Oxidative Phosphorylation and Electron Transport

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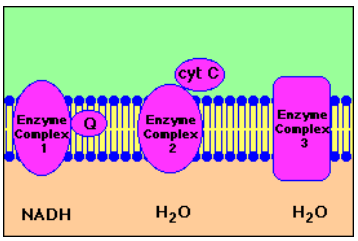
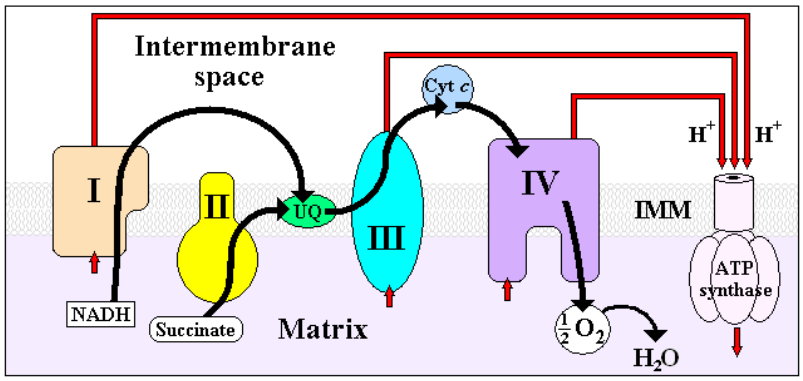
Oxidative Phosphorylation



The process by which oxygen allows ATP production by phosphorylation of ADP is called oxidative phosphorylation. It produces energy-rich ATP molecules with the help of energy by oxidation, and it reduces co-enzymes. $NADH_2$ and $FADH_2$ are produced during respiration. The enzyme required for their synthesis is called ATP synthase. The enzyme ATP synthase becomes active in ATP formation whenever there is a proton gradient. Movement of electrons from NADH by the electron transport chain transfers 3 pairs of electrons to the outermost part. Later high energy ATP is produced by protons returning to the matrix through the inner membrane particles.

Electron Transport Chain:



The physiological activities like photosynthesis and respiration in organelles like chloroplast and mitochondria take place with the help of the electron transport system. It results in the formation of ATP.

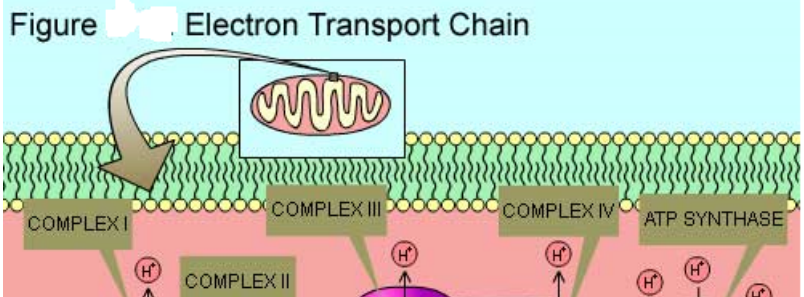
In the chloroplasts the oxygen is converted with the help of water and $NADP^+$ to NADHP and is driven by physical forms of energy such as sunlight or an external source of light. The same process takes place in case of mitochondria where oxygen is converted to water, NADH to NAD^+ and conversion of succinate to fumarate by successive transfer of electrons occurs.

Electron Transport Chain in Mitochondria:

Electron transport chains in mitochondrial: Cells in animals have a organelle referred to as mitochondria where electron transfer takes place via electron carriers with help of redox reactions and Krebs cycle, fatty acid oxidation, and amino acid oxidation. The end product tends to lose electron and give up to oxygen which is an electro-negative element.

In mitochondria there are four complexes with transmembrane nature and are found in the inner membrane.

NADH ? Complex I ? Q ? Complex III? Cytochrome C ? Complex IV ? O2



- Referred as NADH dehydrogenase
- Electron donor is NADH
- Electron acceptor is ubiquinone (Q) and converts to ubiquinol (QH_2)

Complex II

- Referred as Succinate dehydrogenase complex
- Electron acceptor is ubiquinone (Q) and converts to ubiquinol (QH_2)
- Electron donors are fatty acids, glycerol 3-phosphate

Complex III

- Referred as Cytochrome bc1 complex
- Electron Donor is Ubiquinol (QH_2)
- Electron acceptor is cytochrome C

Complex IV

- Referred as Cytochrome C Oxidase
- Electron donor is Cytochrome C
- Electron acceptor is molecular oxygen

Electron Transport Chain in Bacteria:

NADH ? Complex I ? Q ? Complex III ? Cytochrome ? Complex IV ? O2
Complex I, III, and IV are referred as proton pumps. Ubiquinone and Cytochrome C are electron carriers and the final electron acceptor is molecular oxygen.

Eletron Transport System(ETS) – a Quick Summary

1. Takes place within mitochondrion.
2. Oxygen is used up as the oxygen atoms receive the hydrogen from NADH and FADH2 to form water(H2O)
3. NAD+ and FAD are released to be used over again.
4. 32 ATPs are produced.

What is the difference between a ETC and Oxidative phsophorelation ?

Want to know more about the Electron Transport chain? Click here to schedule a live help with an eTutor!

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Reference Links:

- http://en.wikipedia.org/wiki/Electron_transport_chain
- http://en.wikipedia.org/wiki/Krebs_cycle
- http://en.wikipedia.org/wiki/Prokaryote
- http://en.wikipedia.org/wiki/Eukaryote
- http://www.youtube.com/watch?v=0LcWbKOW0u8
- http://www.youtube.com/watch?v=xbJ0nbzt5Kw

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