Abstract

In last decade, investigations of mitochondria including their various reduced forms such as hydrogenosomes and mitosomes revealed unexpected diversity of this indispensable organelle. Interestingly, the single mitochondrion of parasitic protist *Trypanosoma brucei* is able to undergo remarkable functional and structural changes reflecting available carbon sources. Moreover, it was proposed that trypanosomes belong among the most ancient eukaryotes and as such, their mitochondria raised high attention of biologists. To contribute to the knowledge of mitochondrial biogenesis and function, we focused on studies of two key mitochondrial processes, the processing of preproteins that are imported to the mitochondria, and mechanism of pyruvate transport to these organelles. Moreover, we also investigated uptake of iron by *T. brucei*. This metal is essential for function of numerous proteins, particularly for iron-sulfur proteins in mitochondria.

Evolutionary history of trypanosomes and their mitochondrion is a question of debates. According to some reports, mitochondrion of trypanosomes represent an ancient form of this organelle, which is supported by identification of putative "archaic" translocase of the outer mitochondrial membrane (ATOM) and finding of only a single type of translocation pore in mitochondrial inner membrane. On the contrary, we identified and characterized mitochondrial processing peptidase within the mitochondrial matrix and two subunits of core proteins bound to the mitochondrial membrane with similar characters as those described in metazoans and fungi. Presence of highly evolved mitochondrial peptidases and comparable N-terminal mitochondrial presequences that target proteins to the trypanosomal mitochondrion do not support ancient character of this organelle. Further, we investigated an enigmatic mitochondrial pyruvate carrier (MPC) in inner mitochondrial membrane and characterized its function in procyclic and bloodstream forms of *T. brucei*. The character of *T. brucei* MPC appeared to be similar to previously discovered MPC in human, yeast and fruit fly. Additionally, we studied mechanism of iron uptake, which is poorly understood in procyclic form of *T. brucei*. We found that procyclic *T. brucei* is able to acquire iron from ferric complexes via a reductive mechanism, which can be beneficial for the parasite within the insect gut and which is comparable to mechanism used by yeast.

Taken together, our results do not support the ancient character of *T. brucei* mitochondrion. It seems more likely that it represents a highly evolved and versatile organelle, which is comparable in many characters with other eukaryotes.