



Electron Transport Chain

The center of activity that brings your cells to life is found inside the dynamic mitochondria organelle. The inner mitochondrial membrane is coated with enzymes that catalyze the chemical reactions of respiration, working in sequence to generate the electron transport chain.

The first step in the electron transport chain is performed by Enzyme Complex I. Complex I receives electrons from coenzyme NADH, a substrate produced by the citric acid cycle. The catalytic mechanism of Enzyme Complex I connects two different kinds of reaction.

Coenzyme NADH is oxidized at one end of the enzyme, releasing two electrons that hop through the interior to coenzyme Q, which is reduced. Traveling amongst membrane lipids, coenzyme Q carries electrons to the next step in the electron transport chain. The movement of charged electrons through Complex I makes it bend in shape, transmitting energy for pumping four protons across the membrane.

The second step of the electron transport chain is performed by Enzyme Complex III. The mechanism of Complex III separates electrons from coenzyme Q, passing one electron to cytochrome C, which is reduced.

A complete reaction cycle of Enzyme Complex III transports four protons across the membrane. Traveling within the intermembrane space, reduced cytochrome C carries the electron to the final step in the electron transport chain.

The destination for electron transport is a molecule of oxygen, held inside Enzyme Complex IV. Reduced cytochrome C delivers electrons that transfer to the reaction center of Enzyme Complex IV. A molecule of oxygen from the air you breathe is captured, split, and reduced. The separated oxygen atoms accept electrons and pick up protons, creating two molecules of water.

The substrate providing electrons to Enzyme Complex I is coenzyme NADH, a product of the citric acid cycle. A second supply of electrons for the electron transport chain is from Step 6 of the citric acid cycle, performed by Enzyme Complex II. Enzyme Complex II catalyzes oxidation of succinate, releasing two electrons, which hop through the enzyme to coenzyme Q, which is reduced.

Traveling through the membrane, coenzyme Q carries the electrons to enzyme Complex III of the electron transport chain.