Identification of electron transport proteins in different complexes of cellular respiration system

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Background

Cellular respiration is the process by which cells obtain energy from glucose, and is a very important biological process in living cell. As cells do cellular respiration, they need a pathway to store and transport electrons, the electron transport chain. The function of the electron transport chain is to produce a trans-membrane proton electrochemical gradient as a result of oxidation-reduction reactions. If protons flow back through the membrane, ATP synthase converts this mechanical into chemical energy by producing ATP, which is provided energy in many cellular processes. Therefore, to identify electron transport proteins is an important issue in helping biologists better understand the workings of the cellular respiration.

Methods:

In this work, we propose a method based on radial basis function networks using Position Specific Scoring Matrix (PSSM) profiles and amino acid biochemical properties to identify electron transport proteins.

Results:

We have selected a non-redundant set of 354 electron transport proteins from UniProt database. The proposed method showed a 5-fold cross-validation accuracy of 92.9% for discriminating electron transport proteins from other transport proteins. We also evaluated the performance of the method with an independent dataset of 71 electron transport proteins, and we obtained an accuracy of 91.3%. In addition, we have systemically analyzed electron transport proteins in five complexes of electron transport chains. Finally, we developed a protocol based on PSSM profiles and biochemical properties for identifying electron transport proteins in new protein sequences.

Conclusions:

We have developed a novel approach based on PSSM profiles and biochemical properties for identifying electron transport proteins in new protein sequences. The proposed approach could serve as an effective tool for annotating electron transport proteins in genomic sequences.

Key words: electron transport proteins; transporter; annotation