Effect of Specific Lysine Modification on the Reduction of Cytochrome c by Succinate-Cytochrome c Reductase†

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ABSTRACT: The reduction of cytochrome c by succinate-cytochrome c reductase was studied at very low cytochrome c concentrations where the reaction between cytochrome c1 and cytochrome c was rate limiting. The rate constant for the reaction was found to be independent of ionic strength up to 0.1 M chloride, and to decrease rapidly at higher ionic strength, suggesting that the interaction between cytochrome c1 and cytochrome c was primarily electrostatic. The reaction rates of cytochrome c derivatives modified at single lysine residues to form trifluoroacetylated or trifluoromethylphenylcarbamylated cytochromes c were studied to determine the role of individual lysines in the reaction. None of the modifications affected the reaction at low ionic strength, but at higher ionic strength the reaction rate was substantially decreased by modification of those lysines surrounding the heme crevice, lysine-8, -13, -27, -72, and -79. Modification of lysine-22, -25, -55, -99, and -100 had no effect on the rate. These results indicate that the binding site on cytochrome c for cytochrome c1 overlaps considerably with that for cytochrome oxidase, suggesting that cytochrome c might undergo some type of rotational diffusion during the electron-transport process.

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