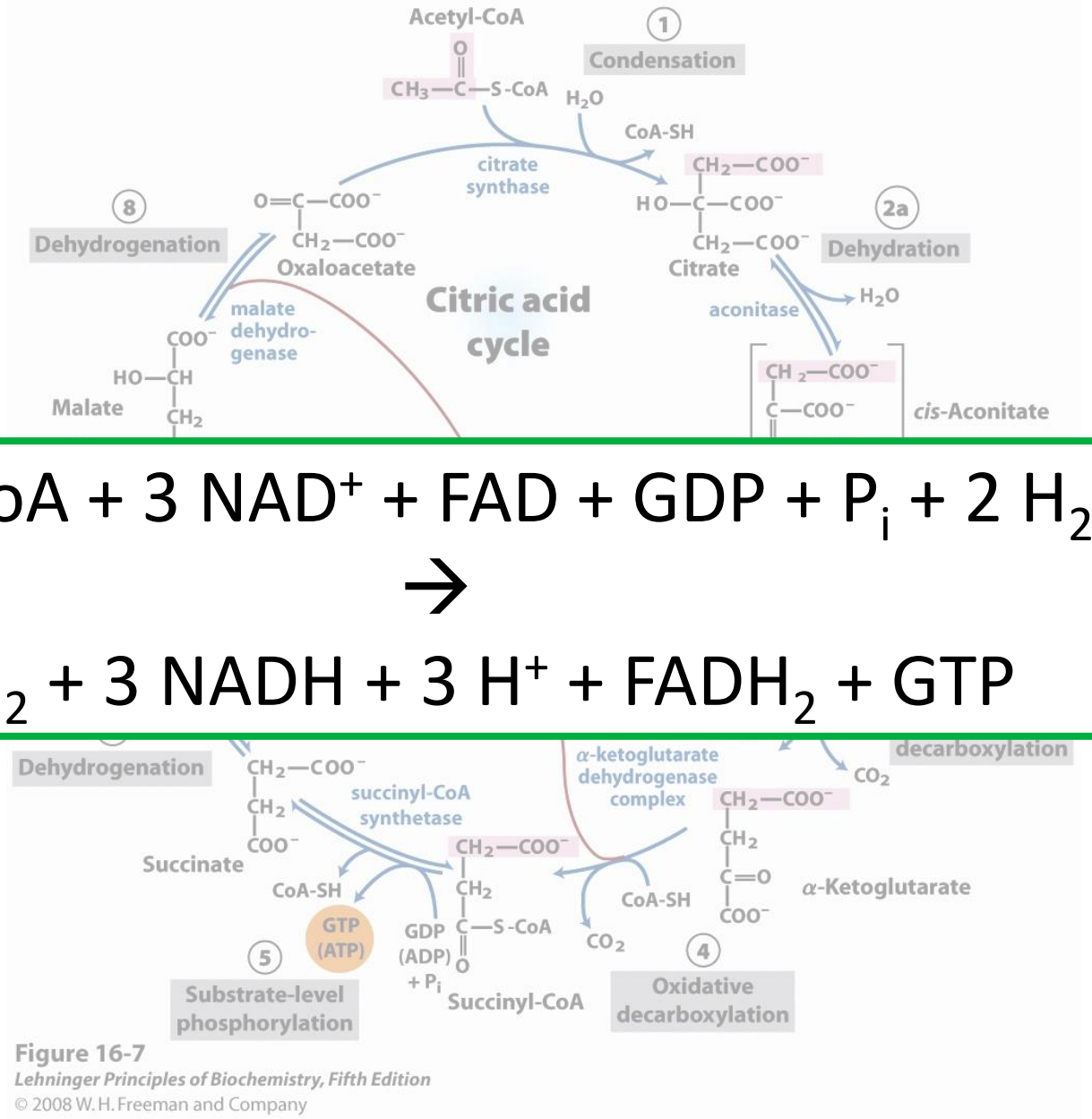

Figure 16-7
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$$\text{Acetyl-CoA} + 3\ NAD^+ + FAD + GDP + P_i + 2\ H_2O \rightarrow 2\ CO_2 + 3\ NADH + 3\ H^+ + FADH_2 + GTP$$

Úloha meziproduktů Krebsova cyklu v anabolismu

prekurzor	aminokyselina
oxalacetát	Asp, Asn
α-ketoglutarát	Glu, Gln, Pro, (Arg, His)
pyruvát	Ala
3-fosfoglycerát	Ser, Cys, Gly
Phe	Tyr

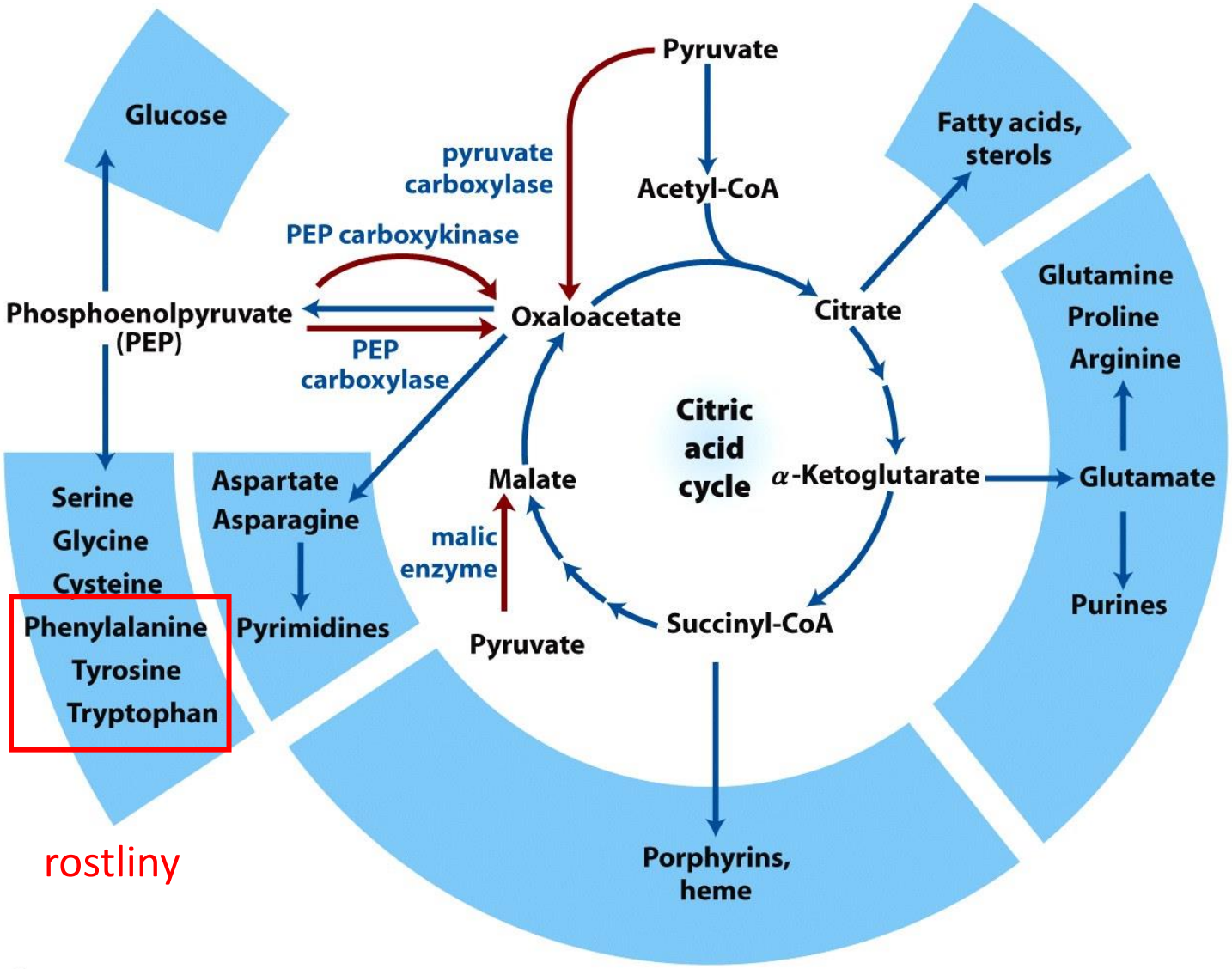

Figure 16-15
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Anaplerotické reakce

- reakce tvořící meziprodukty Krebsova cyklu
- opakem jsou reakce **kataplerotické**

TABLE 16–2 Anaplerotic Reactions

Reaction	Tissue(s)/organism(s)
$\text{Pyruvate} + HCO_3^- + \text{ATP} \xrightleftharpoons{\text{pyruvate carboxylase}} \text{oxaloacetate} + \text{ADP} + P_i$	Liver, kidney
$\text{Phosphoenolpyruvate} + CO_2 + \text{GDP} \xrightleftharpoons{\text{PEP carboxykinase}} \text{oxaloacetate} + \text{GTP}$	Heart, skeletal muscle
$\text{Phosphoenolpyruvate} + HCO_3^- \xrightleftharpoons{\text{PEP carboxylase}} \text{oxaloacetate} + P_i$	Higher plants, yeast, bacteria
$\text{Pyruvate} + HCO_3^- + \text{NAD(P)H} \xrightleftharpoons{\text{malic enzyme}} \text{malate} + \text{NAD(P)}^+$	Widely distributed in eukaryotes and bacteria

Table 16-2
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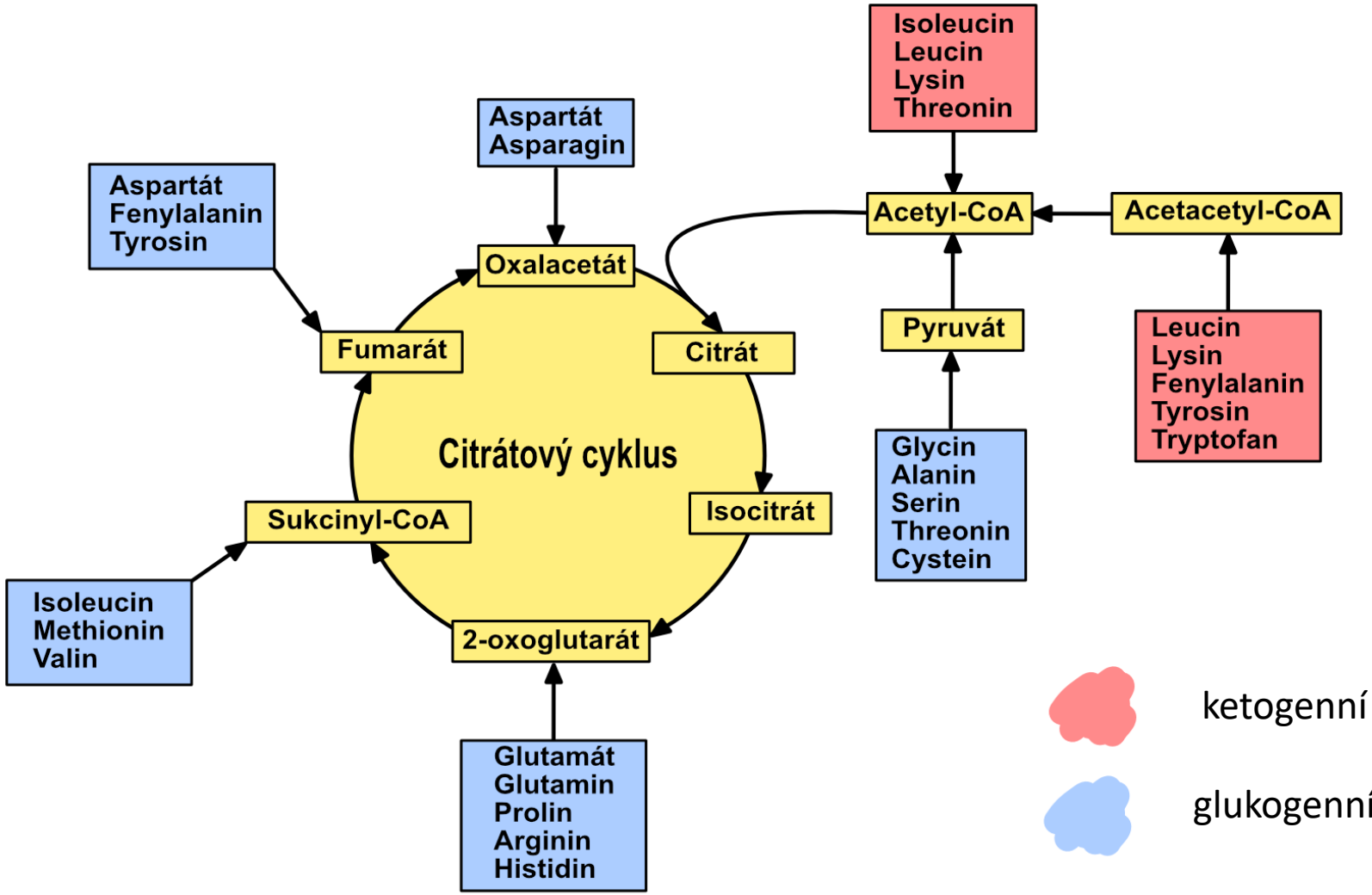
Tvorba meziproduktů z aminokyselin



keto: L

lysin
leucin

keto + gluko: FITTT

fenylalanin
isoleucin
threonin
tyrosin
tryptofan

ketogenní aminokyselina

glukogenní aminokyselina

Regulace Krebsova cyklu

- alosterická inhibice produktem
- negativní zpětná vazba

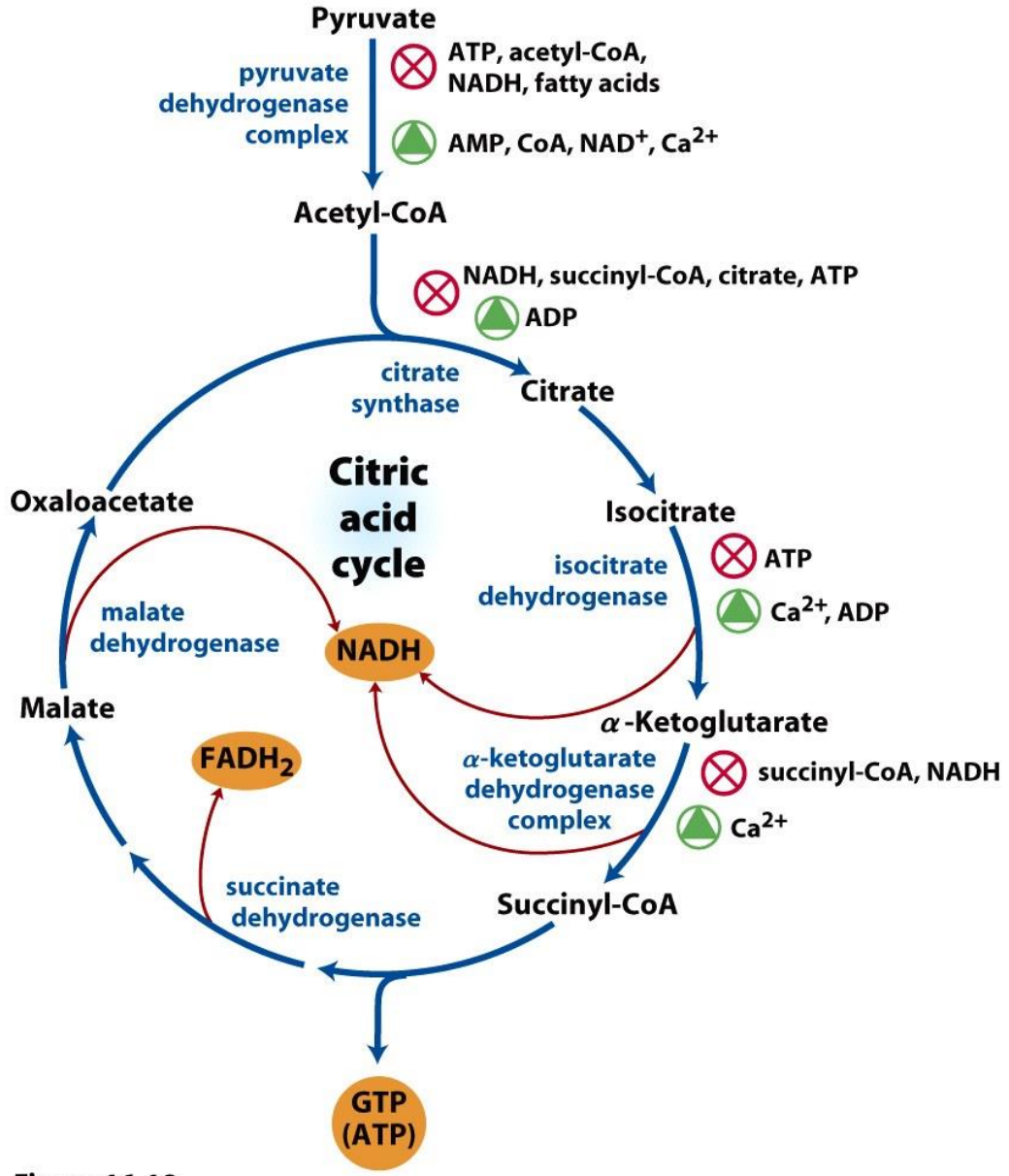


Figure 16-18
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Glyoxylátový cyklus

- probíhá v mitochondriích (a glyoxysomech) některých mikroorganismů a rostlin
- acetyl-CoA se využije na vznik **sukcinátu**, který se v Krebsově cyklu může měnit na oxalacetát
- druhým produktem je **glyoxylát**, který s dalším acetyl-CoA kondenzuje na **malát**

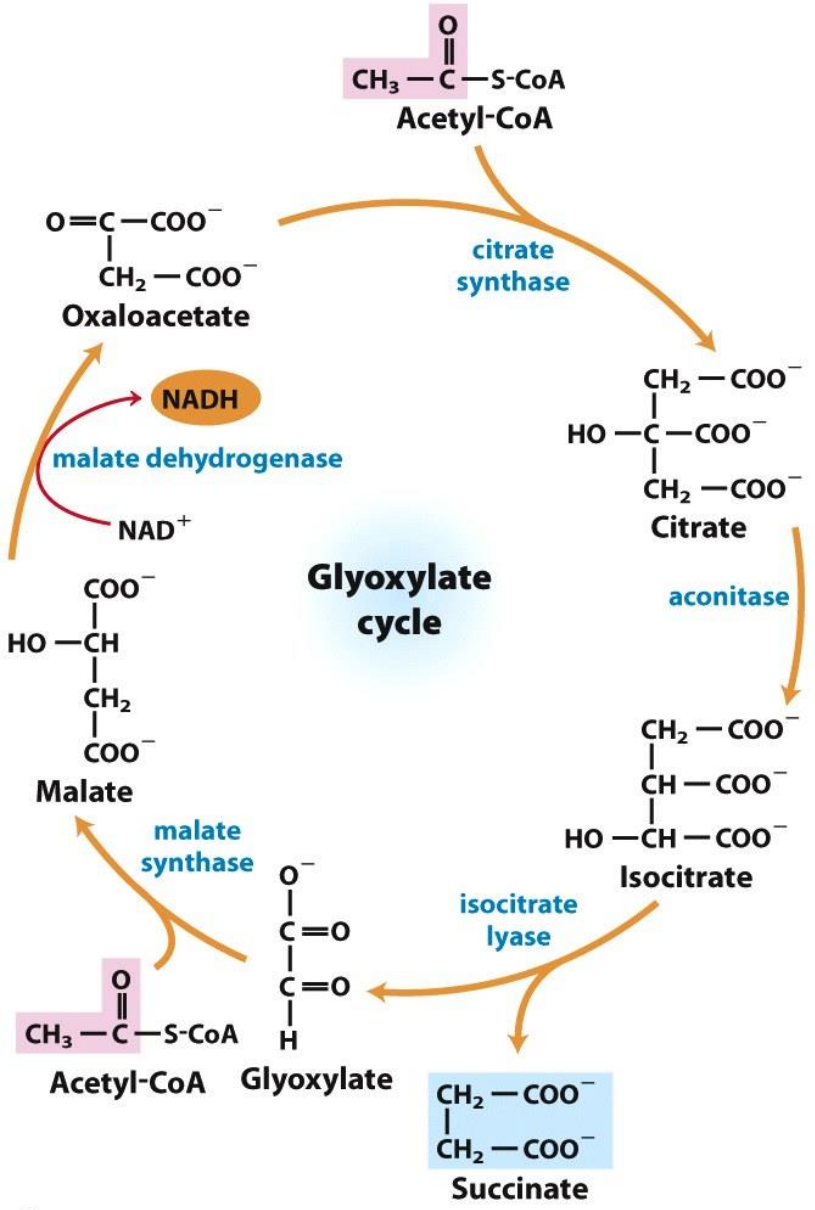

Figure 16-20
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$$2\text{-acetyl-CoA} + 2NAD^+ + FAD \Rightarrow \text{oxalacetát} + 2CoASH + 2NADH + FADH_2 + 2H^+$$

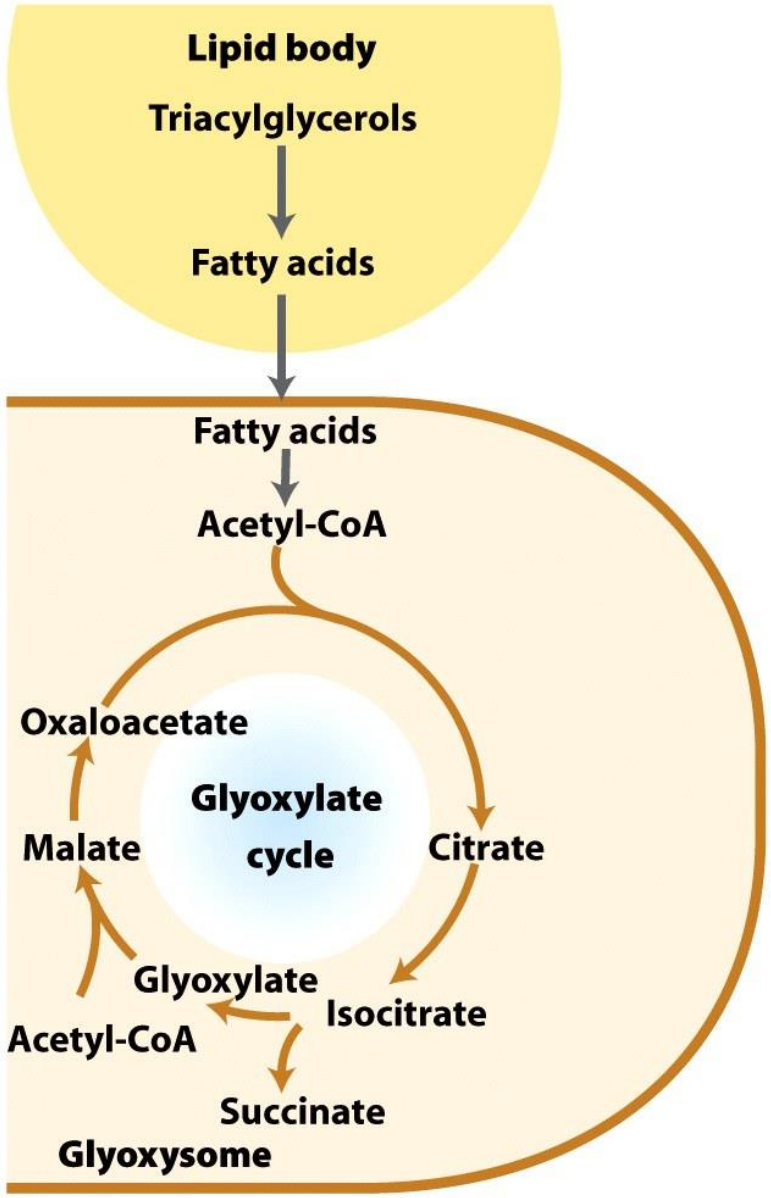

Figure 16-22 part 1
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Propojení glyoxylátového a Krebsova cyklu

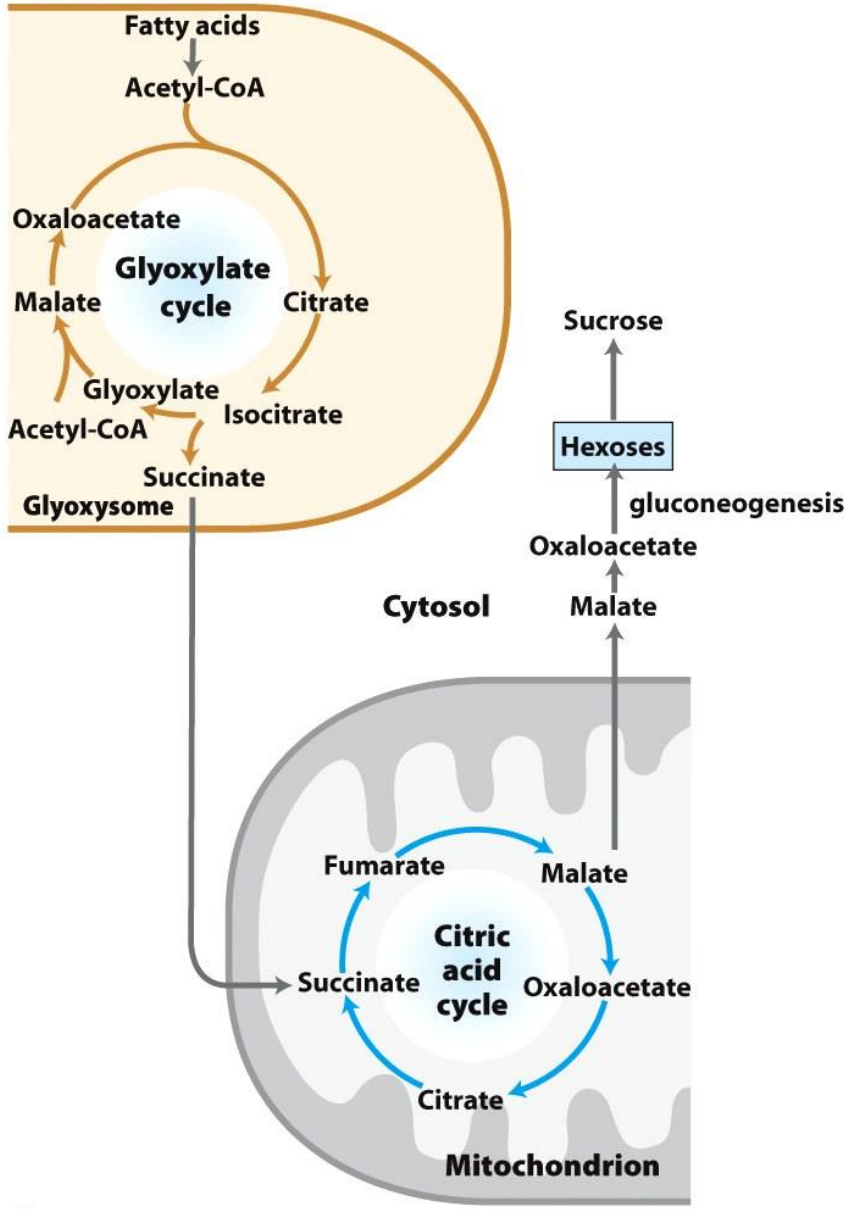

Figure 16-22 part 2
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