Control and alteration of mitochondrial protein traffic

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【Outline of survey】

In eukaryotic cells, proteins have to be transported to their destination compartments such as organelles, where they constitute semi-autonomous systems to respond to the demand for complex cellular functions. In order to achieve and maintain proper transport and assembly of 1,000-100,000 different proteins, the cell contains an elaborate system to control protein trafficking, which is mediated by protein complexes, 'translocators', in the organellar membranes. Translocators recognize targeting signals encoded in the transported proteins themselves, provide channels through which transported proteins go across or get inserted into the organellar membranes, and offer driving forces to promote these processes. In the present research project, we aim at revealing the entire networks and dynamics of the translocators functioning in yeast mitochondria, generality and specificity of the principles of translocator actions, and mechanisms of traffic control by coordinated actions of the translocators. We also plan to design an artificially altered traffic control system to achieve desired protein fluxes to organelles.

【Expected results】

It is expected that the entire view of the system that can sort more than thousand different mitochondrial proteins to distinct submitochondrial compartments will be uncovered. Besides, simultaneous alteration of the destination signals in the transported proteins and their cognate receptors will promote development of such a technology that enables us to achieve precise delivery of recombinant proteins to specific organelles and sub-organellar compartments and integration of membrane proteins into the membranes with specific membrane topology, which lead to giving significant impact on the application field.

【References by the principal researcher】

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• M. Esaki, T. Kanamori, S. Nishikawa, I. Shin, P. G. Schultz, and T. Endo: Tom40 protein import channel binds to non-native proteins and prevents their aggregation. *Nature Struct. Biol. 10*, 988-994 (2003)

【Term of project】 FY2006－2010

【Budget allocation】18,000,000 yen

【Homepage address】 http://biochem.chem.nagoya-u.ac.jp/HP2002/index-E.html