

ELECTRON CARRIERS

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ELECTRON CARRIERS

- Electron carriers, also called electron shuttles, are small organic molecules that play key roles in cellular respiration
- They pick up electrons from one molecule and drop them off with another

Continue....

- There are five different kinds of electron carriers that participate in the transport of electrons in mitochondria:
 - 1) Nicotinamide adenine dinucleotide (NAD)
 - 2) Flavoproteins
 - 3) Nonheme iron proteins
 - 4) Quinones
 - 5) Cytochromes

Nicotinamide adenine dinucleotide (NAD)

- Nicotinamide adenine dinucleotides are the derivatives of the vitamin niacin
- They are coenzymes for enzymes known as dehydrogenases that catalyze oxidation reduction reaction
- Three of the oxidations in Krebs cycle involve the removal of the equivalent of two hydrogen atoms from the substrates like isocitric acid, α -ketoglutaric acid and malic acid
- In pyruvic acid oxidation , the electrons are first transferred to lipoic acid then from lipoic acid to FAD and finally to NAD^+
- $\text{Malic acid} + \text{NAD}^+ \rightleftharpoons \text{Oxaloacetate} + \text{NADH} + \text{H}^+$

Flavoproteins

- The prosthetic groups of flavoproteins are the flavin coenzymes FAD and FMN
- They are associated with the protein moiety
- The flavin cofactors accept two electrons and a proton from NADH or two electrons and protons from an organic substrate such as succinic acid
- $\text{NADH} + \text{H}^+ + \text{FAD} \rightleftharpoons \text{NAD}^+ + \text{FADH}_2$

Nonheme iron proteins

- This type of protein is known as ferredoxin
- It consists two or more iron atoms arranged in an iron-sulfide bridge (Fe- S)
- In the oxidized state iron atoms are in the ferric state , when reduced it become ferrous form

Quinones

- Mitochondria contain a quinone called ubiquinone
- It serves as an additional electron carrier between the flavin coenzymes and the cytochromes
- It can accept the electrons not only from NADH dehydrogenase but also from the flavin components of succinic acid dehydrogenase



Cytochromes

- The cytochromes are conjugated proteins having an iron porphyrin as a prosthetic group
- The cytochromes are capable of being alternately oxidized and reduced
- The cytochromes accept the electron from ubiquinone
- Ubiquinone(reduced) + 2 cytochrome (Fe³⁺) → Ubiquinone (oxidized) + 2 cytochrome (Fe²⁺) + 2H⁺

THANK YOU