Monomer And Dimer Structures of Cytochrome Bo3 Ubiquinol Oxidase from Escherichia Coli

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The Escherichia coli cytochrome bo3 ubiquinol oxidase is a heme-copper oxidase composed of four subunits that functions as a proton pump in the E. coli aerobic respiratory chain. Despite numerous mechanistic studies, it remains uncertain whether this ubiquinol oxidase functions as a monomer or dimer, similar to its eukaryotic counterparts in mitochondrial electron transport complexes.

We determined the monomeric and dimeric structures of the E. coli cytochrome bo3 ubiquinol oxidase that co-purified with another membrane protein. The structures of the monomer and dimer forms of the E. coli cytochrome bo3 ubiquinol oxidase were reconstructed by cryogenic electron microscopy single particle reconstruction (cryo-EM SPR) to a resolution of 3.15 and 3.46 Å, respectively. Our results showed that the protein can form a dimer with C2 symmetry, and the dimerization interface is maintained by interactions between subunit II of one monomer and subunit IV of the other monomer. We found that the dimerization does not induce significant structural changes in the monomers, except for the movement of a loop in subunit IV (residues 67–74).

We will present the details of the reconstruction process and discuss how the particles were computationally enriched to solve these two structures in the presence of other macromolecules. Our findings will guide further mechanistic studies of this system.