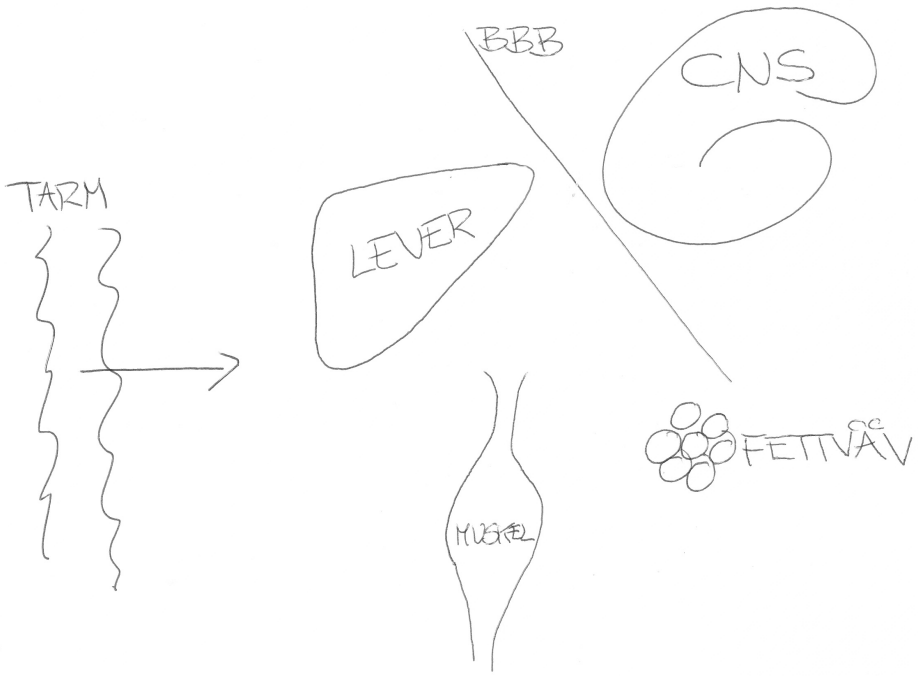
Lipidmetabolism

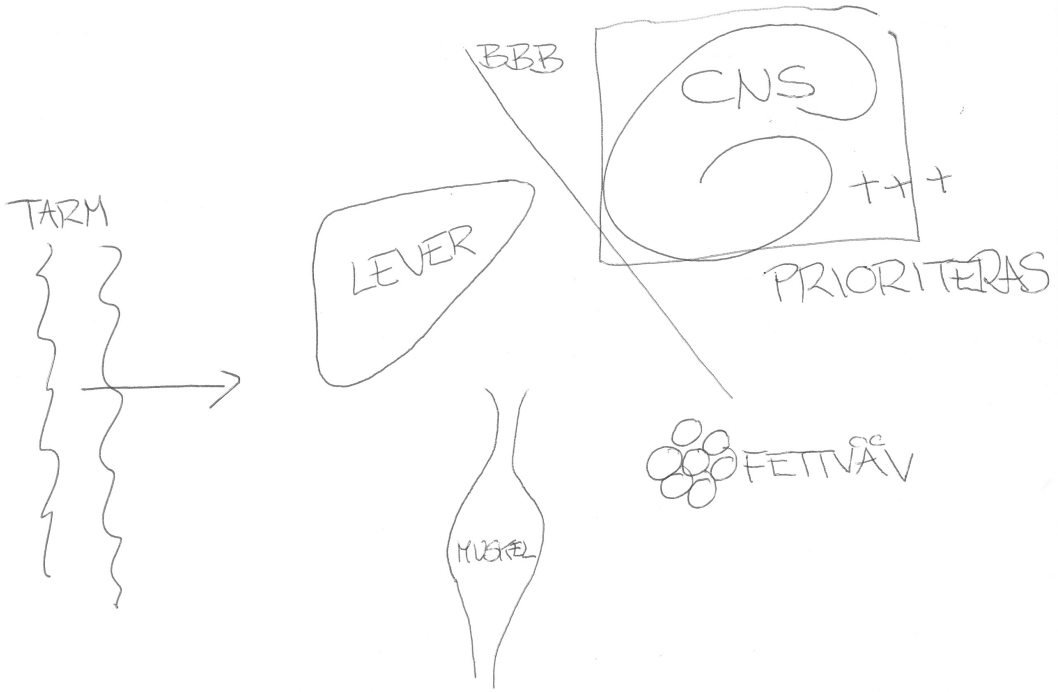
Biochemistry kapitel 22


BBB
CNS
TARM
LEVER
FETTVÄV
MUSKEL

INSULIN – uppbyggnad – ökade energilager

GLUKAGON och ADRENALIN – nedbrytning – minskade energilager

Vid brist på energi ställs metabolismen om så att energitillförsel till CNS prioriteras



Energireserv hos 70 kg man:

TAG	100 000 kcal (ca 11 kg)
Protein	25 000 kcal
Glycogen	600 kcal
Glucos	40 kcal

Total oxidation av fettsyra – ca 9 kcal/g
Total oxidation av kolhydrat – ca 4 kcal/g

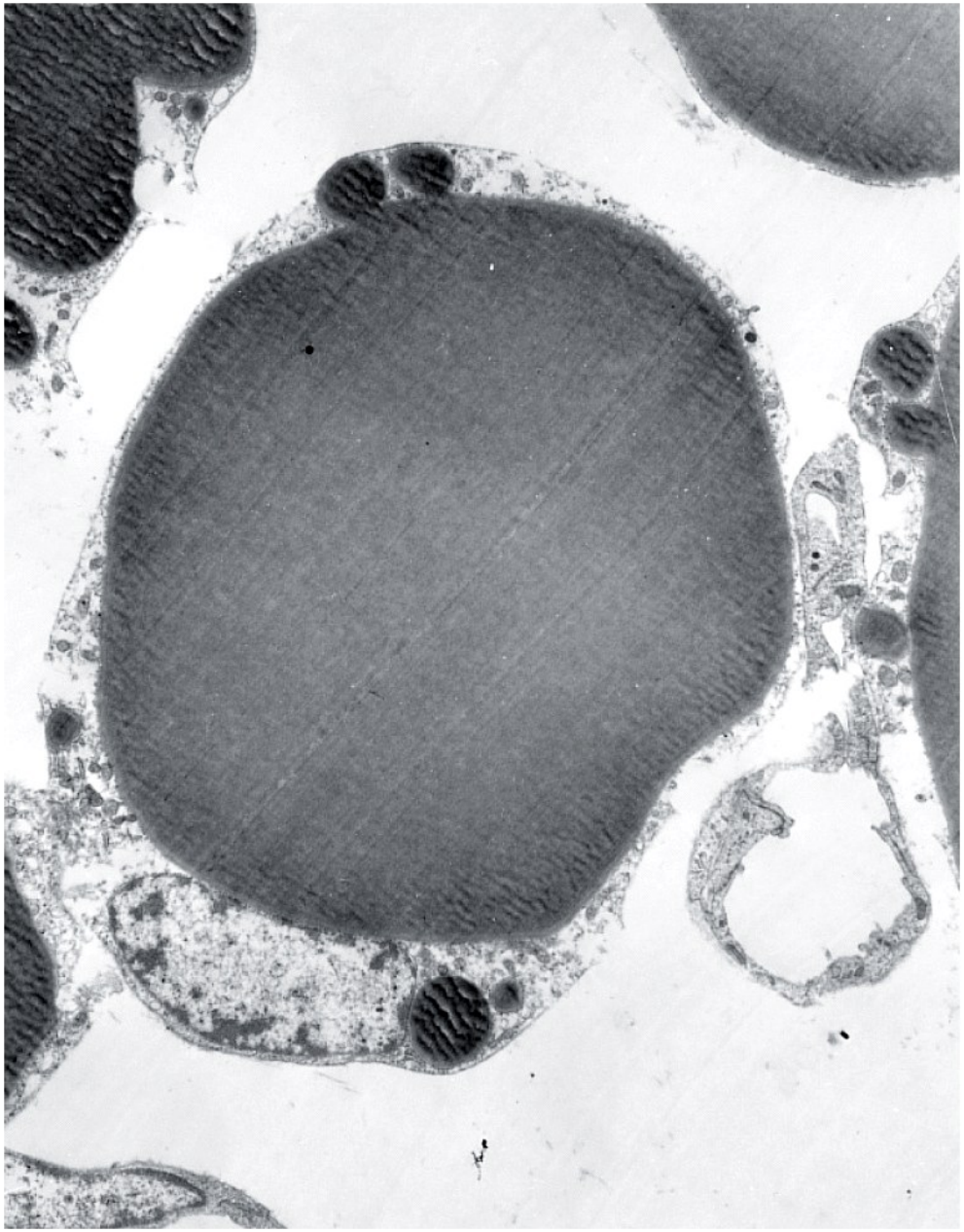


Figure 22.1
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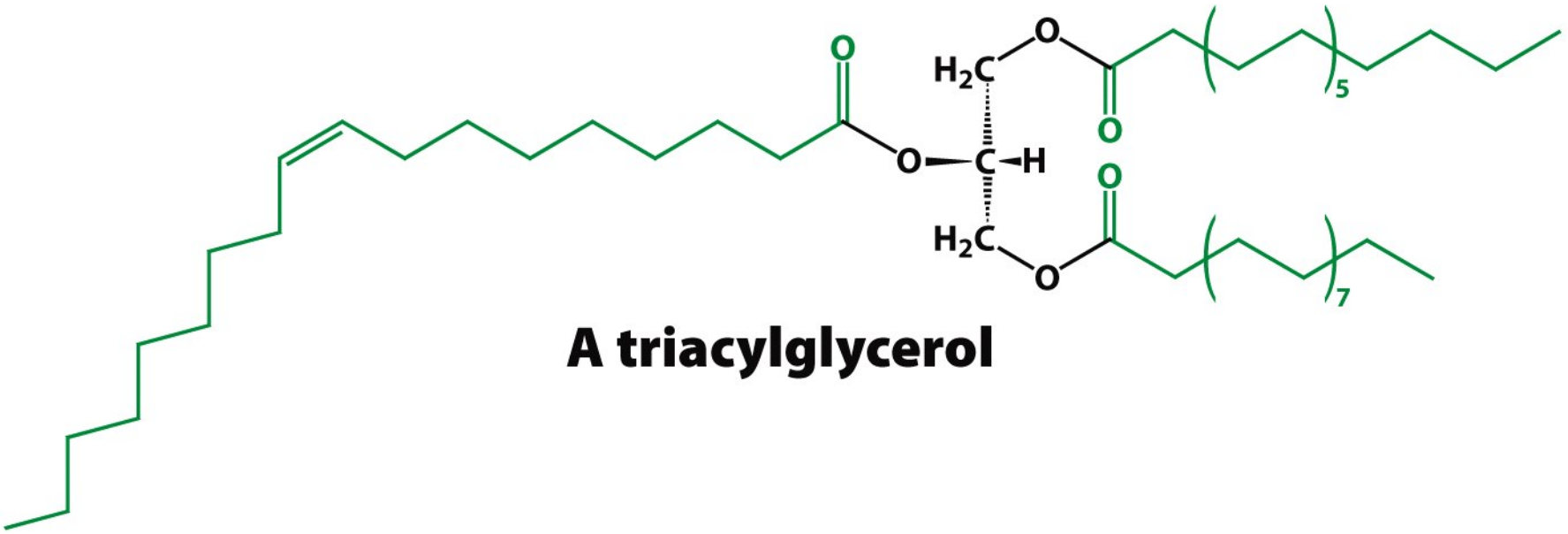

A triacylglycerol

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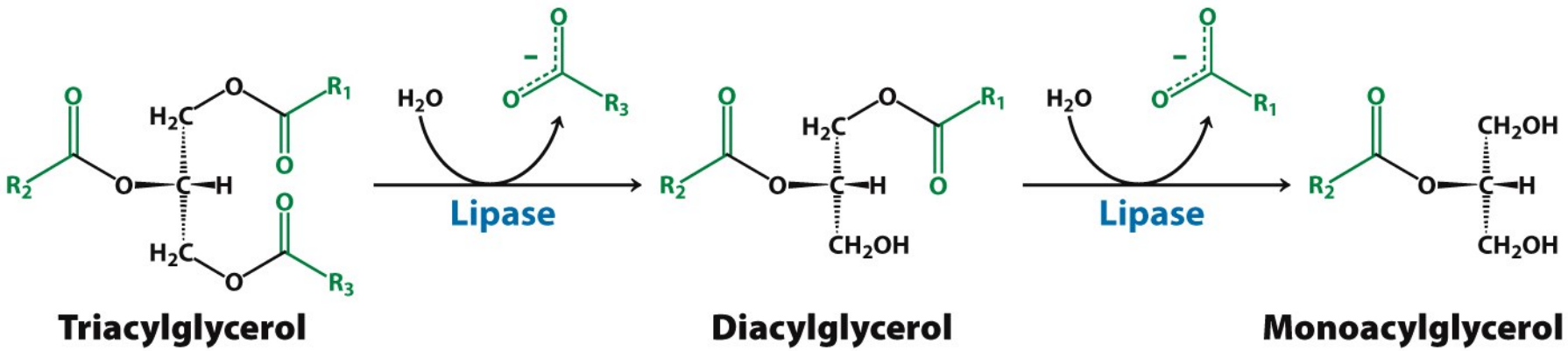


Figure 22.3
***Biochemistry*, Seventh Edition**

FRIA FETTSYROR

Långa kedjor av CH_2 med en karboxylsyra (COOH) i änden

$CH3(CH_2)_nCOOH$

Storlek C_{16}-C_{24}

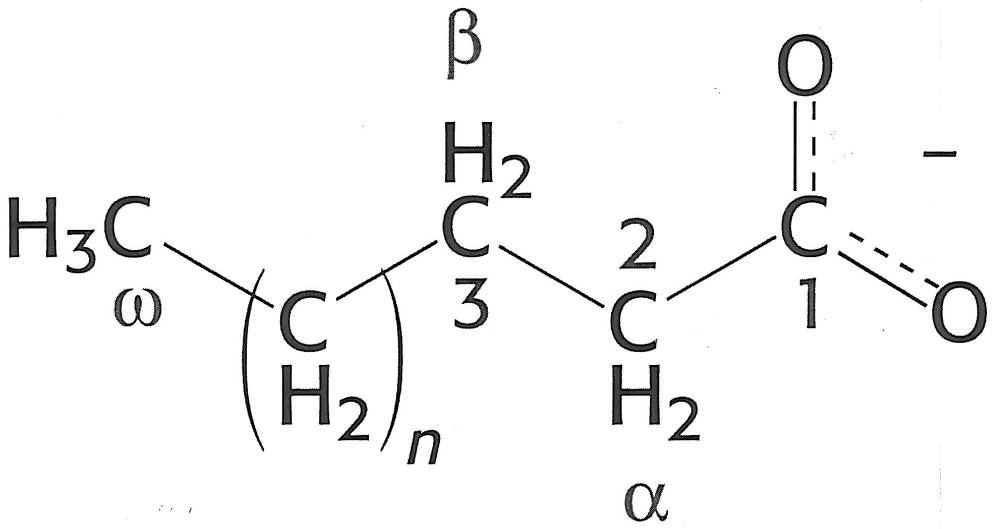
Oftast jämnt antal kolatomer

Mättade = inga dubbelbindningar
Omättade = en eller flera dubbelbindningar

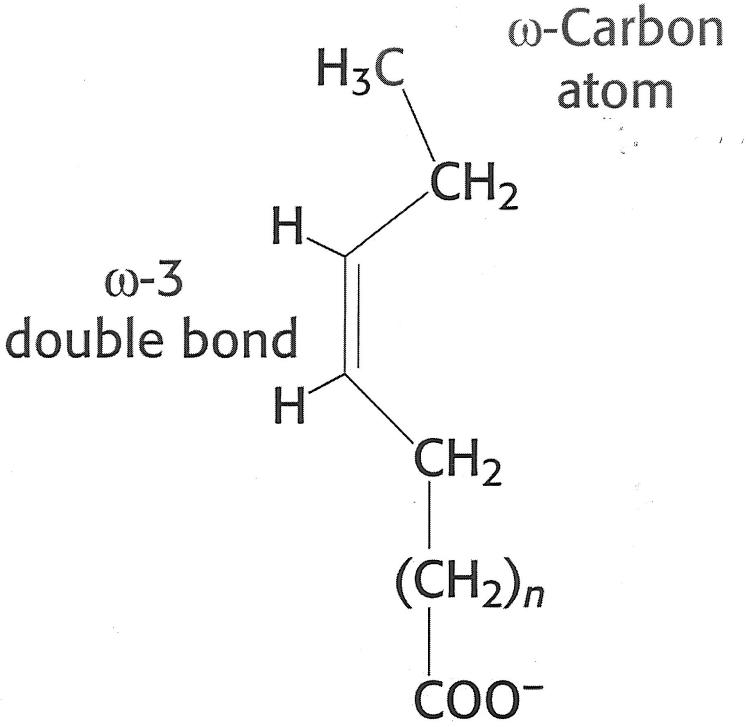
Cis –C=C-
H H

Trans H
-C=C-
H

Fria fettsyror: namngivning



Omegafettsyror



An ω-3 fatty acid

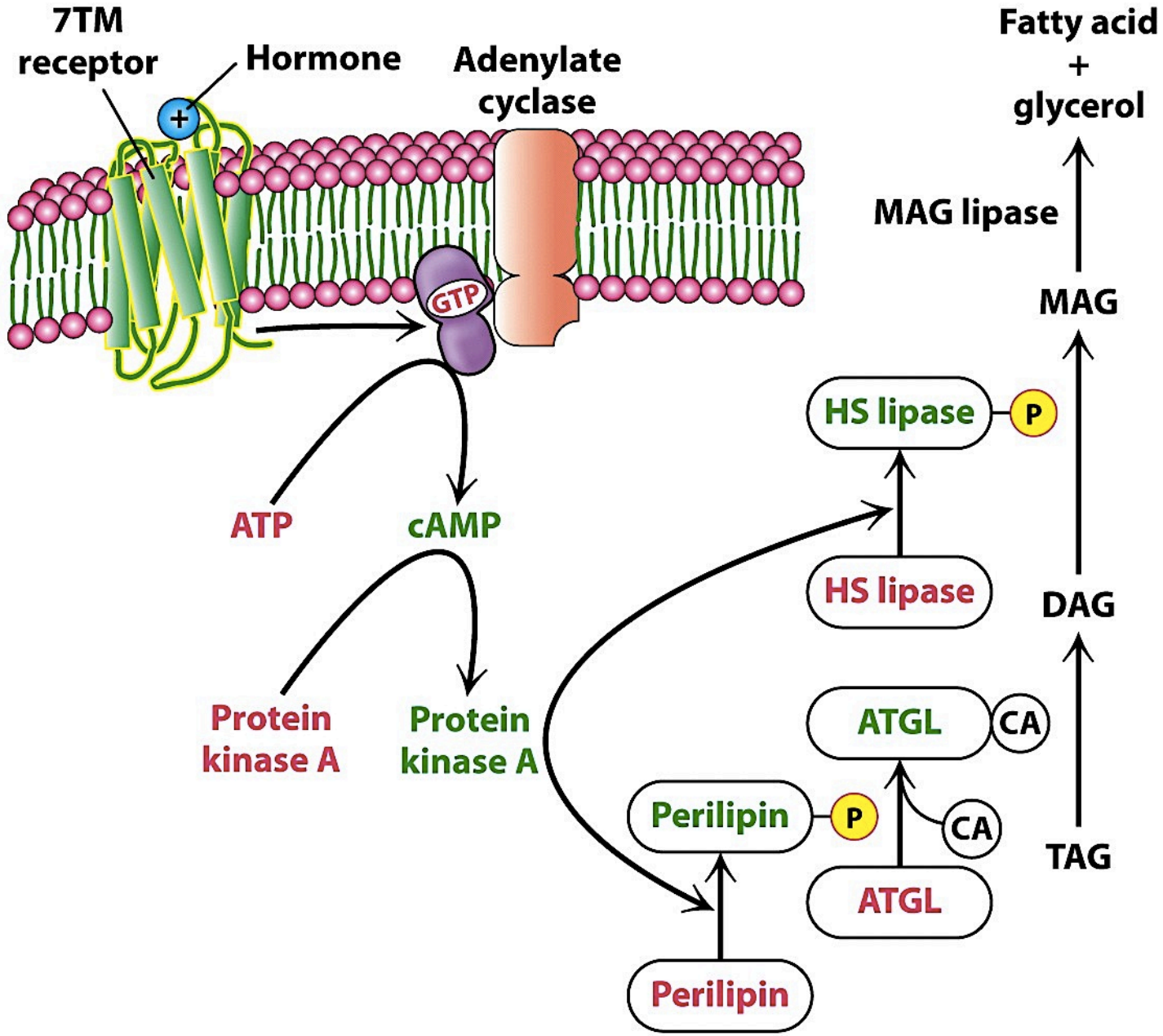


Figure 22.6
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Fria fettsyrorna transporteras bundna till ALBUMIN i blodbanan.

Albumin kan inte passera blod-hjärn-barriären så fria fettsyror från adipocyter i periferin kan ej direkt transporteras till CNS

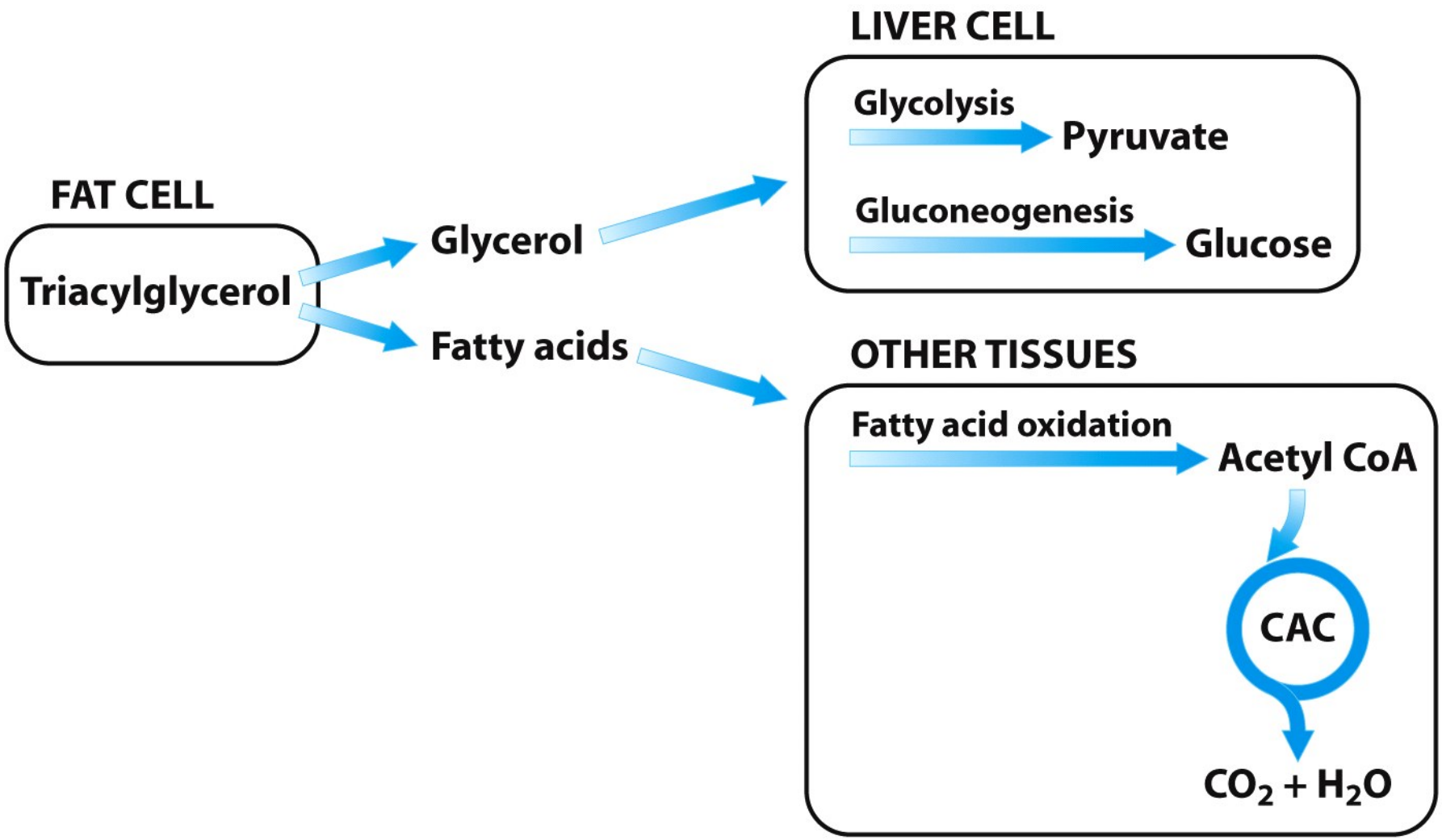

Figure 22.7
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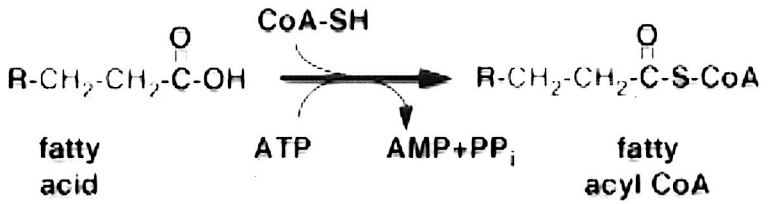
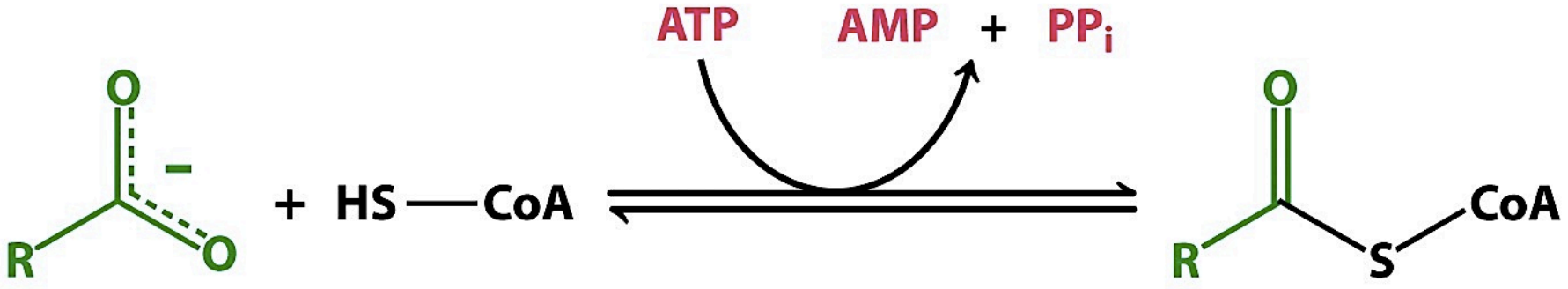
Activation step

The first phase of this process is conversion of the fatty acid into a fatty acyl CoA.

This activation step requires energy - 2 ATP.



The fatty acid acyl then enters a mitochondria for further degradation.



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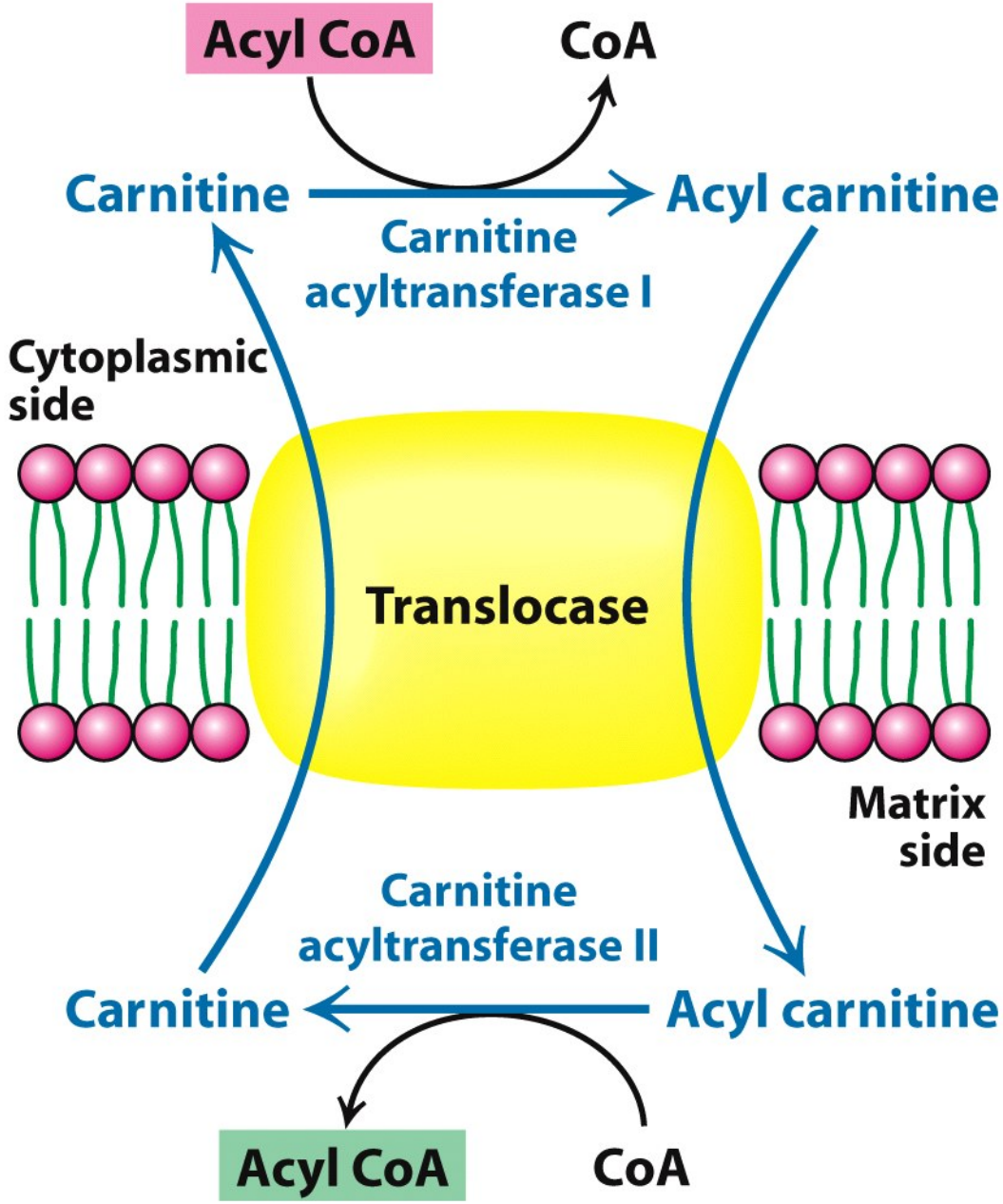


Figure 22.8
***Biochemistry*, Seventh Edition**

Fatty acid degradation

β-oxidation

Fatty acids are recycled through the same five step process.

Two carbons are removed each time.

An acetyl CoA is produced with each pass.

Acetyl CoA then goes on to the citric acid cycle for energy production.

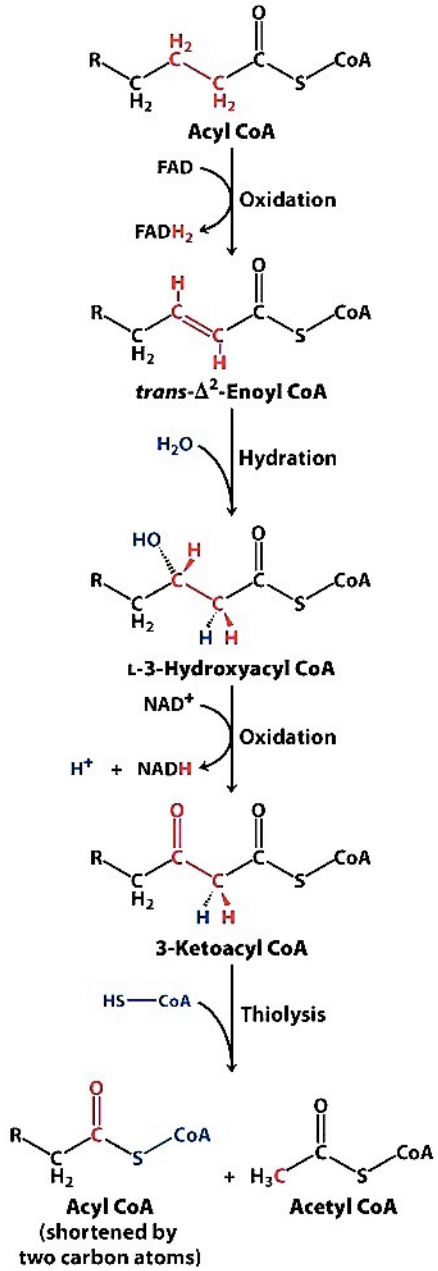


Figure 22.9

***Biochemistry*, Seventh Edition**

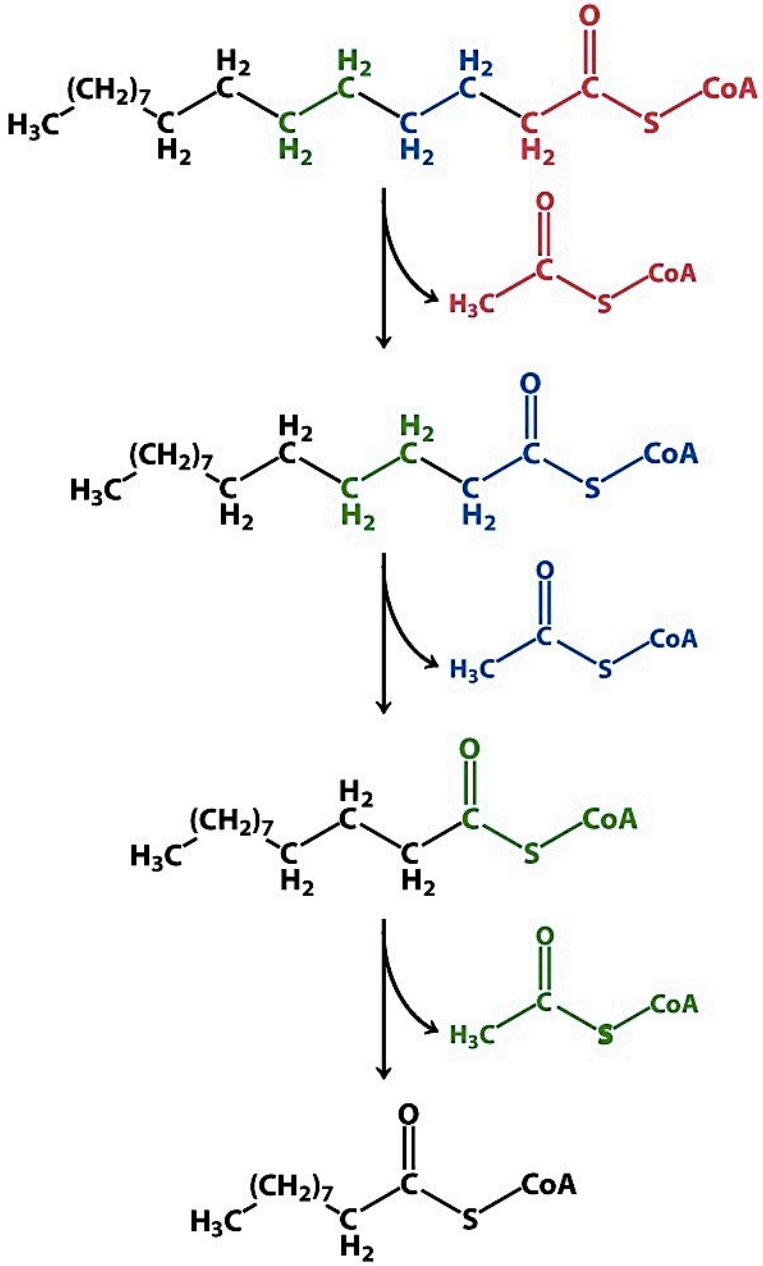


Figure 22.10
***Biochemistry*, Seventh Edition**

AcetylCoA metaboliseras via citronsyracykeln (AcetylCoA + oxaloacetat – citrat osv)

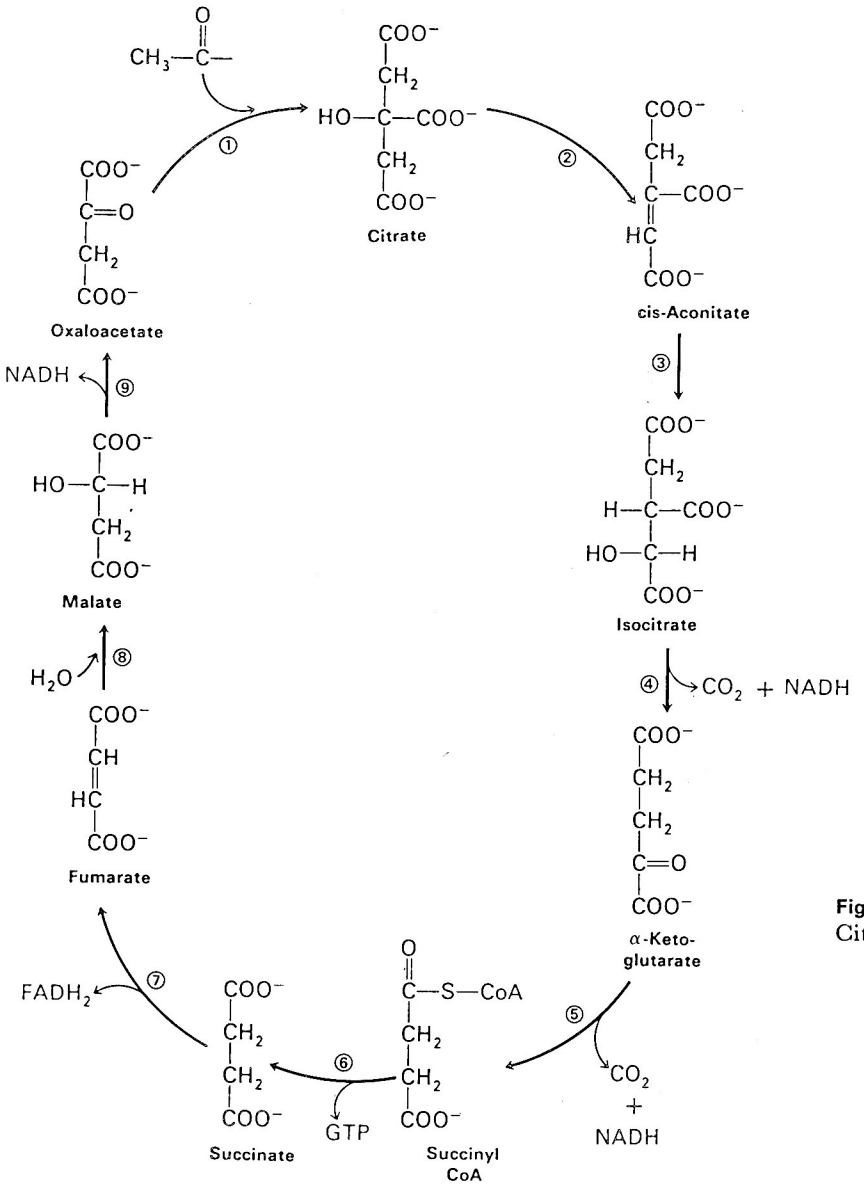


Figure 13-5
Citric acid cycle.

Example - stearic acid
18 carbon fatty acid

Step	ATP/Unit	Total ATP
Activation step		-2
9 acetyl CoA	12	90
8 $FADH_2$	2	12
8 ($NADH + H^+$)	3	20
Total ATP		120

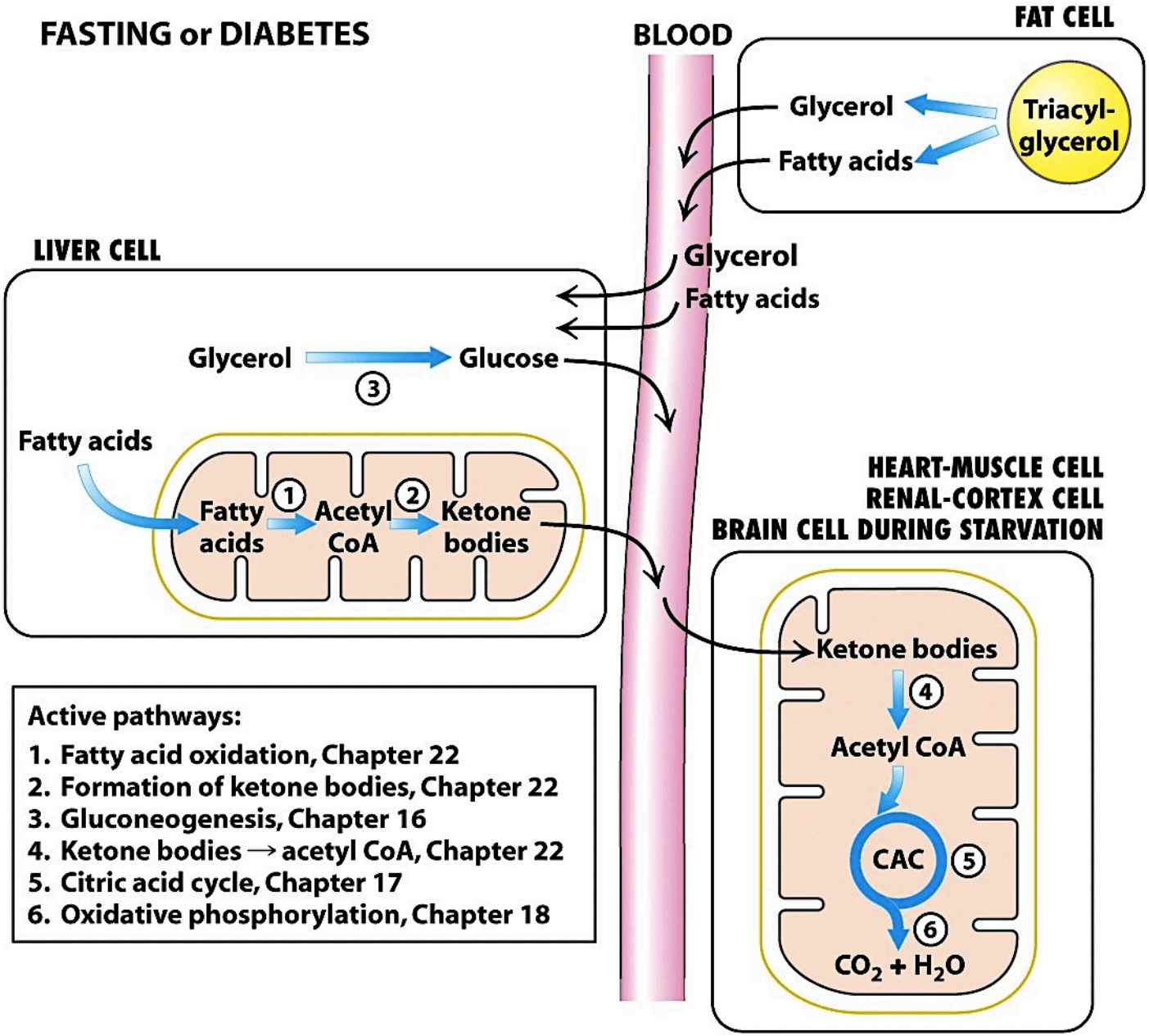


Figure 22.22
Biochemistry, Seventh Edition

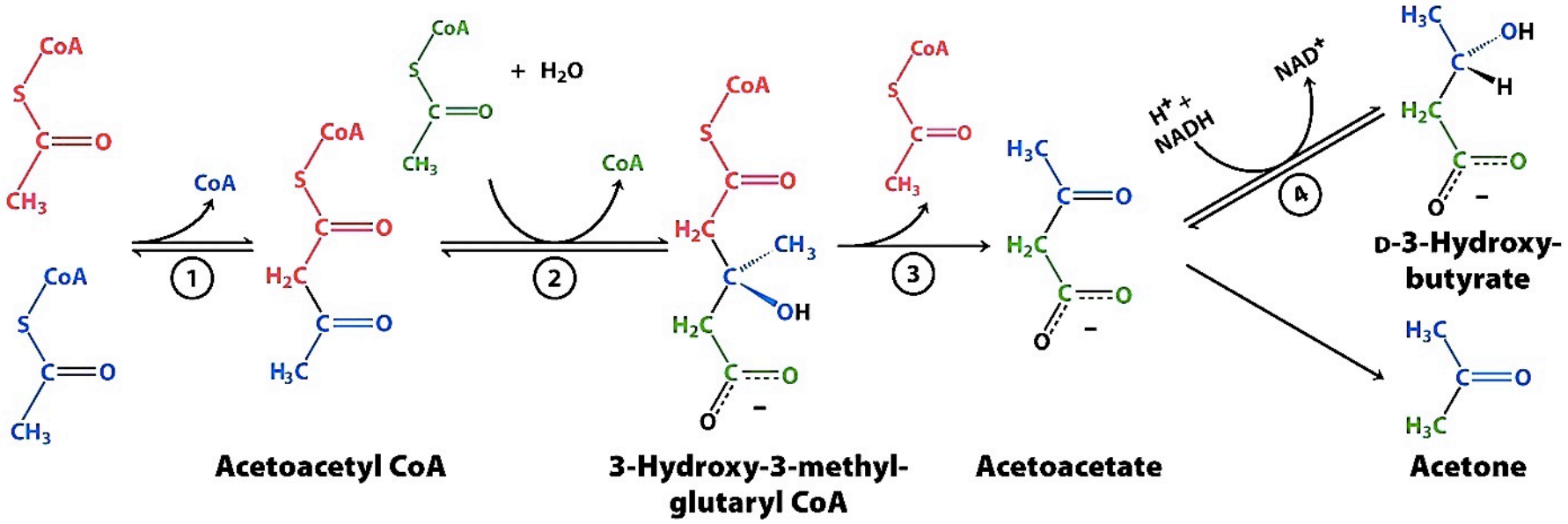
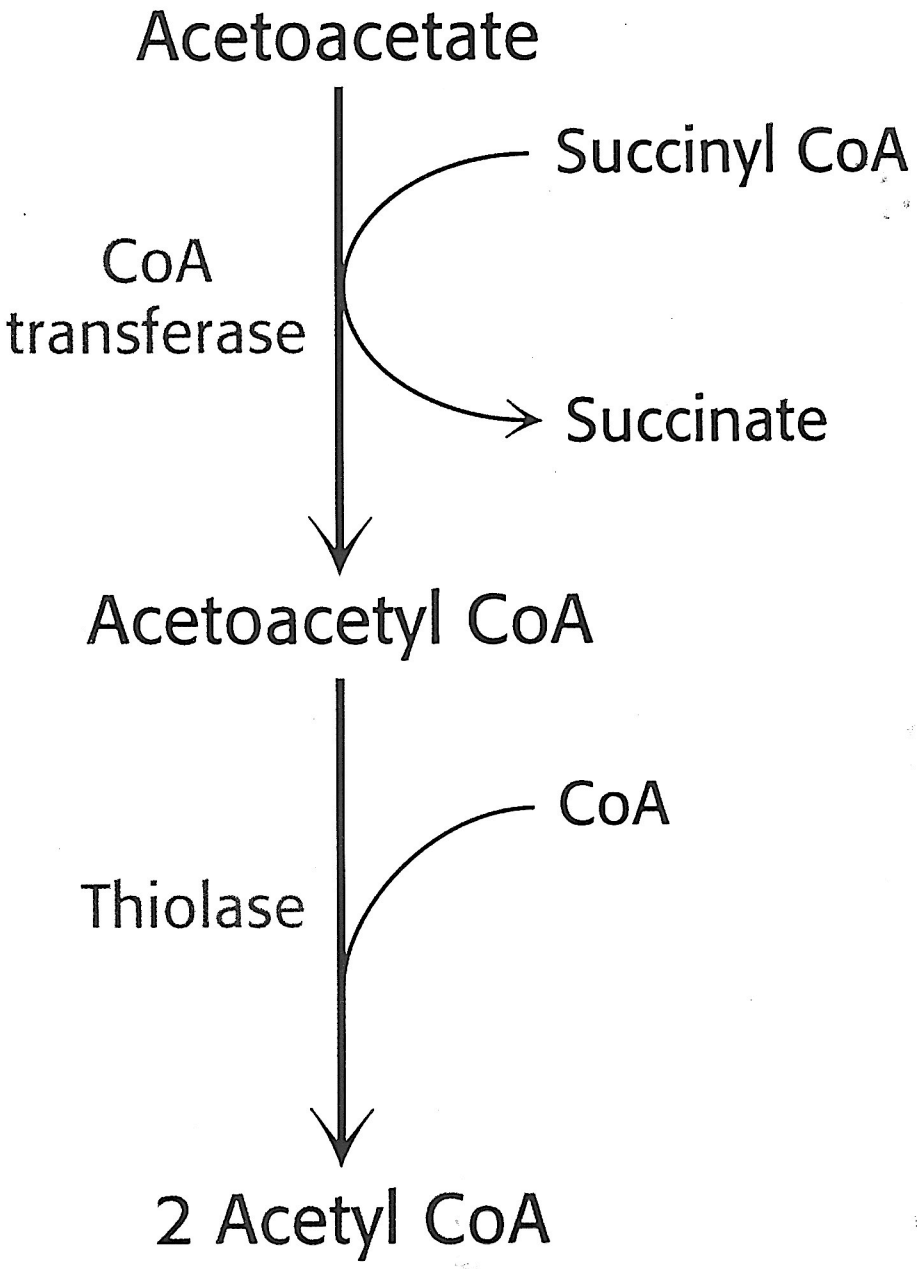


Figure 22.21
***Biochemistry*, Seventh Edition**


Acetoacetate
Succinyl CoA
CoA
transferase
Succinate
Acetoacetyl CoA
CoA
Thiolase
2 Acetyl CoA

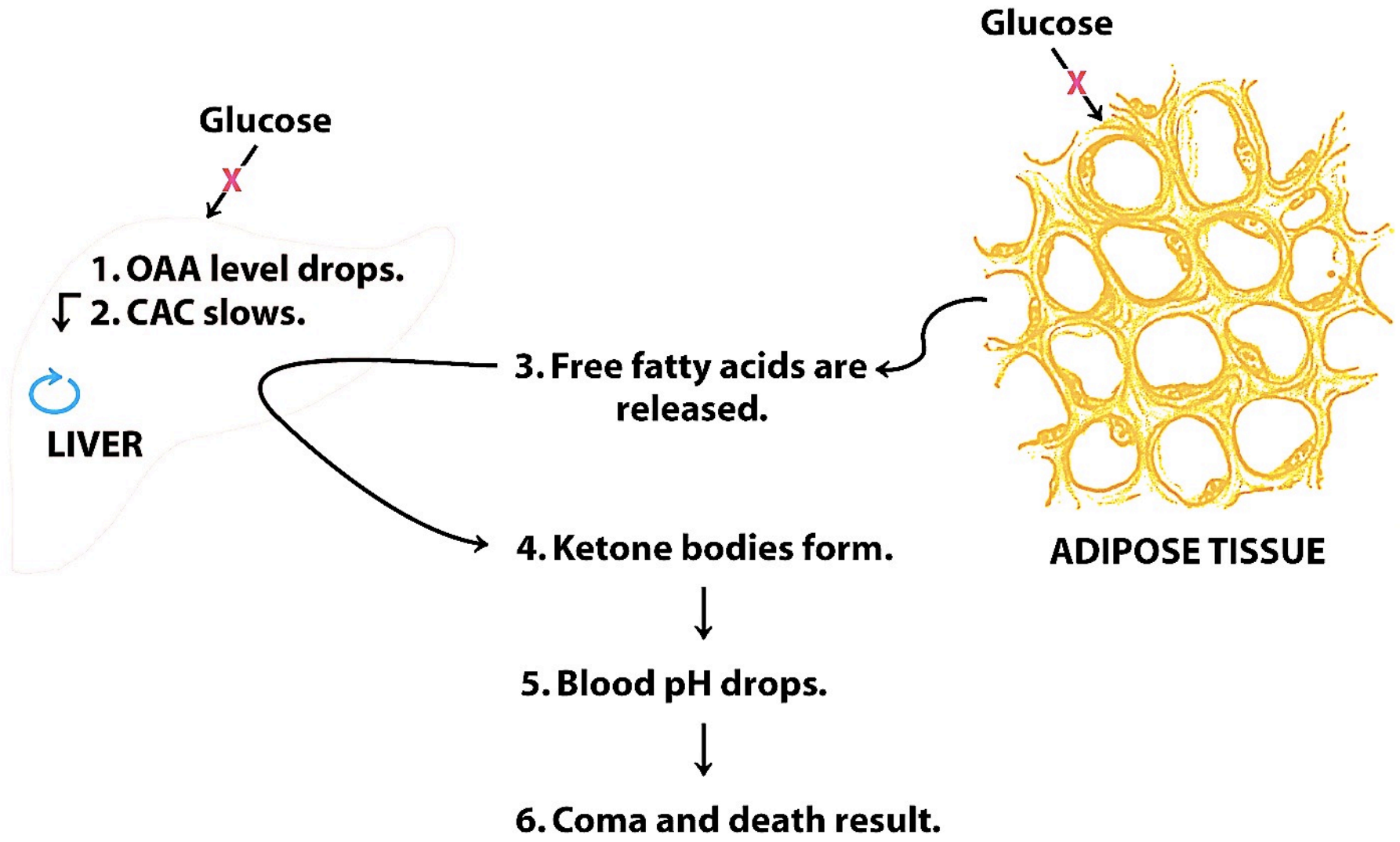


Figure 22.24
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Production of fatty acids

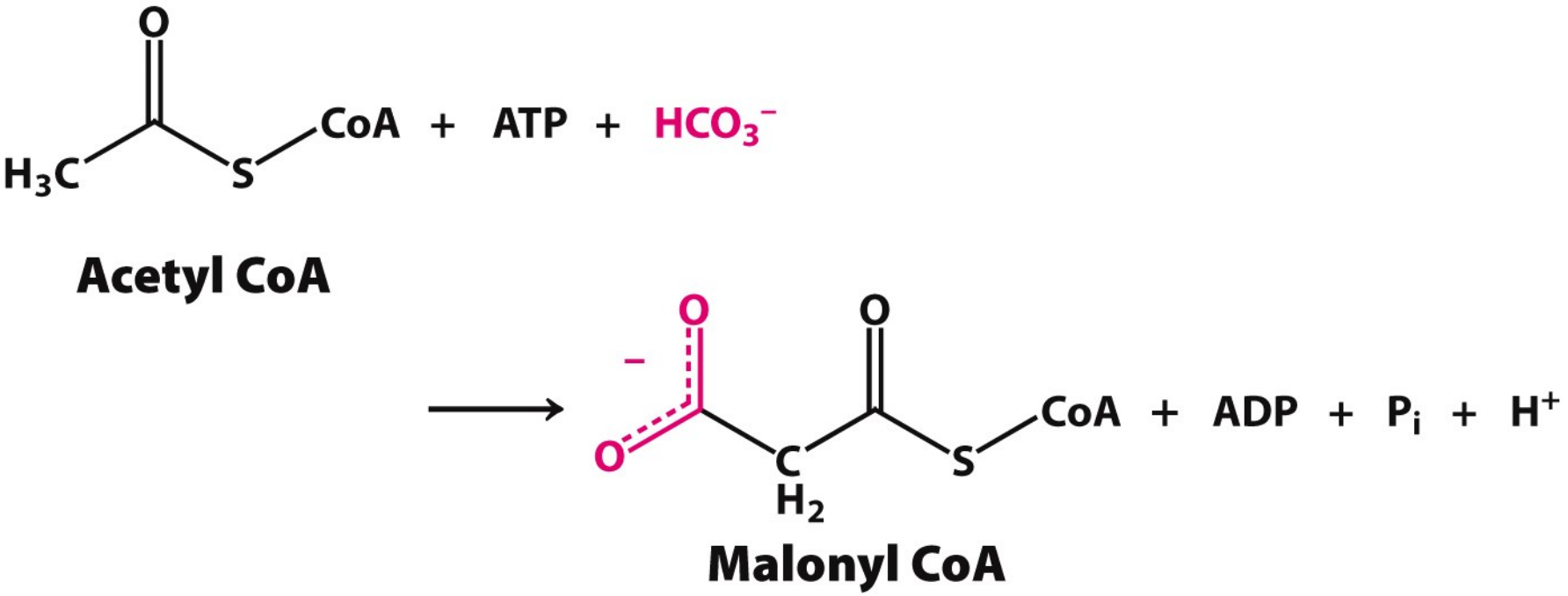
Food is not our only source of fat.

All organisms can synthesize fatty acids for long term energy storage and use in membrane structures.

In humans, excess acetyl CoA is converted to fatty acid esters.

Synthesis of fatty acids is similar to their degradation.

Steg 1: AcetylCoA carboxylas



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Reglering av fettsyrasyntesen = reglering av AcetylCoA carboxylasets aktivitet

AcetylCoA carboxylas aktiveras av:
Insulin
Citrat

AcetylCoA carboxylas inhiberas av:
Glukagon
Adrenalin
AMP
PalmitoylCoA

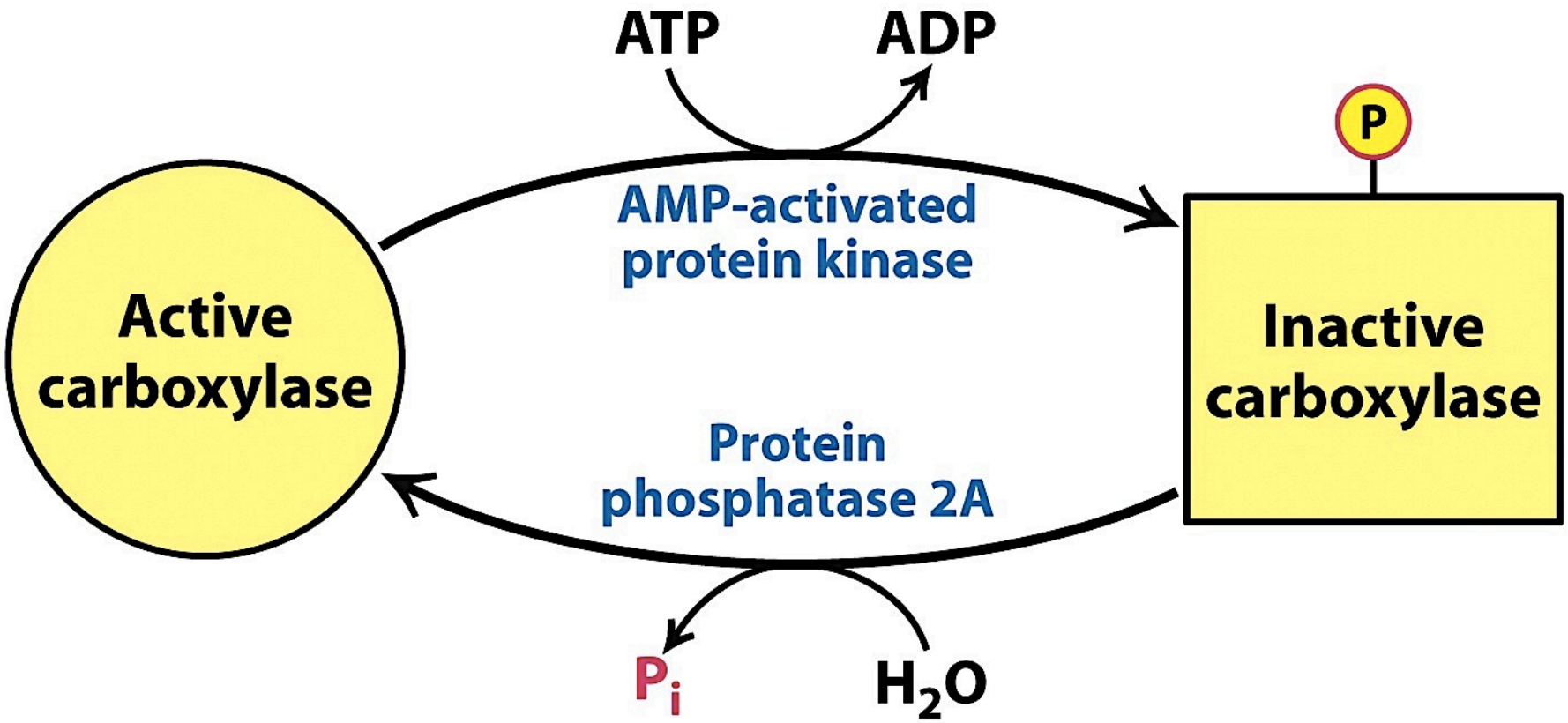

Figure 22.34
***Biochemistry*, Seventh Edition**

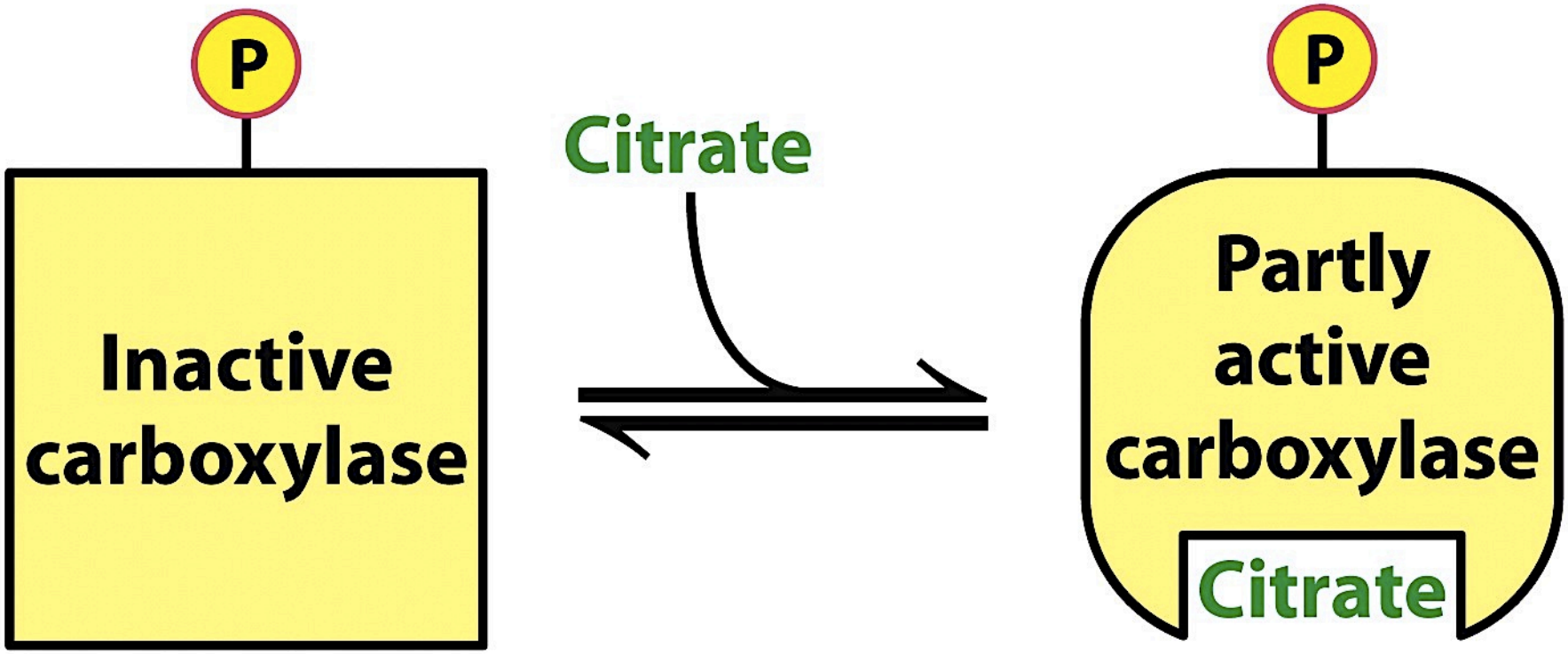

Figure 22.36a
***Biochemistry*, Seventh Edition**

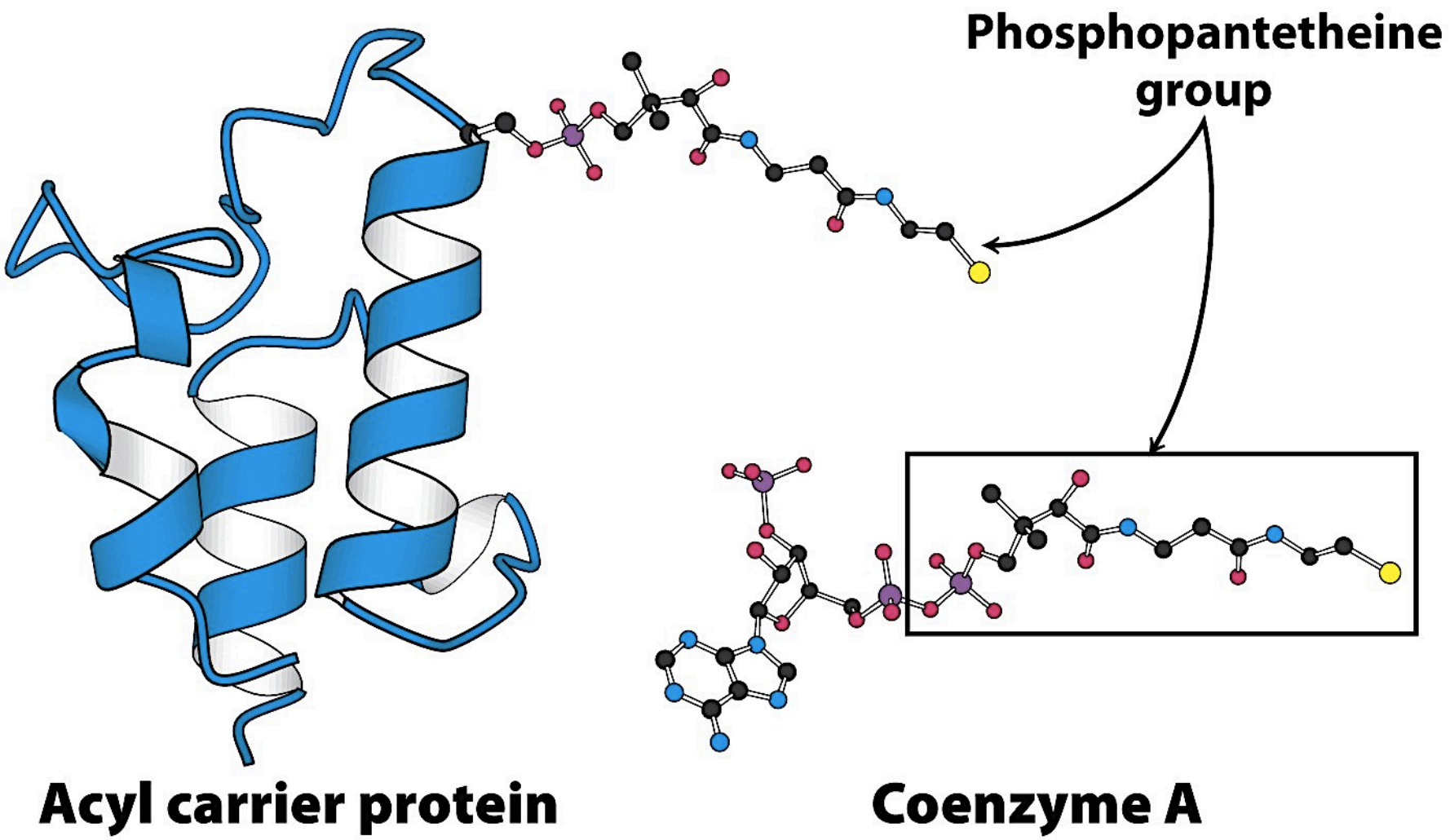

Figure 22.25
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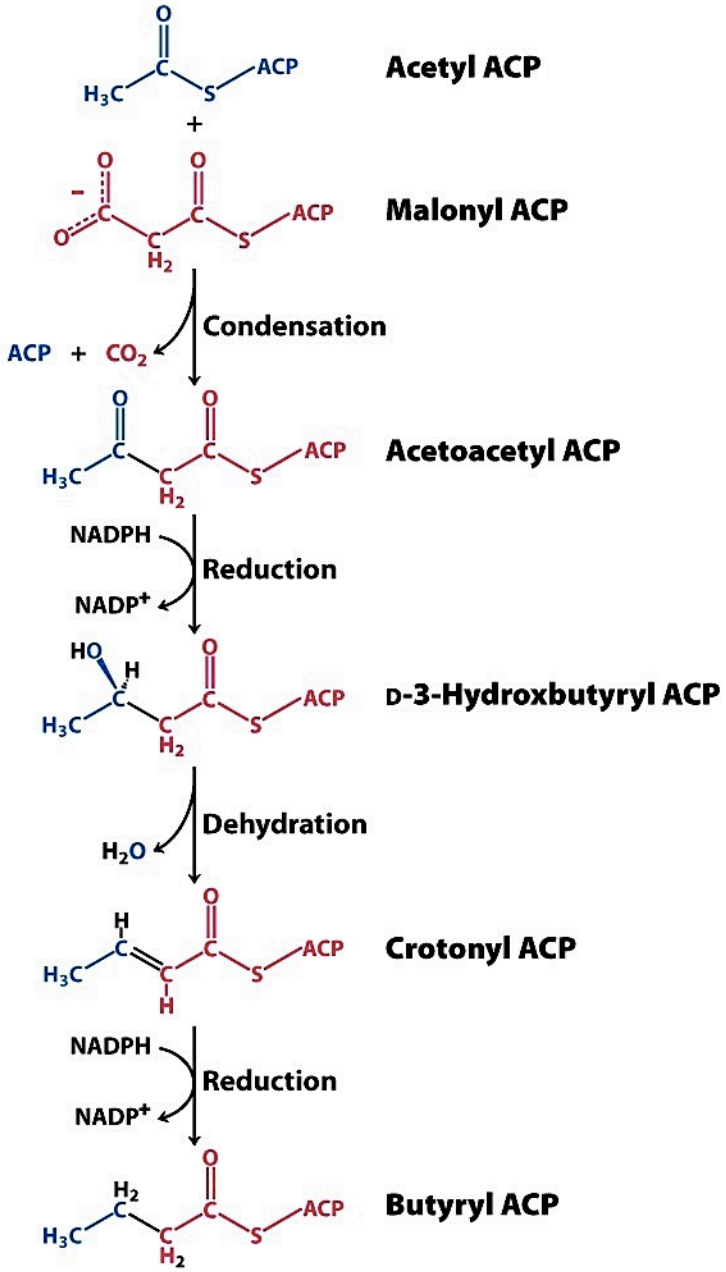

Figure 22.26
***Biochemistry,* Seventh Edition**

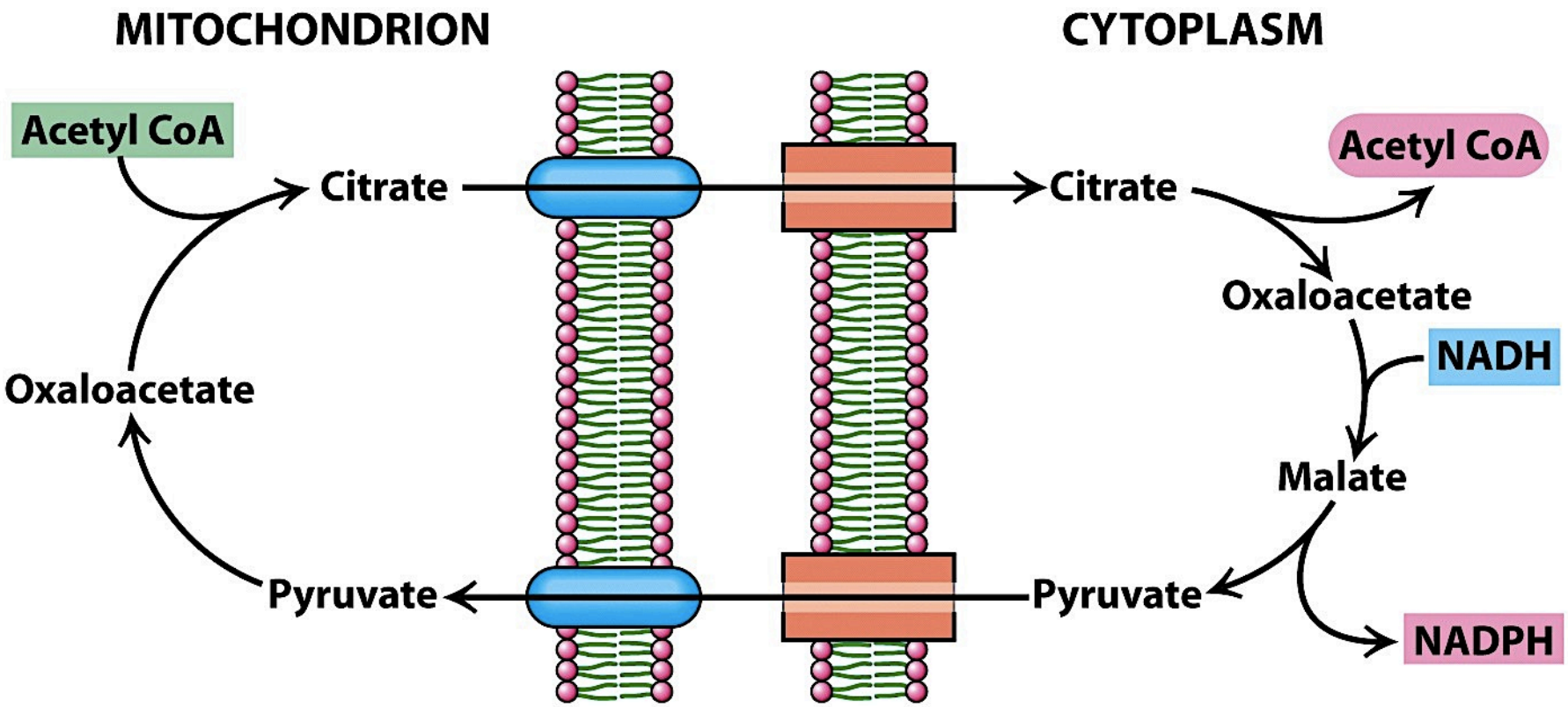

Figure 22.29
***Biochemistry*, Seventh Edition**

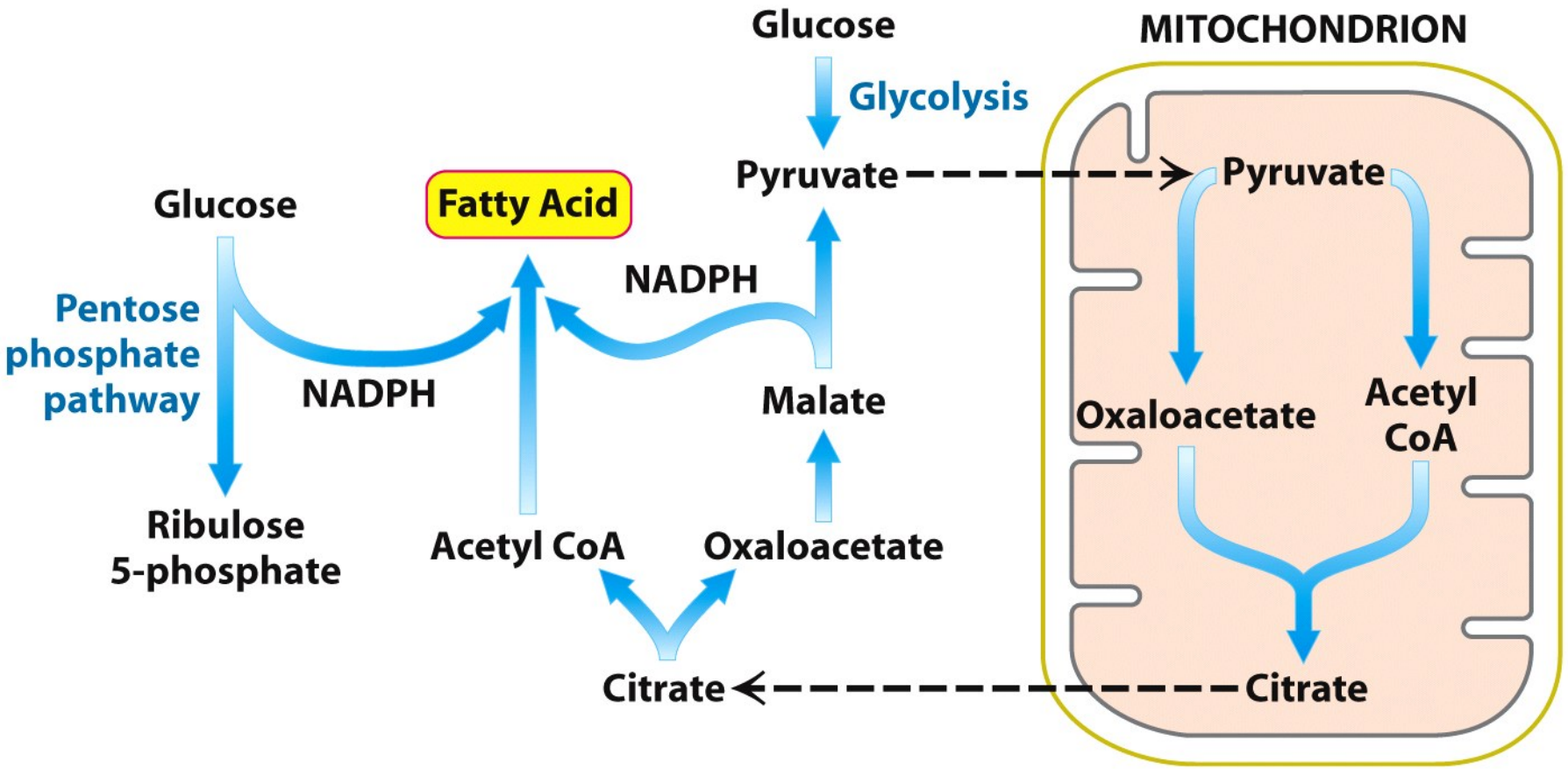

Figure 22.30
***Biochemistry*, Seventh Edition**

DUBBELBINDNINGAR (”OMÄTTNAD”) skapas i ERs MIKROSOMALA SYSTEM med hjälp av **DESATURASER**

Hos människa kan dock inte dubbelbindningar införas **bortanför C9** – därför är sådana fettsyror **ESSENTIELLA**

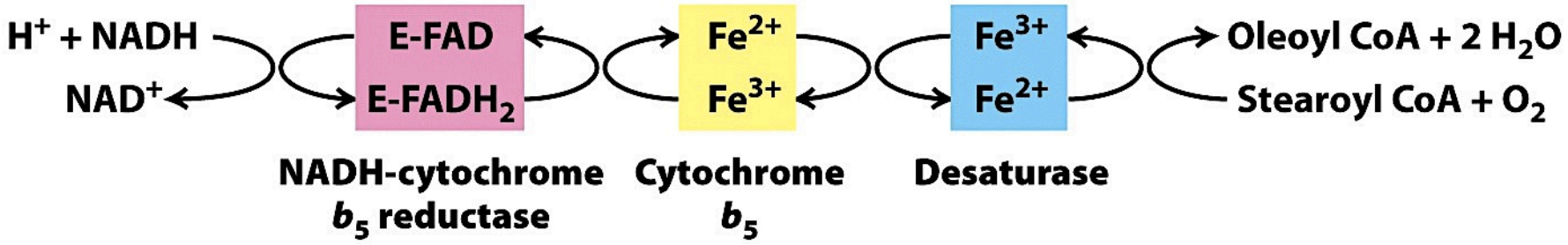

Figure 22.31
***Biochemistry*, Seventh Edition**

Syntes av triacylglycerol

Dihydroxyacetonfosfat från glykolysen