Papers of the Week

Tracing the Evolution of Mitochondrial Protein Translocation Machinery ♦


Bacterial Origin of a Mitochondrial Outer Membrane Protein Translocase. New Perspectives from Comparative Single Channel Electrophysiology

Mitochondria are evolutionarily related to bacteria. To function in a eukaryotic cell, they have to import most of their proteins from the cytoplasm. Much of the importing is done by a pore in the outer mitochondrial membrane called Tom40, which is conserved in virtually all eukaryotes. However, the evolutionary origins of Tom40 are uncertain because its bacterial counterpart has not yet been identified. The archaic translocase of the outer mitochondrial membrane (ATOM) is the key component of the mitochondrial protein translocation machinery in the parasitic protozoon *Trypanosoma brucei*. It bears sequence similarities to Tom40 and bacterial translocases of the Omp85 family. In this Paper of the Week, Richard Wagner at the University of Osnabrück in Germany and colleagues showed that ATOM forms a hydrophilic pore with large conductance and high open probability. It prefers the passage of cationic molecules, supporting the hypothesis that it may translocate unfolded proteins with positively charged N-terminal presequences. Their detailed analysis of ATOM pore characteristics provides experimental support for a close functional similarity to Omp85-type translocases. “Our results support the idea that ATOM represents an evolutionary intermediate between a bacterial Omp85-like protein export machinery and the conventional Tom40 that is found in mitochondria of other eukaryotes,” say the authors.

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