

CHAPTER 17 : Citric Acid Cycle  
(Krebs cycle)  
(TCA or Tri Carboxylic Acid cycle)

Glycolysis : glucose  $\longrightarrow$  pyruvate

intermediate step: pyruvate + CoA  $\longrightarrow$  acetyl CoA

Citric acid cycle: acetyl CoA  $\longrightarrow$  CO<sub>2</sub> + CoA

The stoichiometry of the citric acid cycle is :

Acetyl CoA + 3 NAD<sup>+</sup> + FAD + GDP + P<sub>i</sub> + 2 H<sub>2</sub>O  $\longrightarrow$

$\longrightarrow$  2 CO<sub>2</sub> + 3 NADH + FADH<sub>2</sub> + GTP + 2 H<sup>+</sup> + CoA

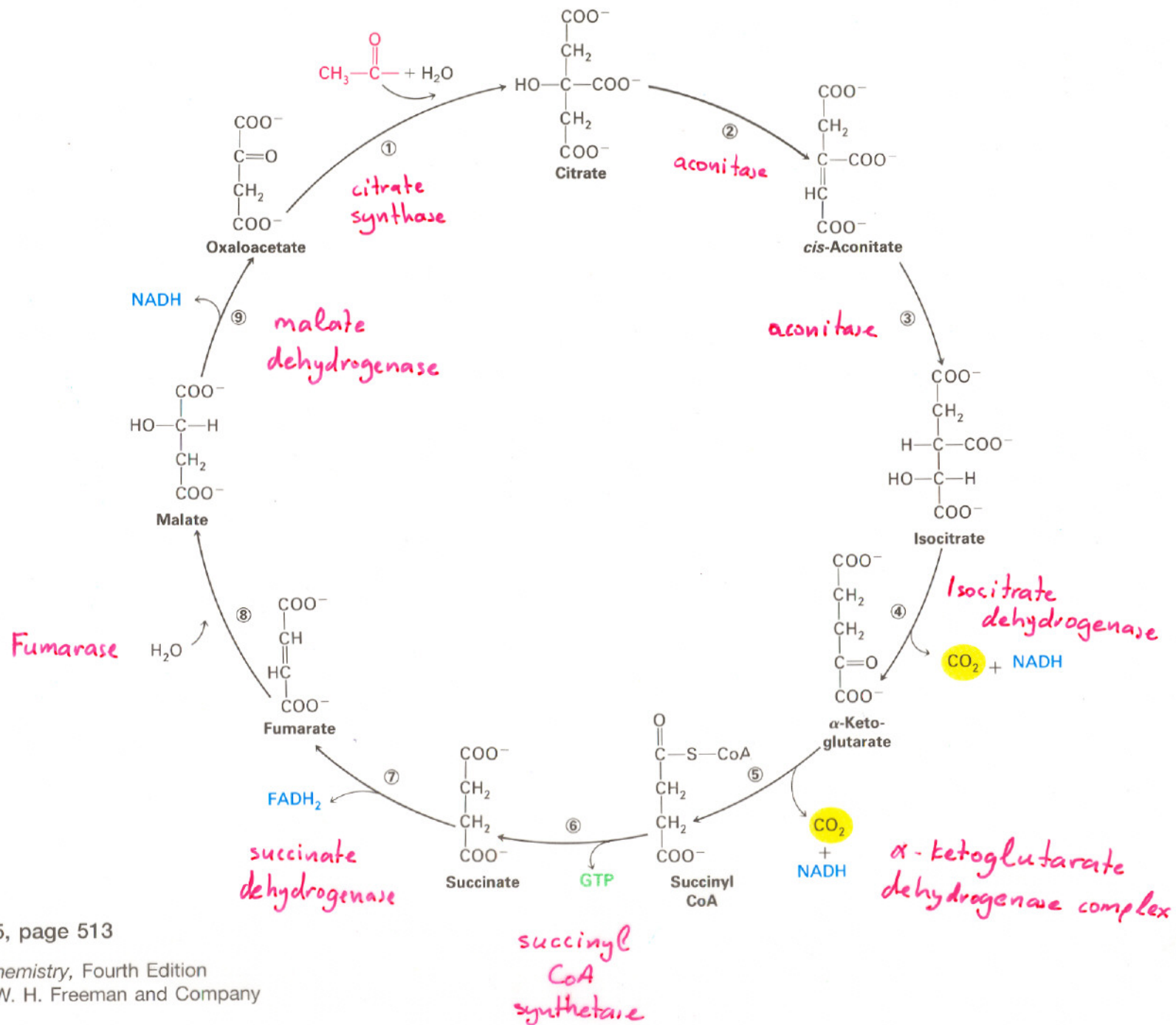
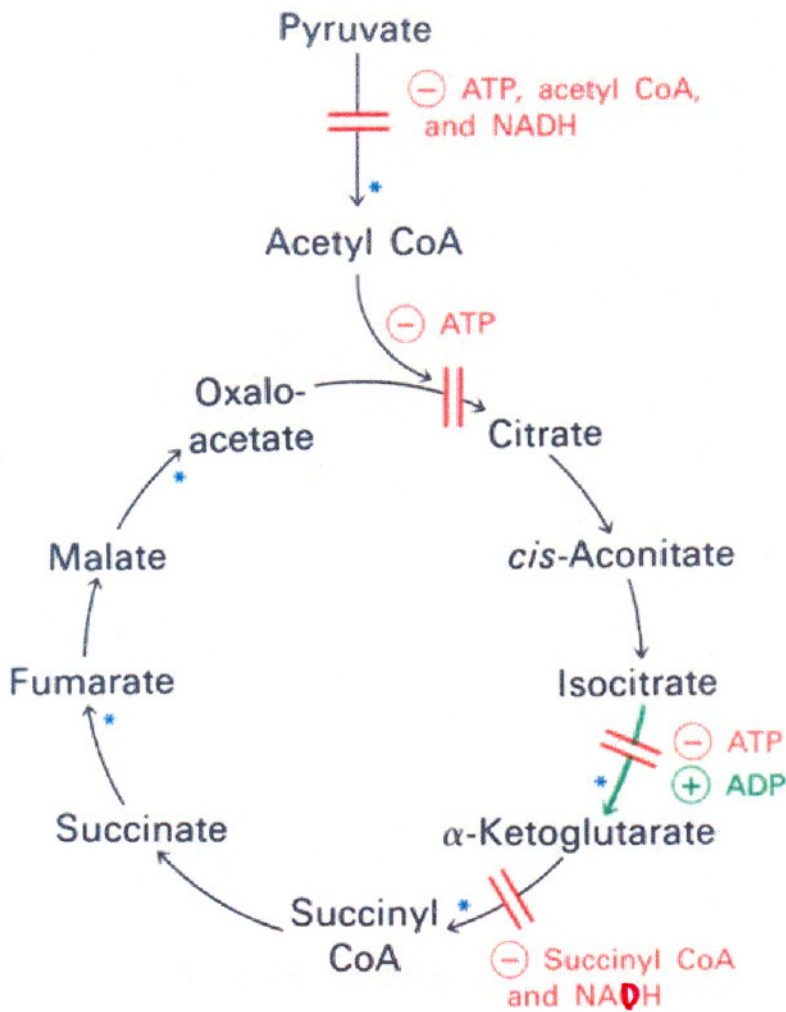


Figure 20-5, page 513

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NADH

NADH

Control of the citric acid cycle

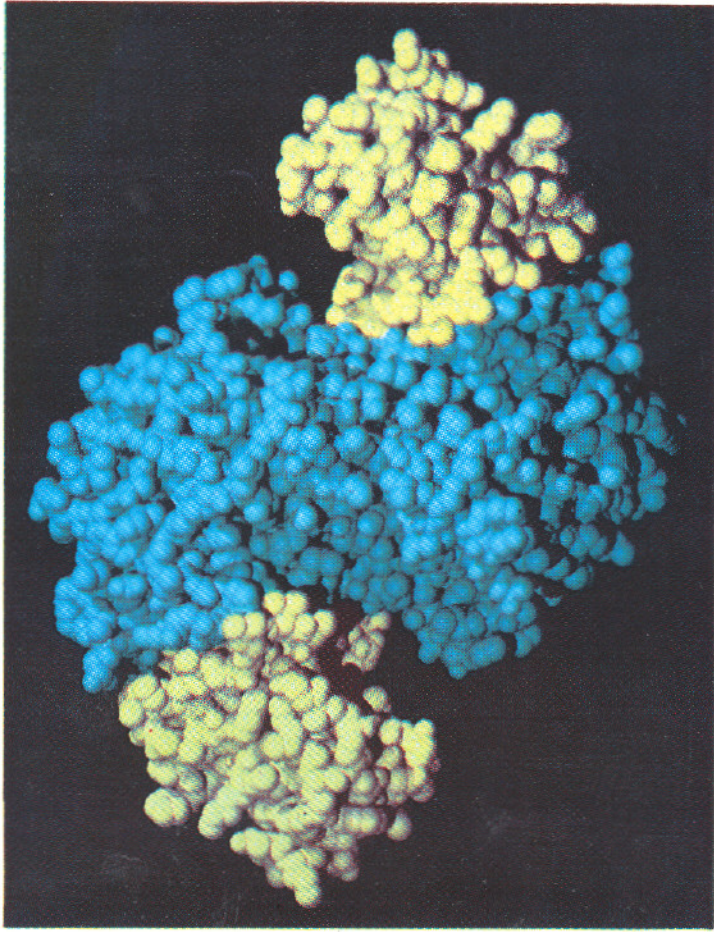
## $\alpha$ -ketoglutarate Dehydrogenase Complex

- it catalyzes a reaction similar to the one catalyzed by the pyruvate dehydrogenase complex
- the same cofactors are involved  
(TPP, lipoamide, CoA, FAD,  $\text{NAD}^+$ )
- $E_1'$ ,  $E_2'$ ,  $E_3'$
- "homologous enzyme assemblies"

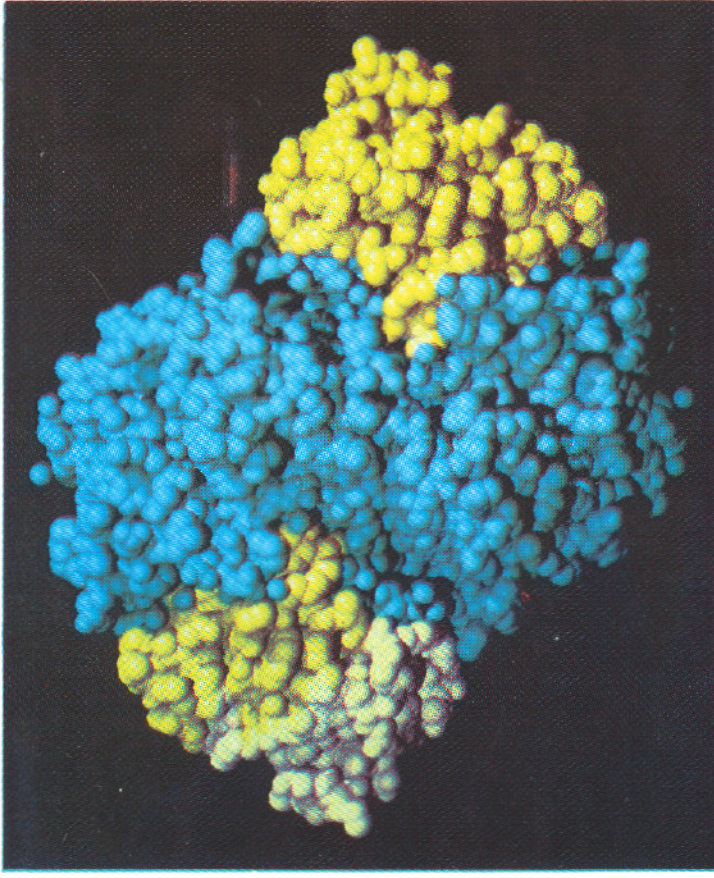
## Beri-Beri

- a neurologic and cardiovascular disorder
- dietary deficiency of thiamine (vitamin B<sub>1</sub>)
- major problem in the Far East  
(rice has low content of thiamine)
- TPP is the prosthetic group of
  - (i) pyruvate dehydrogenase
  - (ii)  $\alpha$ -ketoglutarate dehydrogenase
  - (iii) transketotase
- TPP utilizes the transfer of an activated aldehyde unit
- it causes increased levels of pyruvate and  $\alpha$ -ketoglutarate in blood





A



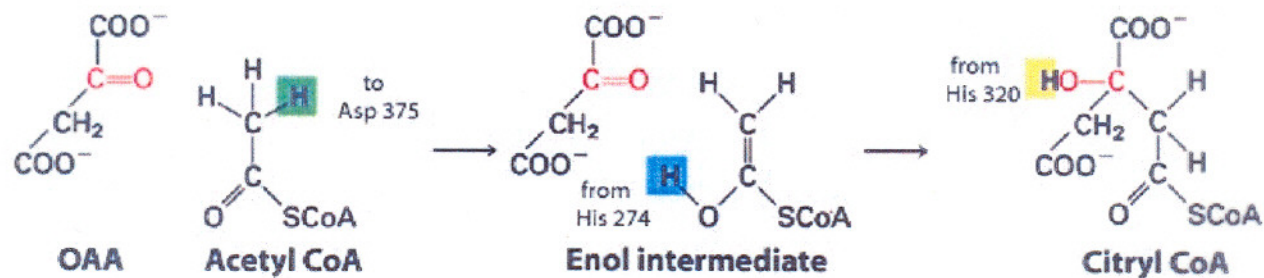
B

Citrate synthase undergoes a large conformational change on binding oxaloacetate. Then it can bind acetyl CoA

- dimer of two identical 49 kDa subunits
- each subunit has two domains (small - yellow, large - blue)

Figure 20-13, page 519

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His 274  
 Asp 375  
 His 320

Mechanism of synthesis of citryl CoA by  
 citrate synthase

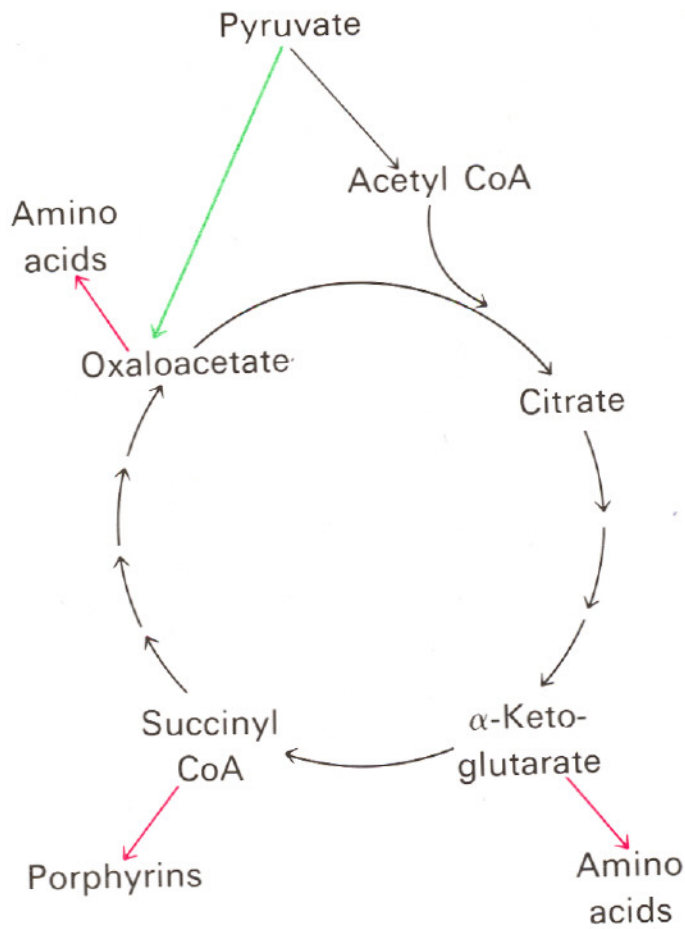
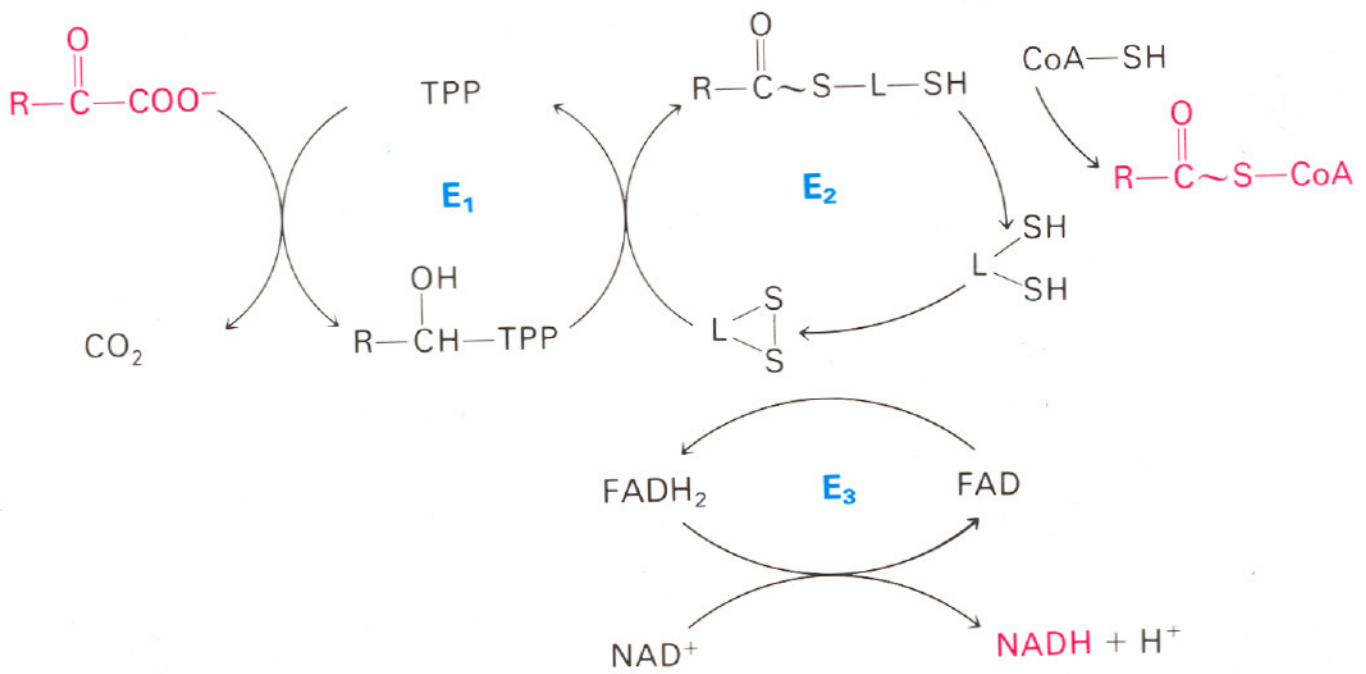


Figure 20-12, page 517; Figure 20-17, page 522