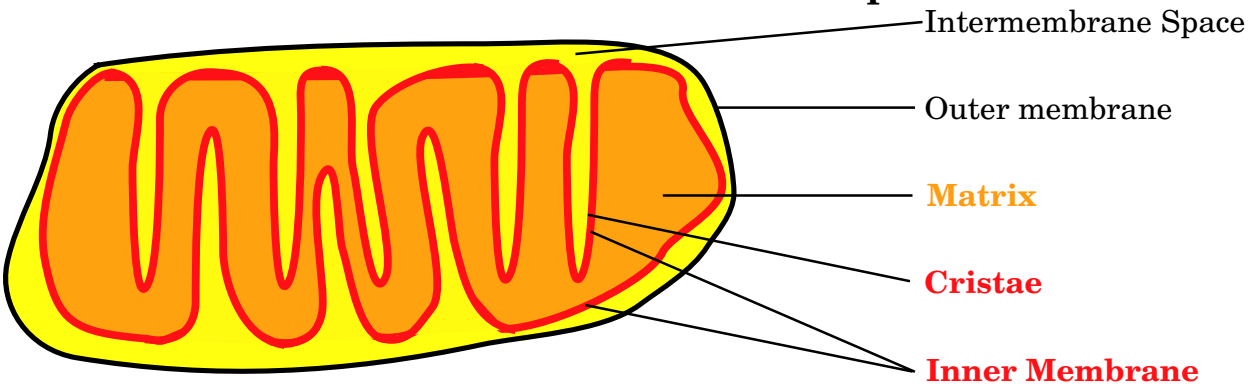
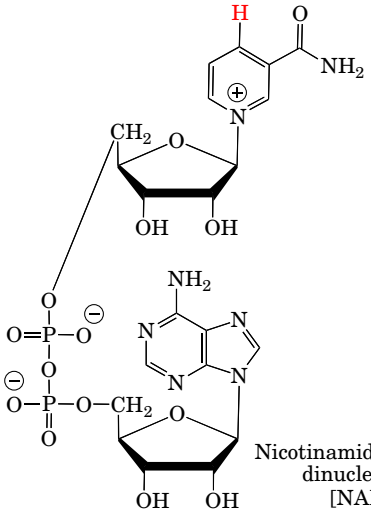
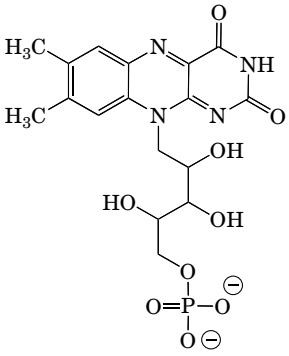
Mitochondrial Structure and Electron Transport

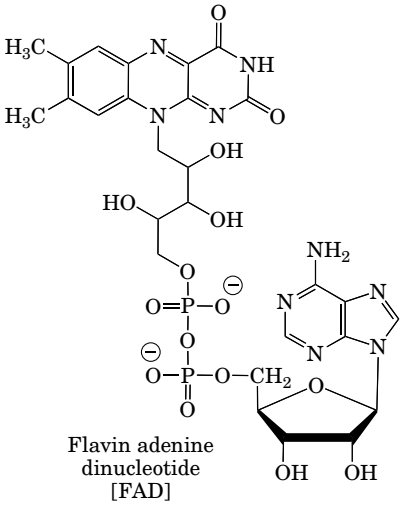




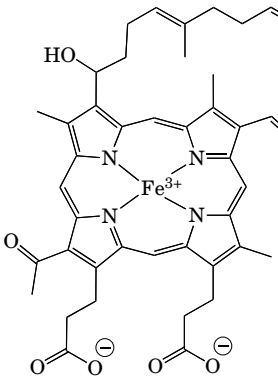
Nicotinamide adenine dinucleotide [NAD]



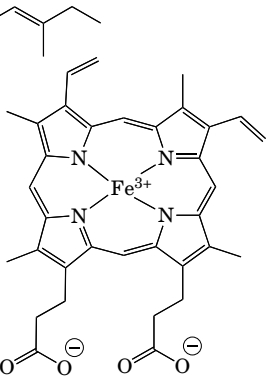
Flavin mononucleotide [FMN]



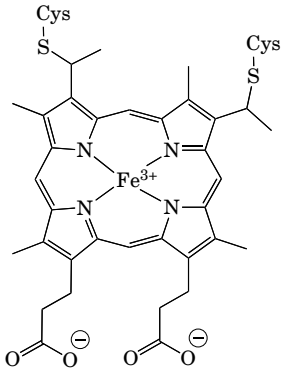
Flavin adenine dinucleotide [FAD]



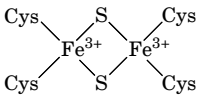
Heme *a*



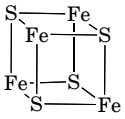
Heme *b*
Iron-Protoporphyrin IX



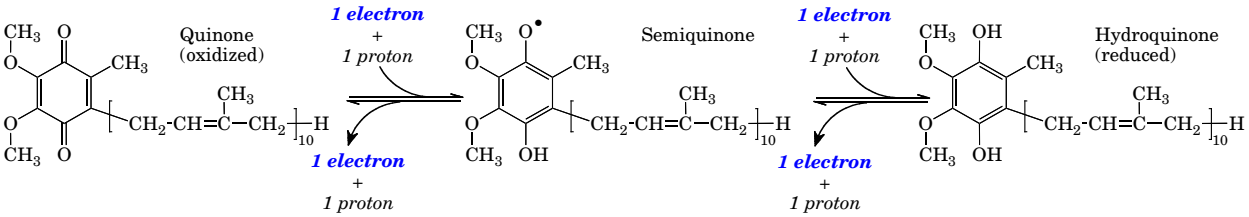
Heme *c*

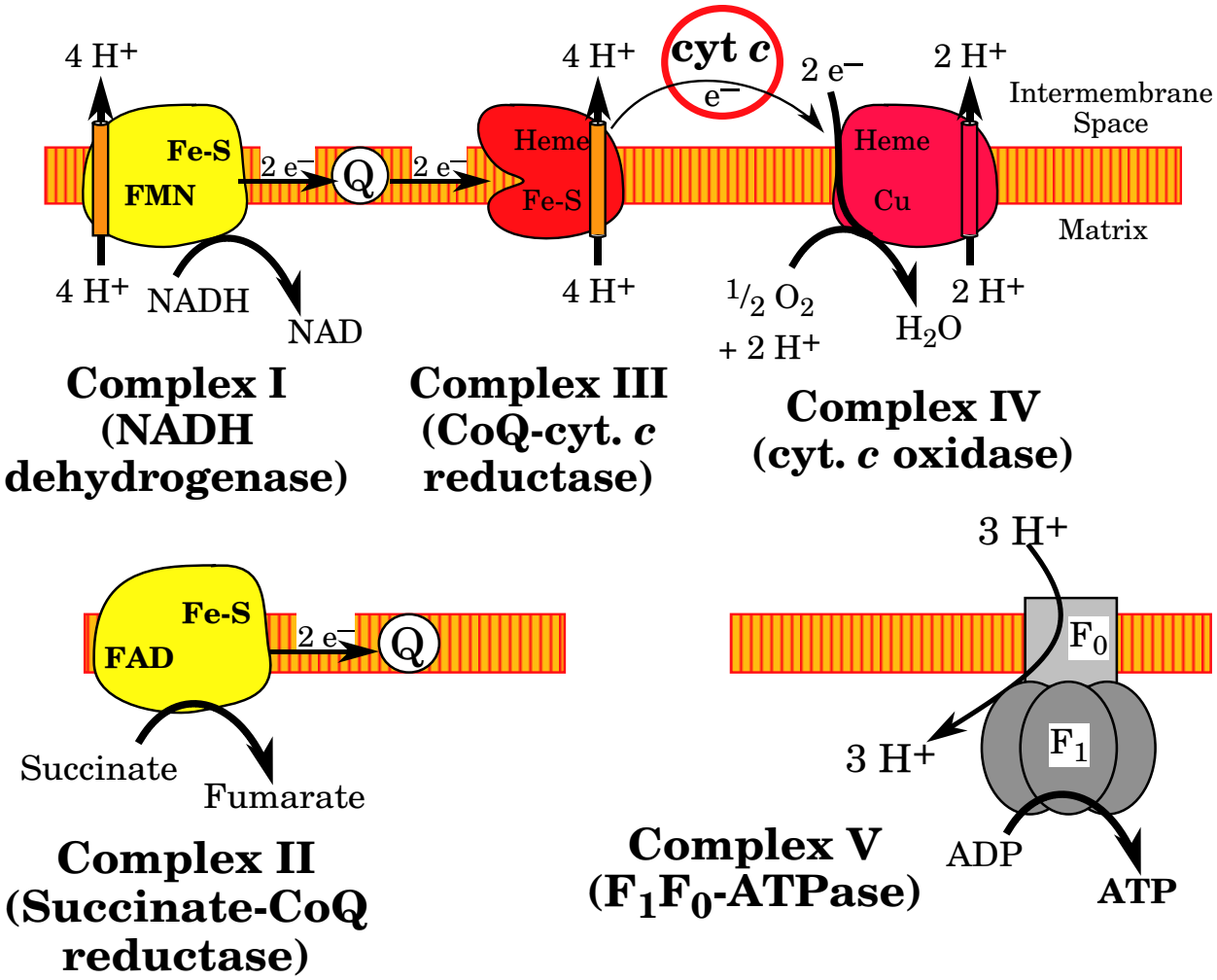


2-Iron-2-Sulfur [2Fe•2S]



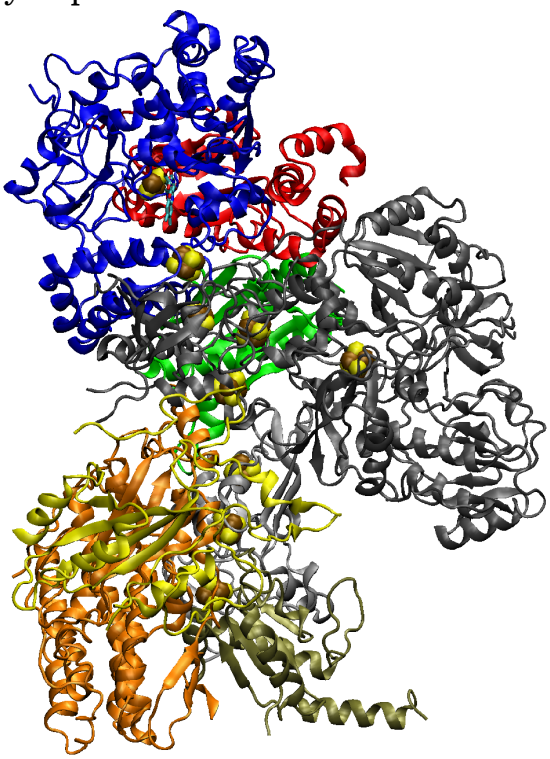
4-Iron-4-Sulfur [4Fe•4S]

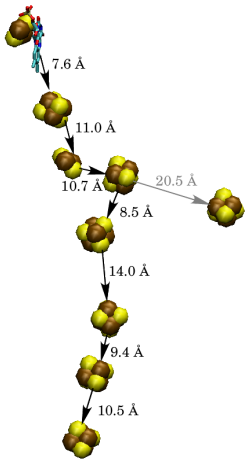


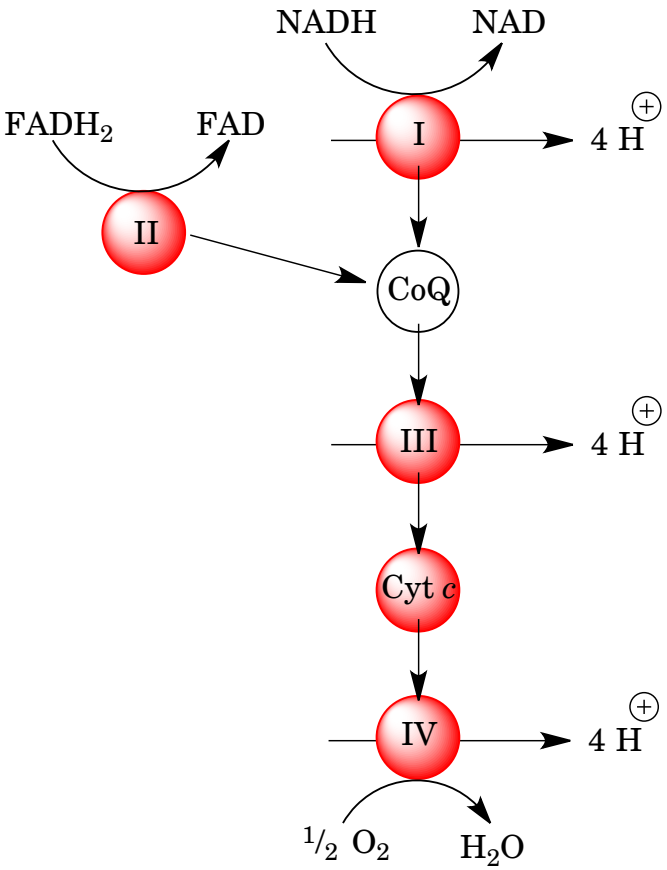


Compound	Reduction potential (V)
NADH	–0.315
Complex I Fe-S	–0.38 to –0.27
Succinate	+0.031
Complex II FAD	–0.04
Complex II Fe-S	–0.245 to –0.03
Complex II heme	–0.08
Coenzyme Q	+0.045
Complex III heme *b*	–0.03 to +0.03
Complex III Fe-S	+0.28
Complex III heme c_1	+0.215
Cytochrome *c*	+0.235
Complex IV heme	+0.21 to +0.385
Complex IV Cu	+0.245 to +0.34
Oxygen	+0.815

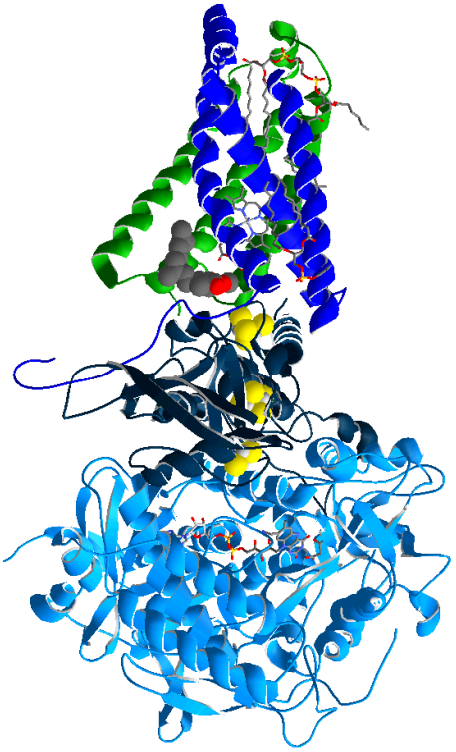
Complex I Hydrophilic Domain from *Thermus thermophilus* (pdb ID 2FUG)



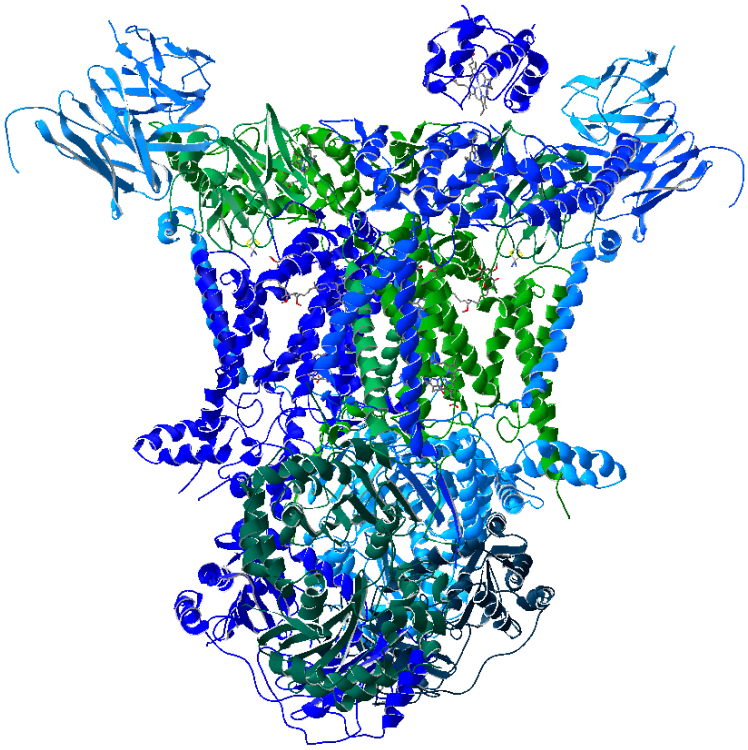




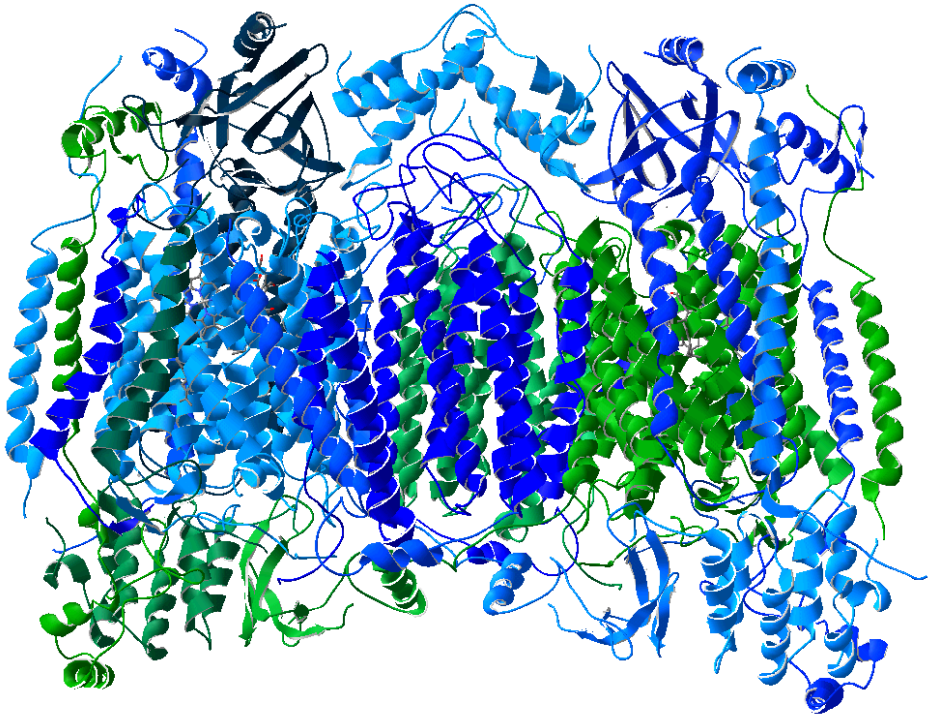
Complex II from *Escherichia coli* (pdb ID 1NEK)



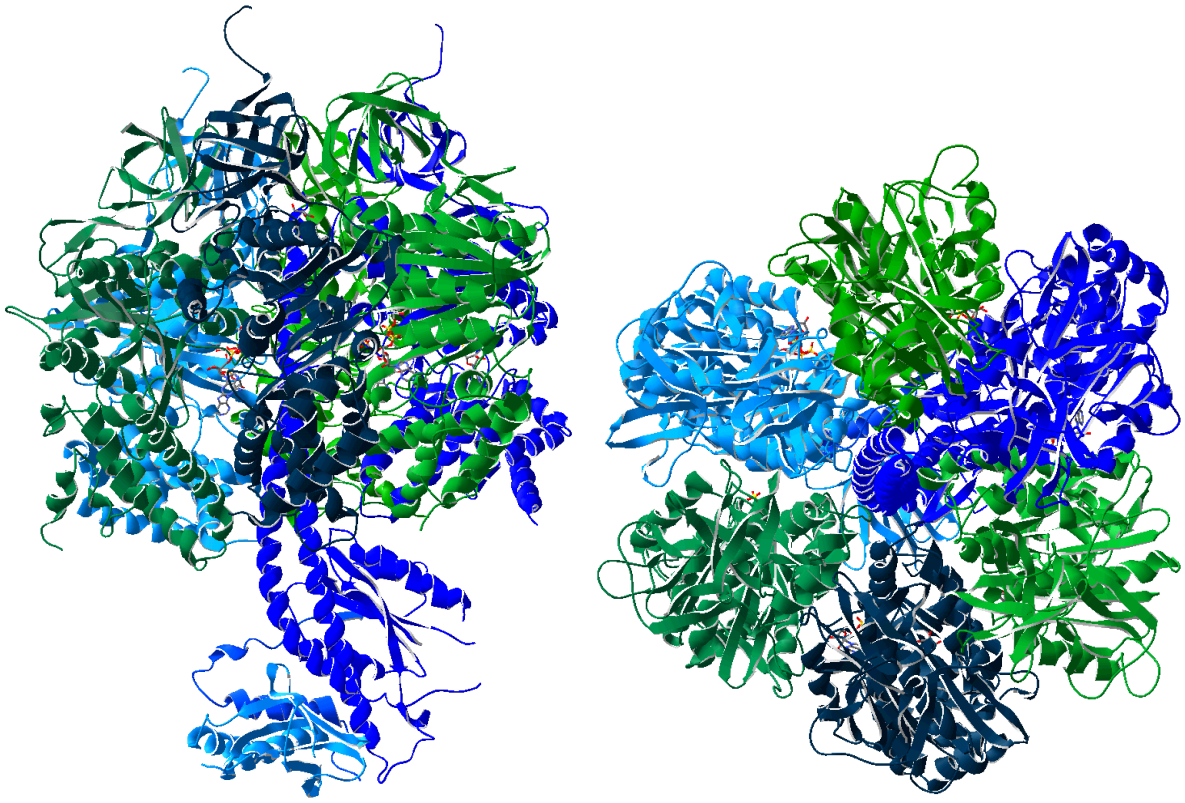
Complex III and cytochrome *c* from *Saccharomyces cerevisiae* (pdb ID 1KYO)



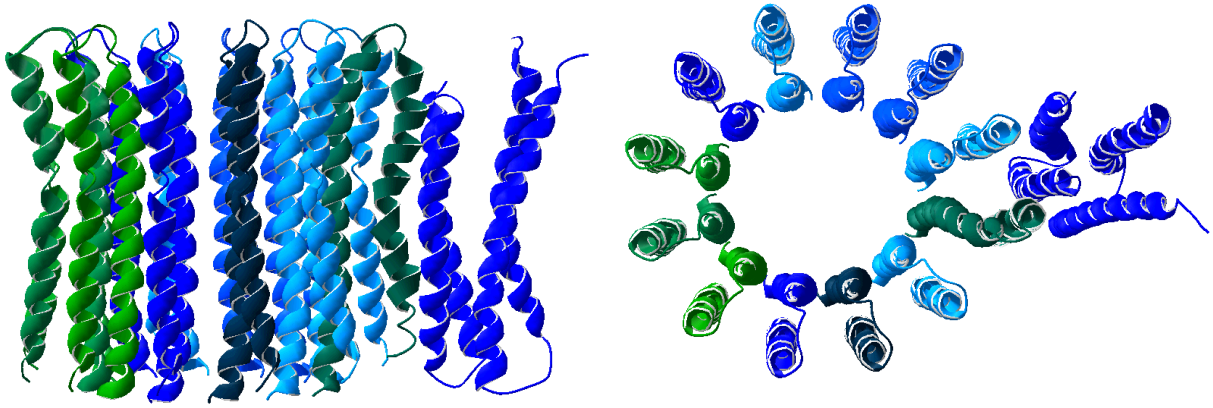
Complex IV from *Bos taurus* (pdb ID 2OCC)



F_0-F_1 ATPase (ATP Synthase)

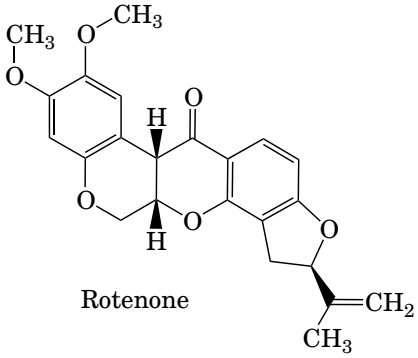


pdb ID 1E79

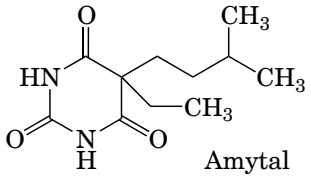


pdb ID 1C17

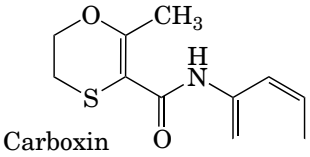
Examples of compounds that affect mitochondrial ATP synthesis



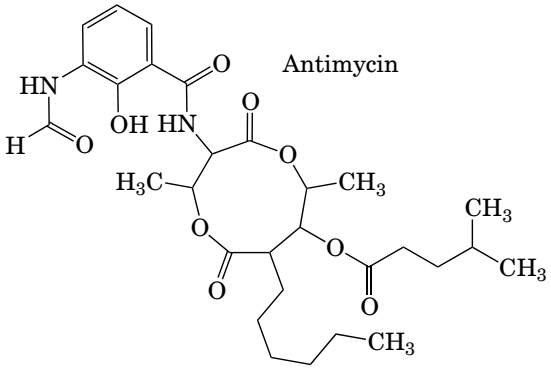
Rotenone



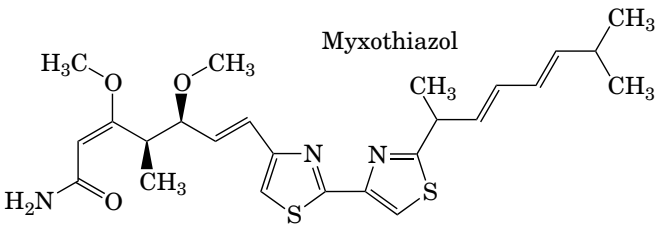
Amytal



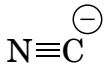
Carboxin



Antimycin



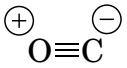
Myxothiazol



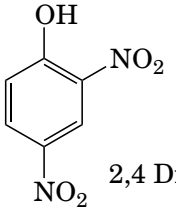
Cyanide

H_2S

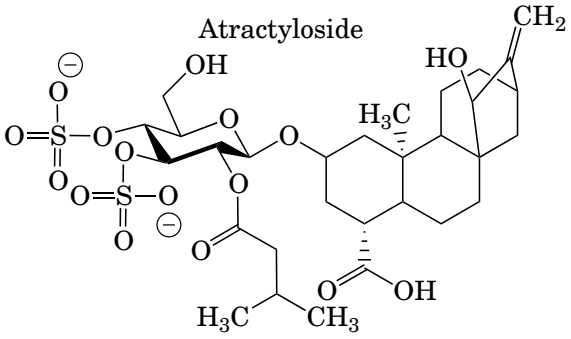
Hydrogen sulfide



Carbon monoxide



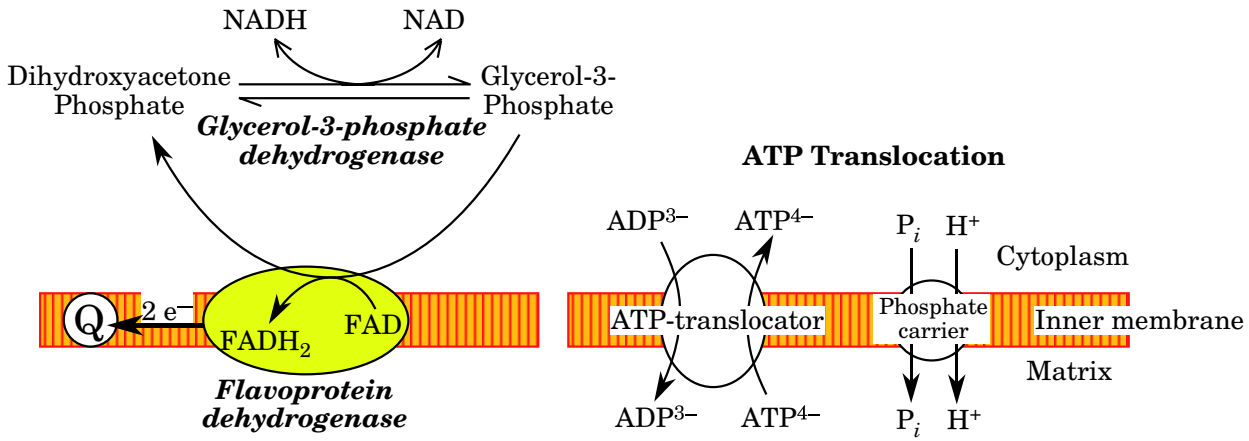
2,4 Dinitrophenol



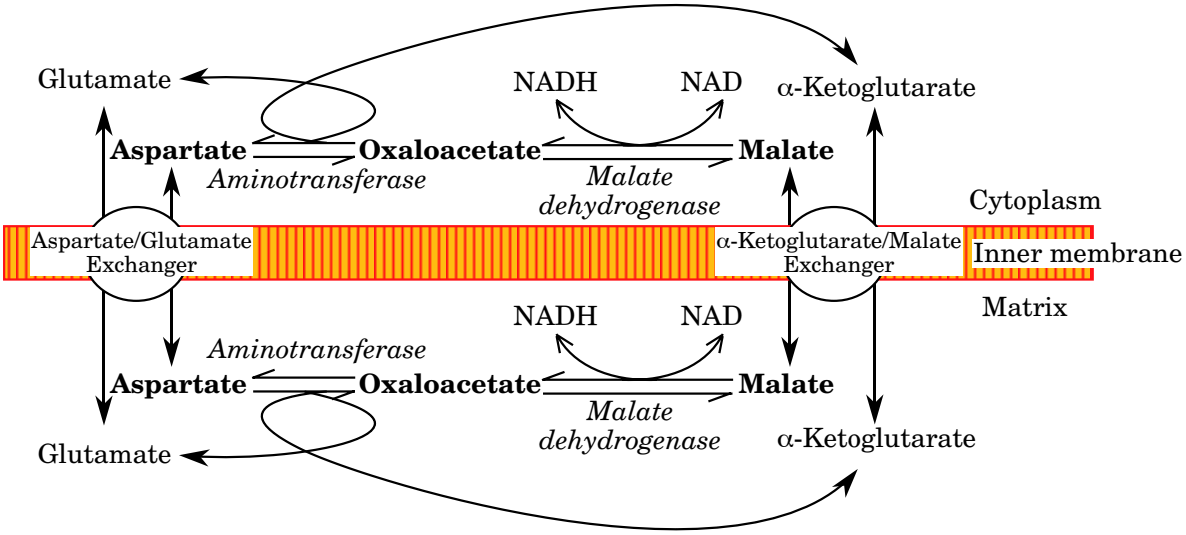
Atractyloside

Examples of Mitochondrial Shuttle Pathways

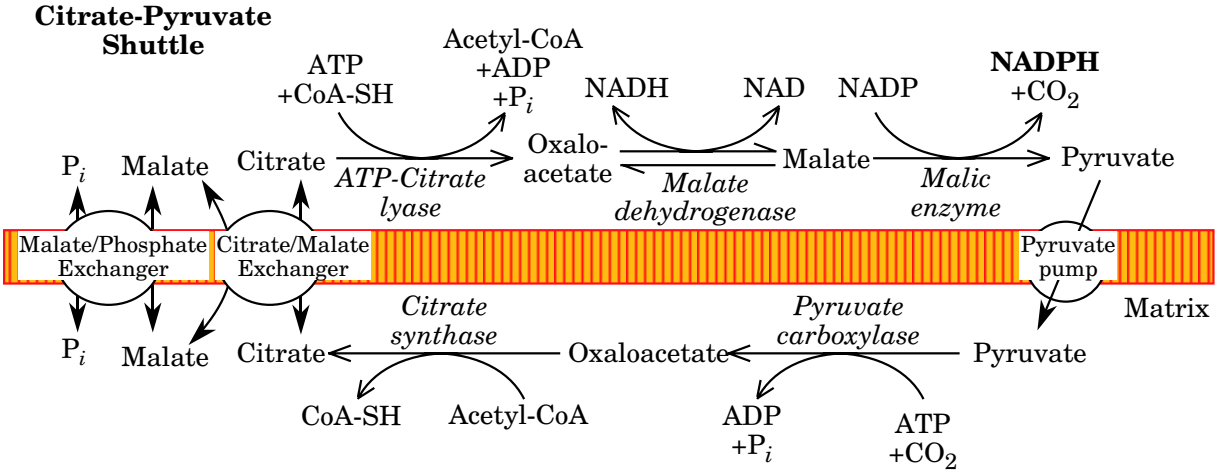
Glycerophosphate Shuttle



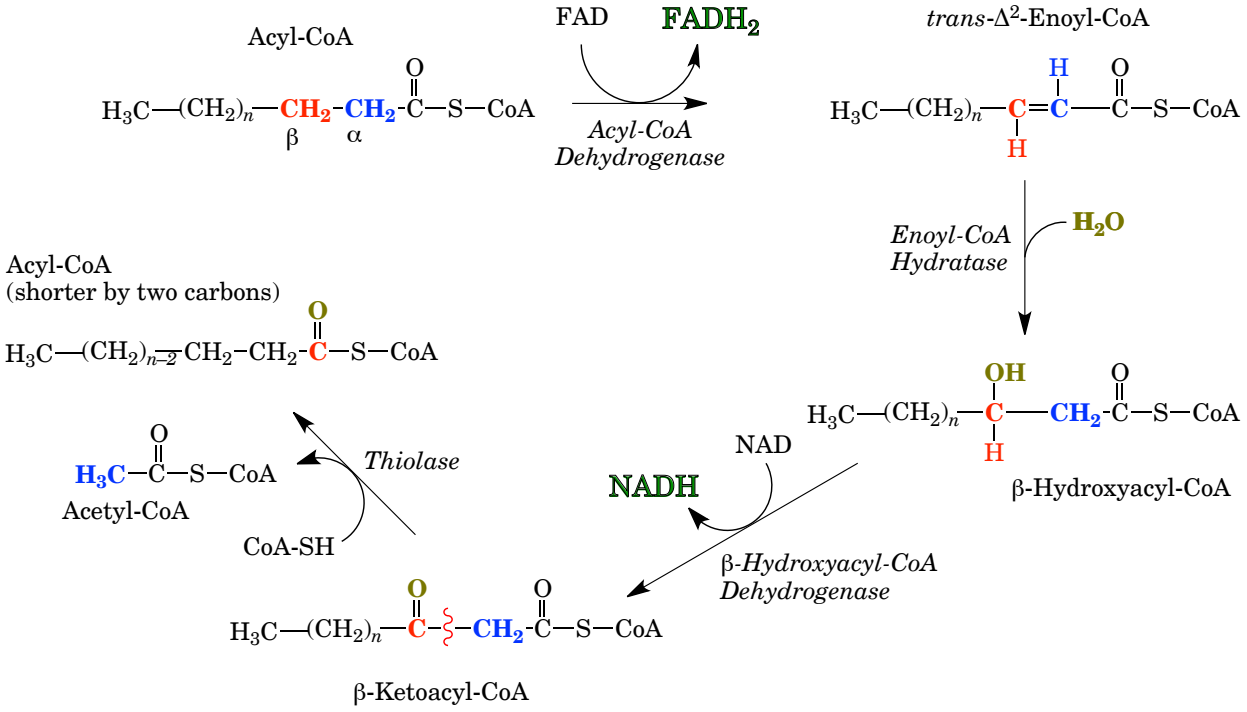
Malate-Aspartate Shuttle



Citrate-Pyruvate Shuttle



Fatty Acid β-oxidation



Comparison of Energetics of Metabolism for Glucose and Stearic Acid

Energetic molecule	Glucose	Stearate ↓ Acetyl-CoA	9 Acetyl-CoA ↓ CO_2	Stearate (total)
Products				
ATP	**4 → 4 ATP**	–2	9	**7 → 7 ATP**
NADH	**10 → 30 ATP**	8	27	**35 → 105 ATP**
$FADH_2$	**2 → 4 ATP**	8	9	**17 → 34 ATP**
Total	**38 ATP**			**146 ATP**